

Relationship Building: Conflict and Project Choice over Time

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February 2013

Abstract

The question of how to develop a relationship is central to business and management. This is especially true when the environment is characterized by informational asymmetries and subjectivity, as for example in management consulting. This paper presents a model of relationship building inspired by the consultant-client relationship. Consistent with the evidence, it shows that consultants and clients optimally start with low-risk, low-return projects, and move up to high-risk, high-return projects over time as they accumulate relationship capital. The probability of conflict and breakup is decreasing over the course of the relationship, but may jump when a higher-risk project is adopted.

This is a pre-copyedited, author-produced PDF of an article accepted for publication in the *Journal of Law, Economics and Organization* following peer review. The version of record, Halac, Marina. "Relationship Building: Conflict and Project Choice over Time." *Journal of Law, Economics and Organization* 30, no. 4 (2014): 683-708, is available online at: < <http://dx.doi.org/10.1093/jleo/ewt009> >.

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1 Introduction

The question of how to develop a relationship is central to business and management. This is especially true when the environment is characterized by informational asymmetries and subjectivity, as for example in management consulting. Consulting guides and manuals stress the importance of creating solid consultant-client relationships.¹ Consulting firms such as McKinsey & Company and the Boston Consulting Group place building enduring relationships with clients among their core values.²

This paper presents a model of relationship building inspired by the consultant-client relationship. I start by exploring, in Section 2, real-world relationships in the management consulting industry. Two facts seem prominent in this industry. First, the nature of projects changes over the course of the consultant-client relationship. In particular, consultants and clients typically start with small and relatively safe tasks, and gradually move to larger, more specialized, and riskier tasks as their relationship develops. Second, disputes between consultants and clients are not rare, and they sometimes result in termination of the relationship. Parties tend to disagree on the magnitude of the client's problem and the amount of consulting services that are needed to solve it. Conflicts then arise when the consultant asks for more time (and fees) than initially agreed to complete a project, or tries to charge for expenses that the client finds unnecessary.

In Section 3, I attempt to theoretically uncover what might be behind these facts. I develop a formal model that explains the choice of projects over time and the occasional breakdown of relationships. The assumptions of the model are based on what seem to be the most important aspects of the consultant-client relationship, as described in Section 2, and the analysis sheds light on the role of the assumptions and why the industry displays the dynamics that it does.

Specifically, I consider two risk-neutral parties, such as a consultant and a client, who can trade for infinitely many periods. Every time the parties trade, they make relationship-specific investments; hence, repeat business is valuable. The terms or conditions of trade, however, cannot be objectively defined. In particular, in any given period, the difficulty of the client's problem may be the consultant's private information—the consultant may be more knowledgeable, or her evaluation of difficulty subjective—and the client's decision to exert costly, difficulty-reducing effort is the client's private information. The relationship is thus subject to both private monitoring and moral hazard.

The parties structure their relationship by choosing the type of project in which they

¹See Biswas and Twitchell (2002), Kubr (2002), and Stroh and Johnson (2006).

²See the companies' websites.

engage in a given period. High-risk, high-return projects produce a larger per-period surplus than low-risk, low-return projects when the difficulty of the project is minor. The probability that difficulty is minor (rather than serious), however, is higher for low-risk, low-return projects. In expectation, high-risk, high-return projects generate a larger per-period surplus.

Two benchmark settings are analyzed in Section 4. First, I consider a setting with common monitoring, where the client always observes the true difficulty of the project. Second, I consider a setting with no moral hazard, where the client's effort is either observable or costless. I show that, in any of these settings, the parties choose the efficient, high-risk, high-return project in all periods in which they trade, and they never end the relationship in equilibrium. Thus, the question of relationship building is rather trivial, and paths as those observed for the consultant-client relationship cannot be replicated.

The results change when both private monitoring and moral hazard are present. As discussed in Section 5, an optimal contract must now simultaneously induce the consultant to report the difficulty of the project truthfully and the client to exert difficulty-reducing effort. In such a contract, the relationship is terminated if the client finds the consultant cheating (misreporting difficulty), which never occurs in equilibrium. However, this threat of termination *off the equilibrium path* is not sufficient to sustain trade if the value of the relationship is low and the monitoring and incentive problems are severe. Intuitively, this punishment for cheating is low if the client is unlikely to detect cheating and the relationship is not very valuable, while the consultant's temptation to cheat is high if high-powered incentives for effort are given. Consequently, an optimal contract must also involve termination *on the equilibrium path*: the client ends the relationship with positive probability when the consultant claims a serious difficulty and the client cannot assess the true difficulty.

The optimal type of project is then determined by a risk-versus-return tradeoff. High-risk, high-return projects generate a higher per-period expected return, but, because they are more likely to be seriously difficult and thus to put the parties in a situation where cooperation is ambiguous, they also entail a higher risk of inefficient termination. On the other hand, low-risk, low-return projects make cooperation easier to assess and thus reduce the risk of termination, but at the cost of generating a lower per-period expected return.

The model predicts that the parties typically choose the low-risk, low-return project in the early stages of the relationship, and move to the high-risk, high-return project in later stages. This path follows from the fact that the value of the relationship is low when the parties start trading, but increases over time as the parties accumulate relationship capital. Hence, initially, the threat of termination off the equilibrium path is low, and trade requires a high threat of termination in equilibrium following a serious-difficulty report. The low-risk, low-return project is then optimal because it minimizes the risk of a serious-difficulty

realization. Over time, however, the threat of termination off the equilibrium path becomes more effective, so this risk becomes less relevant relative to the possibility of generating a large per-period surplus. The high-risk, high-return project then becomes more attractive.

The model also shows that costly disputes between consultants and clients arise and parties end their relationship with positive probability in equilibrium. The probability of breakup is decreasing over the course of the relationship given a type of project. At the time the parties move up to a riskier project, the probability of breakup may jump.

While the model is stylized to keep it tractable and highlight the main features of the consultant-client relationship, the results can be shown to obtain under more general conditions. I comment on the simplifying assumptions that I make in Section 3. In Section 6, I discuss some variations of the model: I show that similar relationship dynamics result if monitoring improves or effort costs decline over time, and describe how the relationship's path changes if relationship-specific investments depend on the type of project. Finally, in Section 7, I consider other applications that are consistent with the model's assumptions and predictions, and discuss how the framework may be extended to study richer environments.

1.1 Literature

The theory of relationship building proposed in this paper emphasizes what seem to be the key elements in determining how consultants and clients interact, namely, the informational asymmetries they face about the magnitude of the client's problem and their efforts to collaborate in the projects. However, other theories could explain the gradual building of relationships. For example, Sobel (1985), Ghosh and Ray (1996), Kranton (1996), and Watson (1999, 2002) consider settings where parties have incomplete information about the other party's willingness to cooperate, and show that parties increase the stakes of the relationship gradually to sort out "cooperative" from "noncooperative" types.³ Their predictions for the probability of breakup, on the other hand, are different from those of my model: this probability is typically increasing over time (until full separation of types occurs) in these settings, while I find that it decreases over time given a type of project.^{4,5}

The gradual path of relationships could also be explained by consulting firms having

³Halac (2012) considers a contracting setting with a similar form of incomplete information.

⁴Ghosh and Ray (1996) and Kranton (1996) assume that noncooperative types are completely myopic, so separation of types occurs immediately in their models. Sobel (1985) studies the optimal path for a relationship in a simple lender-borrower model; see Section 6 of his paper. It is easy to verify there that the probability of termination is increasing over time until it becomes zero. Watson (1999, 2002) considers a more general setting and allows for two-sided incomplete information. Like in Sobel (1985), termination increases as information is being revealed.

⁵Inefficient termination is used to mitigate incentive problems in a variety of models, including for example debt financing models such as Bolton and Scharfstein (1990, 1996) and Hart and Moore (1998).

heterogenous ability and developing a “reputation for competence” over time; e.g., Mailath and Samuelson (2001). The dynamics implied by such reputation models, however, are often different—reputations not only build but also dissipate gradually. Moreover, a reputation for competence obtained from engaging in small projects with a client would allow a consulting firm to work on large projects with other clients; instead, the data suggests that a gradual move from small to large projects occurs also within the relationship with each client.

Other recent papers studying relationship dynamics are Chassang (2010) and McAdams (2011). In Chassang’s model, a party cannot observe her partner’s cost of cooperation in a given period but can learn to predict this cost as the parties gain common experience, so the monitoring problem is reduced over time. McAdams studies an economy where each period parties choose costly efforts and whether to leave the relationship and be re-matched. Given an exogenous stochastic process, he shows that relationships in higher states persist longer.

The paper is also related to the literature on repeated games under private monitoring and, more specifically, to work on relational incentive contracts with subjective evaluations. Most closely related are Levin (2003), which studies a principal-agent setting with moral hazard and unobservable outcomes, and MacLeod (2003), which extends Levin’s model by considering risk aversion and outcomes that are observable with positive probability. The present paper incorporates dynamics and different trading opportunities into this type of settings to study how conflict and project choice change over the course of a relationship.

Finally, another related literature is that on credence goods (see Dulleck and Kerschbamer 2006 for a survey), which studies the informational problems associated with expert markets. This paper departs by considering the dual informational problem that arises when private monitoring on one side is accompanied by moral hazard on the other side, and examining how this problem affects contracting in a dynamic environment.

2 The consultant-client relationship

IBISWorld Inc. estimates that, in 2008, there were over 465,000 establishments in the U.S. management consulting industry that generated a total revenue of around \$150 billion. These firms give advice and assistance to businesses and other organizations on management issues.

Repeat business. Studies show that the consultant’s reputation, third-party recommendations, and previous use of the consultant are the most important choice criteria used by firms to select consultants (see Dawes, Dowling and Patterson 1992; Clark 1995; Bennett and Smith 2004). There is also evidence that repeat business represents a large share of consultants’ revenues, between 60 and 80 percent (Kipping 1999).

The large amount of repeat business is in part due to the fact that finding new clients is very costly. Moreover, switching to new clients, as well as switching to new consultants, is costly. When a consultant and a client engage in a project, they make relationship-specific investments—collection of data, analysis of the client’s goals and strategy, efforts to effectively work with each other, inter-personal relationships, etc. Thus, *ceteris paribus*, it is efficient for both parties to collaborate in new projects.

Information and contracts. Management consulting is an industry where the parties are inherently asymmetrically informed. The quality of the consultant’s service is very difficult to assess for the client, both before and after the service is provided (Nayyar 1990; Clark 1993). Not only do the parties have different degrees of knowledge about the client’s problem, but their evaluation of the problem is also highly subjective.

Due to this asymmetry of information, client firms are vulnerable to opportunistic behavior and, thus, often reluctant to work with consultants. Kubr (2002:61) explains that “the client may have only a vague idea of how consultants work and may be slightly suspicious—possibly he or she has heard about consultants who try to complicate every issue, require more information than they really need, ask for more time in order to justify longer assignments, and charge exorbitant fees.” In fact, more than a few have criticized the profession for launching “management fads” and “stating the obvious,” and complained that consultants never want to leave and constantly try to expand the length and scope of their work.⁶

But clients are not the only ones exposed to opportunistic behavior. Consultants need clients to assign qualified managers to the projects, provide any data they may need, learn how to implement their advice, and reduce resistance to change. According to Kubr (2002:67), “collaboration allows the consultant to refrain from undertaking tasks that the client is able and willing to do, thus saving the consultant’s time and reducing the cost of the assignment;” further, “without consultant-client collaboration, there is no effective consulting.” Consultants thus run the risk of high costs if clients have no incentives to collaborate.

Of course, the extent to which each party is vulnerable to opportunistic behavior depends on the form of the contract. The most common fee-setting methods for consulting are to charge a fee per unit of time and to charge a flat fee per project.⁷ None of these is without problems, however. Under fees per unit of time, consultants have incentives to prolong the project, and, as noted, they are often criticized for doing so. Under flat fees, on the other hand, consultants and clients take the risk that the project may take more or less time than initially thought. In particular, “[the consultant] cannot accept this form of fee if completion

⁶See Shapiro, Eccles and Soske (1993) for a list of common complaints about consultants. O’Shea and Madigan (1997) claim that consultants often fail to serve the best interest of the client.

⁷Performance-contingent fees are more rare; see Kubr (2002, chapter 30).

of the job depends more on the client's than on the consultant's staff. Thus, a flat fee may be charged for a market survey, (...), but not for a reorganization that depends much more on decisions and actions taken by the client than by the consultant" (Kubr 2002:688).⁸

Projects. I classify projects as being either relatively low-risk and low-return, or high-risk and high-return. Although this classification is far from exact, it has the advantage of being applicable to a broad set of examples. Moreover, examples suggest a common pattern in the way consultants and clients build their relationships: they begin with low-risk, low-return projects, then gradually move up to high-risk, high-return projects.

An example is offered by the consulting firm Barakat & Chamberlain: "When we started, we were willing to do the \$50,000 studies which the bigger firms were unwilling to do. We started with more *analytical* work and then we moved up to more *management* stuff."⁹ More generally, the evolution of many top consulting firms agrees with this pattern—they start with tasks whose outcomes are relatively certain or easy to assess, and then move to tasks that are riskier but more profitable. For example, Deloitte started by delivering tax and audit services; in the 1970s, it incorporated business consulting to its portfolio.¹⁰ Accenture was established as a technology consultant and systems integrator; over time, as it achieved a credible track record, it began to offer management strategy solutions to its clients.¹¹ James O. McKinsey first developed a reputation by providing finance and budgeting services; he then founded the management consulting company that bears his name.¹² McKinsey initially served small firms and then moved to larger clients; today, McKinsey avoids small firms which cannot afford its fees (Bhide 2000).

For small consulting firms, the evidence further suggests a shift to more specialized and profitable projects within the relationship with a client as this relationship grows. This is supported by data on the selection criteria used by clients for different types of projects. Using a survey covering 454 small consulting firms in Britain, Bennett and Smith (2004) show that there is a significant and positive correlation between the probability that a client selects a previously used consultant, instead of a new consultant, and the consulting assignment having relatively high fee rates, controlling for total cost, duration, type and expertise of the consultant and the client, and other variables. The authors explain that high fee rates are

⁸The comparison between fees per unit of time and flat fees is related to Bajari and Tadelis (2001)'s analysis of procurement contracts.

⁹The quote is from the firm's cofounder, Samir Barakat (the italics are added). The case of Barakat & Chamberlain is described by Bhide (2000:86) in his study of how businesses start and grow.

¹⁰See the company's website.

¹¹See the company's website.

¹²See the company's website. Although Marvin Bower, a founder of McKinsey, wanted to give up the accounting practice and focus on management consulting, the company was initially quite dependent on James O. McKinsey for clients (Bhide 1992).

used to differentiate “highly specialized and intensive assignments” from the rest.

Lastly, another piece of evidence is given by the accounts of how consulting firms entered foreign markets. Wright (2002) studies their expansion to Australia in the 1970s and 1980s and stresses the high resistance that they encountered from managers and employees. However, Wright (2002:195) notes that this was not true for all consultants: “while Australian business acceptance of elite strategy consulting took time to develop, a more favourable corporate reaction greeted the emergence of the other major segment in the Australian consulting market: the Big Eight accounting firms.” The revenues of the consulting divisions of these firms increased dramatically in the 1980s. As a main reason, Wright points to the building of relationships with clients: “the accounting firms had the advantage of pre-existing client relationships built upon years of tax and audit work.”

Conflict. Given the intangible nature of consulting services and the difficulty in measuring the parties’ collaboration efforts, disputes between consultants and clients are not rare. In some cases, differences of opinion end in a breakup of the relationship. One example that was publicized in the business press is that of UOP, a company that develops petroleum and gas process technologies, and Andersen Consulting. In 1994, UOP terminated its contract with Andersen for a project they had started in 1991. UOP fired Andersen shortly after the consulting firm had asked for more time to finish the assignment. In 1995, UOP took the case to court, accusing Andersen of bungling the project and delivering systems that “were materially defective, failed to comport with Andersen’s prior representations and promises, greatly exceeded budget costs, and were delivered far beyond original target dates.”¹³

Another case that ended in litigation concerns the Boston Consulting Group and the management consulting arm of Deloitte. Both firms were hired by the industrial conglomerate Figgie International in the early 1990s to work in a major corporate transformation. In 1994, Figgie sued them for not delivering the services they had promised. Figgie claimed that BCG breached its contract by providing “erroneous market studies and business reports” and billing Figgie for “unnecessary, excessive and/or inflated time and expenses.”¹⁴

3 The model

3.1 Setup

Consider a market with many sellers and buyers of a service. I call them consultants and clients, although, as discussed in Section 7, the model applies to other relationships as well.

¹³*Chemical Week* (March 29, 1995:9); *International Accounting Bulletin* (April 19, 1995:5).

¹⁴*The Boston Globe* (City Edition, August 30, 1994:39).

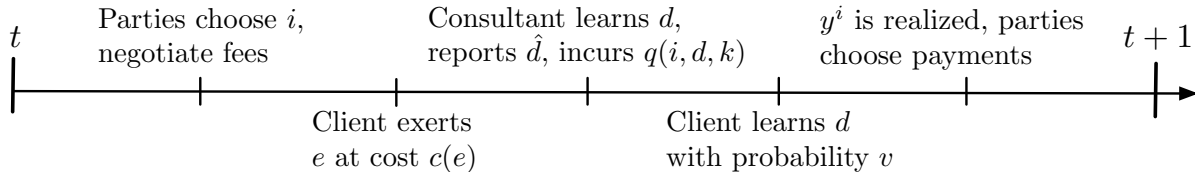


Figure 1: Timing

A consultant (she) and a client (he) can trade at dates $t = 0, 1, \dots$. The parties have the same discount factor $\delta \in (0, 1)$. They can engage in two types of trade or projects, $i \in \{\ell, h\}$. Below I characterize these as low-risk, low-return and high-risk, high-return projects; for brevity, I refer to them as low and high projects.

The sequence of events is shown in Figure 1. At the beginning of each date t , the parties decide whether to trade, choose the type of project i_t , and negotiate a fee for the consultant. It will be irrelevant for the results which party chooses i ; it may be reasonable to think of it as a mutually agreed decision. For the bargaining protocol, I adopt Nash bargaining with bargaining power $\lambda \in (0, 1)$ for the consultant and $1 - \lambda$ for the client. That is, the parties set the consultant’s compensation to split the gains from trading with each other with shares λ and $1 - \lambda$. The disagreement point or outside option for both parties is to trade with a new party or, if such trade does not yield a positive expected surplus, to engage in no trade and receive a zero payoff. The form of the contract is discussed in the next sections.

Every time a consultant and a client trade, they make relationship-specific investments. They gather information, discuss the short- and long-term goals of the client and how to achieve them, and learn how to communicate and work with each other effectively. These investments are valuable for future projects in which the parties may collaborate; they form the “relationship capital.” The stock of relationship capital at time t is denoted by k_t . For concreteness, I assume that the parties accumulate one unit of relationship capital every time they trade, so $k_t = t$ if the parties always traded with each other since $t = 0$.

The difficulty of a project can be minor or serious, $d_t \in \{m, s\}$. More difficult projects require more costly consulting services. The client can exert effort $e_t \in \{0, 1\}$ at private cost $c(e_t)$ to reduce the expected difficulty of the project (or time needed to complete it), where $c(e) = ce$, $c > 0$. The client’s effort choice is his private information. The probability that project i is of minor difficulty given effort e is $p_e^i \in (0, 1)$, where $p_1^i > p_0^i$. I assume that $p_1^i - p_0^i = \Delta p$ for $i \in \{\ell, h\}$, so the incentive problem is the same for the low and high projects (that is, the punishments and rewards necessary to induce effort are the same for both types of assignments).

Over the course of the project, the consultant learns its difficulty d_t , and can make a

report of difficulty $\hat{d}_t \in \{m, s\}$. Upon receiving the consultant's report, the client observes the actual difficulty of the project with probability $v \in (0, 1)$ (v for “validate”), where this observation is common knowledge. (That is, there is a public signal that takes on the realization of actual difficulty with probability v and is a null signal with probability $1 - v$.)¹⁵ The difficulty of the project may be the consultant's private information because she is more knowledgeable about the client's problem, or because the evaluation of the problem is subjective. In the former case, v represents the probability that the client also has the expertise and capacity to assess difficulty. In the latter, v can be interpreted as the correlation between the two parties' subjective perceptions of difficulty.¹⁶ Difficulty is unobservable by third parties, so it is nonverifiable.

The consultant incurs a cost of providing her services $q(i_t, d_t, k_t)$. This cost is increasing in difficulty and decreasing and convex in relationship capital: $q(i, m, k) < q(i, s, k)$, $\partial q(i, d, k)/\partial k \leq 0$, and $\partial^2 q(i, d, k)/\partial k^2 \geq 0$ for all i, d, k .¹⁷ I define the expected cost as $\bar{q}_e(i, k) \equiv p_e^i q(i, m, k) + (1 - p_e^i) q(i, s, k)$, and assume that the decline in the expected cost caused by an increase in relationship capital is the same for both types of projects: $\partial \bar{q}_e(\ell, k)/\partial k = \partial \bar{q}_e(h, k)/\partial k$ for all k .¹⁸

Finally, consulting services generate an output y_t for the client, and the client makes a payment to the consultant W_t . Output is $y_t = y^\ell$ if the low project was chosen, and $y_t = y^h$ if the high project was chosen.

As mentioned, in any given period, rather than collaborating in a project, the parties can choose to trade with a new party or not to trade. In addition, I assume that a consultant and a client can choose to exclusively invest in relationship capital (without producing), where, as above, they can accumulate one unit per period. These investments in this case entail costs χ_C and χ_F for the consultant and client firm respectively, where $\chi \equiv \chi_C + \chi_F$.¹⁹ As will be clear below, the parties may want to only invest in relationship capital in a period only if they will engage in projects in future periods. Indeed, they may want to do this only at the beginning of the relationship, during what I call the “observation period.” A possible interpretation is then that the parties do engage in a project, but need to spend time learning how to work with each other before they can generate an output. To simplify

¹⁵Assuming that the client's observation of difficulty is common knowledge is without loss; see Section 3.2.

¹⁶See MacLeod (2003) for a model of subjective evaluations with this structure.

¹⁷The fact that the cost of consulting services declines with the stock of relationship capital relates to the idea of asset specificity as discussed by Williamson (1971, 1985): while the market is initially competitive, when a consultant and a client trade over time, the consultant acquires a cost advantage.

¹⁸For example, this can be thought of as the cost of consulting services having a variable component that depends on the tasks involved in the project and their difficulty, and a fixed component that falls as relationship capital is accumulated: $q(i, d, k) = \tilde{q}(i, d) + g(k)$, with $g'(\cdot) \leq 0$, $g''(\cdot) \geq 0$.

¹⁹These costs may be opportunity costs or the costs of efforts made towards the investments.

and rule out the possibility of hold-up, I assume that χ_C and χ_F are contractible.

Assumption A1 below characterizes, for any project i , when trade is profitable. It states that the per-period expected surplus is positive if and only if the client exerts effort $e = 1$ in that period. Additionally, the per-period expected surplus when the client exerts no effort is lower than when the parties only invest in relationship capital. Thus, trading without providing incentives for effort is never beneficial.

Assumption A1. For $i \in \{\ell, h\}$ and all k ,

A1a. $y^i - \bar{q}_1(i, k) - c > 0 > y^i - \bar{q}_0(i, k)$,

A1b. $-\chi > y^i - \bar{q}_0(i, k)$.

Next, Assumption A2 specifies how the low and high projects differ from each other. If difficulty is serious, the surplus generated by the relationship is the same regardless of the type of project. Intuitively, in this case, a project generates zero surplus, and the parties bear the cost of engagement. If difficulty is minor, the surplus generated with the high project is larger; however, the probability that this project is of minor difficulty is lower than for the low project. In expectation, given $e = 1$, the high project is more profitable. Therefore, the high project is a high-risk, high-return bet, and the low project is a low-risk, low-return bet.

Assumption A2. For $e \in \{0, 1\}$ and all k ,

A2a. $y^\ell - q(\ell, s, k) = y^h - q(h, s, k)$,

A2b. $p_e^\ell > p_e^h$,

A2c. $y^h - \bar{q}_1(h, k) > y^\ell - \bar{q}_1(\ell, k)$.

I multiply expected lifetime payoffs by $(1 - \delta)$ to express them as per-period averages. Suppose that the parties engage in a project in every period $t = 0, 1, \dots$. Then the consultant and client's expected payoffs at time t are respectively

$$\begin{aligned} \pi_t &= (1 - \delta) \mathbb{E} \sum_{\tau=t}^{\infty} \delta^{\tau-t} (W_\tau - q(i_\tau, d_\tau, k_\tau)), \\ U_t &= (1 - \delta) \mathbb{E} \sum_{\tau=t}^{\infty} \delta^{\tau-t} (y_\tau - W_\tau - c(e_\tau)), \end{aligned}$$

and the expected joint surplus is $S_t \equiv \pi_t + U_t$.

3.2 Discussion of the model

Before proceeding, I comment on some of the modeling choices I have made.

First, I assume that the monitoring and incentive problems, as well as the pace with which relationship capital is accumulated and the expected cost of consulting services reduced, are the same for both types of projects. I make these assumptions in order to focus on projects that are similar in dimensions other than their risk and return, and thus be able to provide a clear characterization of how the relationship dynamics are generated. Naturally, the results of the paper can be shown to hold under less restrictive conditions. In Section 6.2, I consider relationship-specific investments that vary with the type of project that parties engage in.

Second, I assume that the client's cost of effort is independent of the stock of relationship capital. One could imagine that this cost may go down as parties trade with each other. I do not incorporate this effect in the main model because it would cause not only the value of the relationship to increase, but also the moral hazard problem to decline over time. This would make it harder to understand what drives relationship dynamics and to assess whether different types of projects can be optimal at different stages even when the monitoring and incentive problems do not change. I discuss these effects as extensions in Section 6.1.

Third, I assume that the client's observation of difficulty is common knowledge. This assumption is introduced to simplify the analysis but is not necessary for the results. The Appendix shows that this assumption is without loss: if a contract is optimal in a setting where the client's observation is common knowledge, then the same contract but with continuation play being contingent on the client's report of his observation (rather than this observation) is optimal in a setting where the client's observation is his private information. Such a contract gives incentives to the client to report his observation of difficulty honestly.

Fourth, I assume that regardless of d and \hat{d} , the parties complete the project they started (so the current-period output is realized). The motivation is twofold. First, difficulty cannot be fully assessed ex ante; it is learnt and re-evaluated during the consulting process. Thus, it may be prohibitively costly to interrupt a project, and part of the project's output may be already realized when difficulty is re-assessed. Second, relationship-specific investments made during the project may be lost if the project is not completed. Hence, even if it is seriously difficult, the parties will find it beneficial to proceed with the project.

Lastly, the model abstracts from a choice of effort by the consultant. Consultant's effort arguably affects performance and may influence optimal contracts. However, the evidence discussed in Section 2 suggests that it is the consultant's private information about the severity of the client's problem—resulting from the consultant's expertise and the high degree of subjectivity in these practices—what is central to understanding the consultant-client relationship, particularly why disputes arise and how parties structure their relationships over time. To capture the essence of the problem, I thus focus on this informational asymmetry.²⁰

²⁰A variation of the model presented in this paper, with consultant's effort and (two-sided) imperfect

3.3 Solution concept

The design of optimal contracts is complicated by the presence of private monitoring and moral hazard. As will be discussed in the next sections, for the client to have incentives to exert difficulty-reducing effort, his continuation payoff must decrease with difficulty. Now, if the client is unlikely to observe the realized difficulty, his continuation payoff must decrease with the consultant's report of difficulty, and the consultant must have incentives to make honest reports. But then the consultant's continuation payoff cannot increase with difficulty, as she would not be willing to report a minor difficulty level in that case. It thus becomes necessary to impose inefficient, joint punishments after some histories, and the question of how to optimally provide truthful reporting and effort incentives is then not trivial.

Following the literature, I characterize optimal contracts by restricting attention to perfect public equilibria. A perfect public equilibrium is a profile of public strategies that, for each date t and history of play up to date t , yield a Nash equilibrium from that date on. Importantly, public strategies depend only on the public history of play. Public strategies then simplify the analysis by requiring that the consultant report the realized difficulty level in every period. That is, in a perfect public equilibrium, in each period t in which the parties trade and given any history up to t , the consultant reports difficulty honestly, so she does not keep any private information from one period to the next.²¹ Public strategies also require that the client do not condition his actions on past effort choices, which is intuitive, as past effort decisions then do not affect payoffs nor continuation strategies in any way.

4 Benchmarks

I consider two benchmarks: common monitoring and no moral hazard. I show that in any of these settings, the parties choose the high project in each period in which they trade, and they never end the relationship. Hence, the question of relationship building is rather trivial, and the path followed by the consultant-client relationship cannot be replicated.

4.1 Common monitoring

A setting with common monitoring is one in which the difficulty of the project is always observed by both parties; that is, $v = 1$. This difficulty is still nonverifiable, so the parties

public monitoring, can deliver similar results as those obtained here. Such a model though would not reflect the fact that consultants are “experts” and that parties' evaluations are highly subjective.

²¹The restriction to public strategies is not without loss. Fuchs (2007) shows that under private monitoring, a contract where reports are made only every T periods may be optimal. This contract, however, may not be practical in the real world, where reports are necessary for the client to learn how to collaborate effectively.

cannot write a formal contract contingent on difficulty; however, they may be able to use a simple relational contract. Under this contract, the consultant's compensation is composed of a formally-enforced fixed wage $w_t(i_t, k_t)$ and discretionary difficulty-contingent fees $f_t(i_t, d_t, k_t)$, where, without loss of generality, $f_t(i_t, s, k_t) \geq 0$, $f_t(i_t, m, k_t) \leq 0$. If $f_t > 0$, the client decides whether to honor or renege on the fee payment at the end of period t ; if $f_t < 0$, the consultant makes this decision. If any of the parties reneges, their relationship ends with probability one. Note that no party ever reneges in equilibrium, so there is no loss in assuming that a default leads to termination, which is the worst outcome (Abreu 1988).

It follows from Levin (2003) that, conditional on the project i and the relationship capital k , a contract that is independent of time is optimal: in every period on the equilibrium path, $e_t = e(i, k)$, $f_t = f(i, d, k)$, and $w_t = w(i, k)$. Further, it is immediate that if engaging in a project is optimal, conditional on k , the optimal type of project is also independent of time: $i_t = i(k) \equiv i_k$. Thus, suppose that the parties always choose to engage in a project and that relationship capital at time t is k . Making the choice of project explicit, the parties' expected payoffs are

$$\begin{aligned}\pi(i_k, k) &= (1 - \delta) \sum_{\tau=0}^{\infty} \delta^\tau (\bar{W}_e(i_{k+\tau}, k + \tau) - \bar{q}_e(i_{k+\tau}, k + \tau)), \\ U(i_k, k) &= (1 - \delta) \sum_{\tau=0}^{\infty} \delta^\tau (y^{i_{k+\tau}} - \bar{W}_e(i_{k+\tau}, k + \tau) - c(e(i_{k+\tau}, k + \tau))),\end{aligned}$$

where $\bar{W}_e(i_k, k) \equiv w(i_k, k) + p_e^{i_k} f(i_k, m, k) + (1 - p_e^{i_k}) f(i_k, s, k)$.

For the contract to be self-enforcing, no party can wish to renege on a payment:

$$\begin{aligned}-(1 - \delta) f(i_k, m, k) &\leq \delta (\pi(i_{k+1}, k + 1) - \pi(i_0, 0)), \\ (1 - \delta) f(i_k, s, k) &\leq \delta (U(i_{k+1}, k + 1) - U(i_0, 0)).\end{aligned}$$

By adjusting the fixed wage, slack is transferred from one constraint to the other. Thus, the two conditions can be combined into a single enforcement constraint:

$$(1 - \delta)(f(i_k, s, k) - f(i_k, m, k)) \leq \delta (S(i_{k+1}, k + 1) - S(i_0, 0)). \quad (\text{E})$$

Given (E), two conditions determine the consultant's compensation: Nash bargaining and the client's incentive compatibility (IC) constraint for effort. Nash bargaining determines the expected payment, $\bar{W}_e(i_k, k)$. I consider that for new relationships ($k = 0$), competition drives consultants' pay down to cost levels. Thus, for relationship capital k and effort $e = 1$,

the consultant's expected payment is

$$\bar{W}_1(i_k, k) = \bar{q}_1(i_k, k) + \lambda[(y^{i_k} - \bar{q}_1(i_k, k)) - (y^{i_0} - \bar{q}_1(i_0, 0))].$$

The client's IC constraint determines the difference between the serious- and minor-difficulty fees. For the client to choose effort $e = 1$, this difference must be

$$f(i_k, s, k) - f(i_k, m, k) \geq \frac{c}{\Delta p}. \quad (1)$$

Since this constraint puts a lower bound on $f(i_k, s, k) - f(i_k, m, k)$, it is required that (E) be satisfied when (1) holds with equality. Therefore, a self-enforcing contract that implements effort $e = 1$ exists if and only if

$$\frac{c}{\Delta p} \leq \frac{\delta}{1 - \delta} (S(i_{k+1}, k + 1) - S(i_0, 0)). \quad (2)$$

Recall that the per-period expected surplus is largest under the high project (Assumption A2c). It is immediate that if (2) holds for some project, it holds for the high project, and, because it then generates a higher lifetime expected surplus, the high project is optimal for any relationship capital k for which trade is optimal.²²

So far I have assumed that the parties always engage in a project. If condition (2) holds for $k = 0$, engaging in a project is indeed always optimal. Suppose instead that condition (2) holds only if $k > \bar{k}$, for some $\bar{k} > 0$. Then for $k \leq \bar{k}$, effort incentives cannot be given and, by Assumption A1, trade is not profitable. In this case, the parties may choose either not to trade in any period, or to spend the first \bar{k} periods of the relationship investing in relationship capital and then collaborate in projects in the remaining periods. Yet, even if the relationship initially goes through an observation period, it follows directly from the analysis that the high project is optimal in all periods in which the parties decide to trade.

Proposition 1. *Under common monitoring, the parties choose the high project in every period in which they trade. Further, a difficulty-contingent (or per unit of time) fee is used, and a consultant and a client never end their relationship.*

4.2 No moral hazard

Consider next a setting with no moral hazard. Such a setting may be one in which the client's effort choice is observable or one in which the cost of effort is zero. Suppose first

²²This result is easily obtained as the lower bound for $f(i_k, s, k) - f(i_k, m, k)$ given by (1) is independent of i . Clearly, the result holds more generally, but the derivation is not as clean as here.

that the client's effort choice is observable (but nonverifiable). Then the parties may be able to use a relational contract as the one described above, but where fees are contingent on effort instead of difficulty. That is, the consultant's compensation is composed of a formally-enforced fixed wage $w_t(i_t, k_t)$ and discretionary effort-contingent fees $f_t(i_t, e_t, k_t)$. Any failure to make a promised payment ends the relationship. Following the same steps as above, for a relationship capital k , trade is feasible if and only if

$$c \leq \frac{\delta}{1-\delta} (S(i_{k+1}, k+1) - S(i_0, 0)).$$

It is straightforward that the high project is feasible whenever trade is feasible, and is optimal in all periods in which trade is optimal.

Finally, suppose that effort is costless for the client; that is, $c = 0$. Then the parties optimally use a flat contract, where the consultant's wage $w_t(i_t, k_t)$ is determined by Nash bargaining. Since $c = 0$, the client is indifferent between $e = 0$ and $e = 1$ and, thus, chooses $e = 1$ as desired by the consultant. Clearly, here the high project is also always optimal.

Proposition 2. *Under no moral hazard, the parties choose the high project in every period in which they trade. Further, a flat (or per project) fee is used if $c = 0$, and a consultant and a client never end their relationship.*

5 Relationship building

Consider now the case where there is a dual informational asymmetry problem: there is private monitoring because the difficulty of the project may be the consultant's private information, and moral hazard because the client's effort is costly and privately chosen.

In this setting, if the required incentives to induce costly effort and the probability that difficulty is not observable are relatively high, and the value of the relationship (relative to the outside options) is relatively low, contracts as those specified in the previous section will not work. To see this, suppose first that the parties promise to pay fees that are contingent on the consultant's reported difficulty, and continue trading as long as such fees are honored. For the contract to provide effort incentives, a serious-difficulty report must be associated with a high payment to the consultant. But then the consultant never reports a minor difficulty—as cheating is costless, she maximizes her expected payoff by reporting a serious difficulty in every period. In turn, the client exerts no effort, and trade is not feasible.

Consider next a similar contract but specifying that, in any period t , if the client observes difficulty and finds that the consultant cheated (that is, $\hat{d}_t \neq d_t$), the relationship is terminated. Now cheating is not costless; yet, if the incentive and monitoring problems are severe

enough and the parties have not accumulated much relationship capital, cheating is still profitable for the consultant. The benefit of cheating—the difference between the serious- and minor-reported-difficulty fees—is high if $c/\Delta p$ is high, while the cost of cheating—the expected loss due to the possibility that the client will find the consultant cheating and end the relationship—is low if v and $S(i_{k+1}, k+1) - S(i_0, 0)$ are low. Hence, the consultant again chooses to report a serious difficulty in each period, and so the client exerts no effort.

Finally, consider a flat-fee contract. If the client pays a fixed fee to the consultant, then monitoring is not an issue. However, the client will have no incentives to choose effort $e = 1$ at cost c , and will thus choose $e = 0$ at zero cost every period.

In sum, in this setting, an optimal contract must make the consultant’s cheating sufficiently costly to induce truthful reporting while providing sufficiently high incentives to the client to induce costly effort. Since there is only one profitable level of effort in the model, the latter requirement is fully pinned down by the client’s IC constraint. As for the former, it is clear that inducing truthful reporting may entail punishing the consultant not only when the client finds her cheating, but also when she reports a serious difficulty that the client cannot observe. While different forms of punishments may be used, one can show that if an optimal contract that induces truthful reporting exists, then a termination contract—a contract that ends the relationship with positive probability following a serious-difficulty report that is not validated—is optimal.²³ Thus, without loss, I focus on termination contracts.

An optimal termination contract is as follows. The parties agree on a fixed wage $w_t(i_t, k_t)$ and reported-difficulty-contingent fees $f_t(i_t, \hat{d}_t, k_t)$. If the consultant reports $\hat{d}_t = m$, or if she reports $\hat{d}_t = s$ and the client observes $d_t = s$, the parties continue with the relationship with probability one. If the consultant reports $\hat{d}_t = s$ and the client cannot observe d_t , the parties end the relationship with probability $(1 - \phi(i_t, k_t))$ and continue with the relationship with probability $\phi(i_t, k_t)$, for some $\phi(i_t, k_t) \in [0, 1]$. Finally, if the consultant reports $\hat{d}_t = s$ but the client observes $d_t = m$, the parties end the relationship with probability one.²⁴

The smaller $\phi(i_t, k_t)$, the stronger the punishment for misreporting. However, inducing truthful reporting is costly, as it requires inefficient termination of the relationship in equilibrium in periods in which difficulty is not observed. An optimal termination contract then sets the minimum probability of termination $(1 - \phi(i_t, k_t))$ such that the consultant reports difficulty truthfully. This is the probability that makes the consultant indifferent between reporting a serious and minor difficulty when the actual difficulty is minor (and that, therefore, makes the consultant prefer reporting a serious difficulty when the actual difficulty is

²³This follows from the results in Levin (2003).

²⁴One can easily show that specifying fees that are contingent not only on reported difficulty but also on whether the client observes d cannot improve upon this contract where fees depend only on reported difficulty (and the probability of termination depends on whether the client observes d).

serious). Note that termination of the relationship when the client observes difficulty and can validate that the consultant cheated never occurs in equilibrium. For this reason, it is optimal to specify that the relationship ends with probability one following such event.

As in the case of common monitoring, a contract that is independent of time conditional on the stock of relationship capital is optimal. For a relationship capital k , the consultant is indifferent between reporting a serious and minor difficulty when difficulty is minor if and only if for some $\phi(i_k, k) \in [0, 1]$,

$$\begin{aligned} (1-v)\phi(i_k, k)f(i_k, s, k) - f(i_k, m, k) \\ = \frac{\delta}{1-\delta}(1 - (1-v)\phi(i_k, k))(\pi(i_{k+1}, k+1) - \pi(i_0, 0)), \end{aligned} \quad (3)$$

where $\pi(i_k, k) - \pi(i_0, 0) = \lambda(S(i_k, k) - S(i_0, 0))$ and, under the proposed contract,

$$\begin{aligned} S(i_k, k) = & (1-\delta)(y^{i_k} - \bar{q}_1(i_k, k) - c) + \delta[S(i_{k+1}, k+1) \\ & - (1-p_1^{i_k})(1-v)(1-\phi(i_k, k))(S(i_{k+1}, k+1) - S(i_0, 0))]. \end{aligned} \quad (4)$$

The client's IC constraint for effort now implies that $e = 1$ is chosen if and only if

$$\begin{aligned} [v + (1-v)\phi(i_k, k)]f(i_k, s, k) - f(i_k, m, k) \\ \geq \frac{c}{\Delta p} - \frac{\delta}{1-\delta}(1-v)(1-\phi(i_k, k))(U(i_{k+1}, k+1) - U(i_0, 0)), \end{aligned} \quad (5)$$

where $U(i_k, k) - U(i_0, 0) = (1-\lambda)(S(i_k, k) - S(i_0, 0))$.

Condition (3) shows that increasing the serious-difficulty fee $f(i_k, s, k)$ reduces the consultant's incentives to report difficulty truthfully, while condition (5) shows that it increases the client's incentives to exert effort. Furthermore, the conditions show that the latter effect is larger. Intuitively, a higher fee $f(i_k, s, k)$ reduces the consultant's truthful reporting incentives by increasing her payoff from cheating when difficulty is not observed and the relationship continues. But a higher fee $f(i_k, s, k)$ increases the client's effort incentives by increasing the payment he must make both when a serious difficulty is not observed and the relationship continues, as well as when a serious difficulty is observed. Thus, an optimal contract specifies the highest fee $f(i_k, s, k)$ that is self-enforcing, and a probability of termination such that (3) and (5) hold given such fee. To see this, combine (3) and (5):

$$\begin{aligned} \frac{c}{\Delta p} \leq & \frac{\delta}{1-\delta}(1 - (1-v)\phi(i_k, k))(S(i_{k+1}, k+1) - S(i_0, 0)) \\ & - v \left[\frac{\delta}{1-\delta}(U(i_k, k) - U(i_0, 0)) - f(i_k, s, k) \right]. \end{aligned}$$

To provide reporting and effort incentives while minimizing termination, $f(i_k, s, k)$ is set such that the client's enforcement constraint binds, so the expression in square brackets is zero. Hence, trade is feasible only if there exists $\phi(i_k, k) \in [0, 1]$ such that

$$\frac{c}{\Delta p} \leq \frac{\delta}{1 - \delta} (1 - (1 - v)\phi(i_k, k))(S(i_{k+1}, k + 1) - S(i_0, 0)). \quad (6)$$

The Appendix shows that condition (6) is not only necessary but also sufficient to sustain trade. That is, if this condition holds, there exists a contract that induces the consultant to report difficulty truthfully, the client to exert effort, and both parties to honor the promised payments.

If condition (6) can be satisfied with $\phi(i_k, k) = 1$, no termination in equilibrium is necessary. However, note that for $c/\Delta p$ sufficiently large and v and $S(i_{k+1}, k + 1) - S(i_0, 0)$ sufficiently small, (6) requires $\phi(i_k, k) < 1$. In this case, and by the reasoning above, an optimal contract sets $\phi(i_k, k)$ such that (6) holds with equality.

Propositions 3 and 4 below state the main results of the paper. The first result concerns the choice of projects over time:

Proposition 3. *There is an open and dense set of parameters for which, under private monitoring and moral hazard, the parties choose the low project in the initial periods in which they trade and the high project in the subsequent periods. (For any other parameters, the parties choose either the low or the high project in all periods in which they trade.)*

The intuition stems from a tension between generating a high per-period expected surplus and minimizing inefficient termination. High projects offer a higher per-period expected surplus. However, because they are more likely to be seriously difficult and thus to put the parties in a situation where cooperation is ambiguous, high projects also require a higher probability of termination in equilibrium. On the other hand, low projects make cooperation easier to assess and thus reduce termination, but at the cost of generating a relatively low per-period expected surplus.

The optimal path for the relationship then follows from the fact that the value of the relationship is low when the parties start trading, but increases over time as the parties accumulate relationship capital. Hence, initially, the threat of termination off the equilibrium path—the threat that the client will end the relationship if he finds the consultant cheating—is relatively low, and trade requires that the threat of termination following a serious-difficulty realization in equilibrium—the threat that the client will end the relationship when not able to validate a serious-difficulty report—be relatively high. The low project is then optimal because it minimizes the risk of a serious-difficulty realization. Over time,

however, the threat of termination off the equilibrium path becomes more effective, so this risk becomes less relevant relative to generating a large per-period expected surplus. The high project then becomes more attractive.²⁵

It is worth noting that as the value of the relationship increases and the threat of termination off the equilibrium path becomes more effective, the parties reduce not only the probability of termination following an unobserved serious-difficulty realization $(1 - \phi(i_k, k))$, but also the expected loss $(1 - \phi(i_k, k))(S(i_{k+1}, k + 1) - S(i_0, 0))$. It is the decline in this expected punishment what makes the tradeoff between risk and return, and thus the choice of project, change over time. This effect would not be present if $v = 0$, i.e. if the client were never able to observe the difficulty of the project; in that case, there would be no punishment off the equilibrium path, and the parties would choose the same project in each period.

Proposition 3 holds regardless of whether the relationship initially goes through an observation period. An observation period may be beneficial because it allows the parties to have a larger stock of relationship capital, and thus be exposed to a lower risk of termination, once trade starts. However, reducing termination to zero before trade starts will in general not be optimal; that is, $(1 - \delta)(-\chi) + \delta S(i_{k+1}, k + 1) < S(i_k, k)$ for some $\phi(i_k, k) < 1$ and $\chi > 0$. Thus, when the parties move to the trade period, they will likely start with the low project and then switch to the high project.

The second result concerns the probability of termination in equilibrium:

Proposition 4. *Under private monitoring and moral hazard, the probability that a consultant and a client end their relationship is positive and decreasing over time given a fixed type of project. At the point that the parties switch from the low to the high project, given a relationship capital k , the probability of termination increases if $(1 - p_1^\ell)/(1 - p_1^h) \leq (1 - \phi(h, k + 1))/(1 - \phi(\ell, k))$ and decreases otherwise.*

As already mentioned, a positive threat of termination on the equilibrium path is necessary to sustain trade when the monitoring and incentive problems are severe and the value of the relationship is low. As the value of the relationship increases, a given threat of termination in equilibrium can be imposed with a lower probability of termination; moreover, as the threat of termination off the equilibrium path becomes more effective, the threat in equilibrium can be reduced, so the probability of termination can be reduced further.

Now, as the threat of termination in equilibrium is reduced, the high project becomes more attractive, up to the point that the parties find it optimal to switch to this project. At that time, given relationship capital k , the probability that the relationship ends following

²⁵The result is formally obtained by combining equation (6) with equality with the expression for the expected surplus given in (4), as is shown in the proof of Proposition 3 in the Appendix.

an unobserved serious-difficulty realization is reduced from $(1 - \phi(\ell, k))$ to $(1 - \phi(h, k + 1))$, but the probability of a serious-difficulty realization increases from $(1 - p_1^\ell)$ to $(1 - p_1^h)$. If the effects of relationship capital on the relationship's value are small, then $(1 - \phi(\ell, k)) - (1 - \phi(h, k + 1))$ is low and the latter effect dominates. In this case, the probability of termination in equilibrium, $(1 - p_1^i)(1 - v)(1 - \phi(i_k, k))$, jumps when the high project is adopted.

Although the model features only two levels of effort and difficulty (for expositional convenience), one can show that under certain conditions, the results extend to a more general setting with a continuum of effort and difficulty. That is, even if the parties can adjust the levels of risk and return over time given a fixed type of project, different projects may be optimal at different stages. Building relationship capital not only allows parties to increase incentives for a given project, but also to switch to riskier and more profitable tasks.

6 Extensions

6.1 Monitoring and effort costs

The relationship dynamics described in the previous section could also result from changes in monitoring or effort costs.

Over the course of the relationship, the consultant and the client may become able to communicate more effectively and assess difficulty more objectively. In the model, this would be reflected as an increase in the probability that difficulty is observed by both parties, v . (That is, let v be a function of relationship capital k , with $\partial v(k)/\partial k \geq 0$.) As v increases, the threat that the relationship will be terminated if the client finds the consultant cheating increases, and the consultant's incentives to cheat fall. Consequently, as the relationship grows, the need for inefficient termination in equilibrium falls. The resulting path is as above: initially, when the client is unlikely to observe difficulty, the parties choose the low project; as they learn how to measure difficulty, they switch to the high project.

Over the course of the relationship, collaborating with the consultant may become less costly for the client. In the model, this would be reflected as a decrease in the cost of effort, c . (That is, let c be a function of relationship capital k , with $\partial c(k)/\partial k \leq 0$.) As c falls, the moral hazard problem is reduced—the difference between the serious- and minor-difficulty fees required by the client's IC constraint becomes smaller. Consequently, as the relationship grows, the consultant's temptation to cheat falls, and the need for inefficient termination in equilibrium falls. Further, as c falls, the value of the relationship increases, so the mechanism of Section 5 also comes into play. The resulting path is as above: initially, when the cost of collaborating is high, the parties choose the low project; as they continue working together

and this cost goes down, they switch to the high project.

6.2 Relationship-specific investments

The model can be readily used to understand how the relationship would respond to different paths of the stock of relationship capital. For example, the rate at which parties accumulate relationship capital may depend on the type of project in which they engage. In particular, the high project may involve higher specific investments, as the parties collaborate in a larger, more specialized assignment. In the model, this would be reflected as a larger increase in k over time under project h than under ℓ . (That is, assume that $k_{t+1} = k_t + x(i_t)$, with $x(h) > x(\ell)$.) In this case, the benefits of adopting the high project are larger, so the parties optimally switch to the high project earlier in their relationship.²⁶ Yet, provided that the difference in the specific investments under the two projects is not too large (i.e., $x(h) - x(\ell)$ is not too large), the parties will still find it optimal to implement the low project in the early stages to minimize termination, and the resulting path for the relationship is as above.

7 Concluding remarks

This paper presented a model of relationship building that captures the main features and problems of the consultant-client relationship. I showed that the combination of private monitoring and moral hazard that characterizes this relationship results in a risk-versus-return tradeoff, and studied how this tradeoff changes and influences the choice of projects and the probability of breakup over the course of the relationship. The parties typically start with low-risk, low-return projects, which minimize the risk of inefficient termination. Over time, as relationship capital is accumulated, they switch to high-risk, high-return projects, which generate a higher per-period expected return. The probability of breakup decreases over time, but may jump when the parties move to a new type of project. Evidence from the management consulting industry is consistent with these results.

The model could be modified or extended in different directions. For example, projects could be classified according not to the distribution of difficulty, but rather to whether difficulty is relatively easy or hard to assess objectively. The predictions of the model would then be unchanged if high-risk projects are defined as those for which the probability that difficulty cannot be objectively evaluated, or observed by the client, is relatively high. This definition of risk may indeed be appropriate for some real-world examples. As mentioned

²⁶Also, the probability of breakup declines faster once the high project is adopted, as relationship capital is then accumulated at a higher rate.

in Section 3, another possible extension is to consider a choice of effort by the consultant. Project difficulty and performance may depend on the effort levels chosen by both parties. This formulation would give similar results and could be important for other applications.

The model could also be enriched to explore how individuals on the one hand and firms on the other contribute to the building of relationships. The model presented here does not distinguish between these parties; it can be used to understand the relationship between individual consultants and clients as well as the evolution of consulting firms. In reality, however, individuals and firms may play different roles and interact in a way that influences how relationships grow. Likewise, the framework can be adapted to study network evolution. Starting from how a principal-agent relationship is developed, one can explore how a network of relationships evolves, and how the size and shape of the network change over time.

While the model is constructed to describe the relationship between consultants and clients, the results may also shed light on how other real-world relationships are developed. In particular, the model may be well-suited to explain relationships between sellers and buyers of services that require the collaboration of both parties and are subject to informational asymmetries. The examples discussed in the literature on credence goods or expert markets, like lawyers, home improvement contractors, and car mechanics, may enter this category. Anecdotal evidence suggests that these experts typically start with small and simple tasks, and switch to riskier and more profitable tasks as they build relationships with clients.

The model may also be useful to explain relationships between firms, in supply chains and business groups. For instance, it could be used to study the evolution of trade between firms in different countries, for which informational asymmetries are important. Furthermore, the model could help explain not only the choice of tasks over time, but also the choice of governance structure. Using data on alliances between 1970 and 1989, Gulati (1995) finds that firms with prior agreements are more likely to choose nonequity alliances over equity alliances. As the value of the relationship between partner firms increases, they substitute formal contractual provisions with riskier and more efficient informal practices.

Appendix: Proofs

Propositions 1 and 2 are proven by the discussion in the text.

Proof of Proposition 3. I first show that condition (6) is necessary and sufficient for trade to occur in a perfect public equilibrium given relationship capital k . For necessity, note that if (6) does not hold, then both (3) and (5) cannot hold, so a contract that induces truthful reporting and positive effort every period does not exist. For sufficiency, suppose that (6)

holds. Then let

$$f(i_k, m, k) = \frac{\delta}{1-\delta} \left[(1-v)\phi(i_k, k)(U(i_{k+1}, k+1) - U(i_0, 0)) \right. \\ \left. - (1 - (1-v)\phi(i_k, k))(\pi(i_{k+1}, k+1) - \pi(i_0, 0)) \right], \quad (7)$$

$$f(i_k, s, k) = \frac{\delta}{1-\delta} (U(i_{k+1}, k+1) - U(i_0, 0)), \quad (8)$$

and $w(i_k, k)$ so that $U(i_k, k) = U(i_0, 0) + (1-\lambda)(S(i_k, k) - S(i_0, 0))$, $\pi(i_k, k) = \pi(i_0, 0) + \lambda(S(i_k, k) - S(i_0, 0))$. Then both (3) and (5) hold. Moreover, payments are self-enforcing, since

$$-f(i_k, m, k) = \frac{\delta}{1-\delta} \left[\pi(i_{k+1}, k+1) - \pi(i_0, 0) \right. \\ \left. - (1-v)\phi(i_k, k)(S(i_{k+1}, k+1) - S(i_0, 0)) \right] \\ \leq \frac{\delta}{1-\delta} (\pi(i_{k+1}, k+1) - \pi(i_0, 0)),$$

and

$$f(i_k, s, k) \leq \frac{\delta}{1-\delta} (U(i_{k+1}, k+1) - U(i_0, 0)).$$

An optimal self-enforcing contract then maximizes the expected surplus subject to condition (6). In the optimum, this condition must bind; otherwise, $(1-\phi(i_k, k))$ could be reduced and thus the expected surplus increased. Then, substituting $(1-\phi(i_k, k))$ from condition (6) with equality in expression (4), the expected surplus is

$$S(i_k, k) = (1-\delta)(y^{i_k} - \bar{q}_1(i_k, k) - c) + \delta S(i_{k+1}, k+1) \\ - \max \left\{ 0, (1-p_1^{i_k}) \left[\frac{c(1-\delta)}{\Delta p} - v\delta(S(i_{k+1}, k+1) - S(i_0, 0)) \right] \right\}.$$

Assumption A2 implies that for $p_1^\ell - p_1^h$ sufficiently high and $y^h - \bar{q}_1(h, 0) - (y^\ell - \bar{q}_1(\ell, 0))$ sufficiently low, $S(\ell, k) > S(h, k)$ when $S(i_{k+1}, k+1) - S(i_0, 0)$ is low enough and $S(\ell, k) < S(h, k)$ otherwise. The claim then follows from the fact that $S(i_{k+1}, k+1) - S(i_0, 0)$ is low initially, but increases over the course of the relationship as k increases.

Finally, I show that the assumption that the client's observation of difficulty is common knowledge is without loss of generality. Suppose the consultant does not know whether the client learns d in a given period. Then consider a contract as the one described in the paper but where, in each period, the client reports his observation of difficulty and the probability of termination depends on this report. More precisely, let the client's report in period t be \tilde{d}_t , where $\tilde{d}_t \in \{0, m, s\}$ ($\tilde{d}_t = 0$ meaning no observation). Then if the consultant

reports $\hat{d}_t = m$, or if she reports $\hat{d}_t = s$ and the client reports $\tilde{d}_t = s$, the relationship continues with probability one. If the consultant reports $\hat{d}_t = s$ and the client $\tilde{d}_t = 0$, the relationship ends with probability $(1 - \phi(i_k, k))$ and continues with probability $\phi(i_k, k)$. If the consultant reports $\hat{d}_t = s$ and the client $\tilde{d}_t = m$, the relationship ends with probability one. It is immediate that the client has no incentives to lie when $\hat{d}_t = m$. Also, note that the client's enforcement constraint binding, given by condition (8) above, implies that the client is indifferent between reporting $\tilde{d}_t = m$ and reporting $\tilde{d}_t = s$ when $\hat{d}_t = s$. Furthermore, this constraint implies that the client is indifferent between reporting $\tilde{d}_t = 0$ and reporting $\tilde{d}_t = s$. To see this, multiply both sides of (8) by $(1 - \phi(i_k, k))$ and rearrange terms to obtain

$$\begin{aligned} \phi(i_k, k)[(1 - \delta)(-f(i_k, s, k)) + \delta U(i_{k+1}, k + 1)] + (1 - \phi(i_k, k))\delta U(i_0, 0) \\ = (1 - \delta)(-f(i_k, s, k)) + \delta U(i_{k+1}, k + 1), \end{aligned}$$

which shows that the client's payoff from reporting $\tilde{d}_t = 0$ is the same as from reporting $\tilde{d}_t = s$ when $\hat{d}_t = s$. Thus, the client reports his observation honestly, and this contract is optimal and generates the same expected surplus as when the client's observation is common knowledge. \square

Proof of Proposition 4. Consider condition (6):

$$\frac{c}{\Delta p} \leq \frac{\delta}{1 - \delta}(1 - (1 - v)\phi(i_k, k))(S(i_{k+1}, k + 1) - S(i_0, 0)).$$

Note that the probability $\phi(i_k, k)$ that satisfies this condition is strictly less than one if $c/\Delta p$ is sufficiently high and v and $S(i_{k+1}, k + 1) - S(i_0, 0)$ are sufficiently low. Thus, in that case, $1 - \phi(i_k, k) > 0$, and the relationship is terminated with positive probability, $(1 - p_1^i)(1 - v)(1 - \phi(i_k, k)) > 0$, in equilibrium. Further, as explained in the text, the optimal probability of termination is then such that the above equation holds with equality; that is,

$$1 - \phi(i_k, k) = \left(\frac{(1 - \delta)c}{\delta \Delta p (S(i_{k+1}, k + 1) - S(i_0, 0))} - v \right) \frac{1}{1 - v}.$$

Clearly, $1 - \phi(i_k, k)$ goes down as $S(i_{k+1}, k + 1) - S(i_0, 0)$ increases. Hence, given i fixed, the probability of termination in equilibrium, $(1 - p_1^i)(1 - v)(1 - \phi(i_k, k))$, falls over time as k increases and thus $S(i_{k+1}, k + 1) - S(i_0, 0)$ increases. Finally, when the parties switch from project ℓ to h , if the relationship capital is k , the probability of termination in equilibrium increases if and only if $(1 - p_1^\ell)(1 - v)(1 - \phi(\ell, k)) < (1 - p_1^h)(1 - v)(1 - \phi(h, k + 1))$, which is equivalent to the condition given in the proposition. \square

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