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Culture Clash: The Costs and Benefits of Homogeneity

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Abstract

This paper develops an economic theory of the costs and benefits of corporate culture – in the sense of shared beliefs and values – in order to study the effects of 'culture clash' in mergers and acquisitions.

I first use a simple analytical framework to show that shared beliefs lead to more delegation, less monitoring, higher utility (or satisfaction), higher execution effort (or motivation), faster coordination, less influence activities, and more communication, but also to less experimentation and less information collection. When two firms that are each internally homogenous but different from each other, merge, the above results translate to specific predictions how the change in homogeneity will affect firm behavior. The paper's predictions can also serve more in general as a test for the theory of culture as homogeneity of beliefs.

1 Introduction

Look behind any disastrous [merger] and the same word keeps popping up – culture.

The Economist 1999

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Culture clash – the potentially destructive effects of combining two organizations with different cultures – is often considered a major cause for the failing of mergers and acquisitions (Kelly, Cook, and Spitzer 1999, Chang, Curtis, and Jenk 2002). Since the latter are key mechanisms to change a firm's scope and since their failure is common (Ravenscraft and Scherer 1987, Copeland, Koller, and Murrin 1991, Kaplan and Weisbach 1992, Mitchell and Stafford 2000, Shelton 2002), culture clash is an important consideration for corporate strategy. But its importance doesn't end there. Although less publicized, culture clash has also plagued alliances and long-term market relationships (Park and Ungson 2001). And it provides a unique lens on the performance effects of corporate culture itself, and thus culture's potential to generate a competitive advantage.

This paper draws upon a simple analytical framework to derive a series of specific predictions regarding the positive and negative effects of corporate culture and of (one form of) culture clash in mergers and acquisitions. I start, in particular, from the definition of corporate culture as shared beliefs and values (Schwartz and Davis 1981, Donaldson and Lorsch 1983, Schein 1985, Kotter and Heskett 1992, Van den Steen 2005a) and formalize this in a simple economic model. In this model, a firm has to choose a course of action or a way of doing things, but its members – who care about the success of the firm – may openly disagree on the best approach.[1] Culture is then defined as the degree to which members have similar beliefs about the best way of doing things.

In a first step, I use this model to systematically derive the effects of shared beliefs and values on organization behavior and performance. The model shows that shared beliefs lead to more delegation, less monitoring, higher utility (or satisfaction), higher execution effort (or motivation), less information collection, less experimentation, faster coordination, less influence activities, and less biased communication. The key intuition for why 'culture as homogeneity' is such a pervasive force in this setting is that 1) agency problems arise from differences in objectives and 2) shared beliefs and values reduce or eliminate such differences in objectives, thus eliminating the agency issues (and their negative and positive consequences) at the root. This link between the general agency problem, on the one hand, and corporate culture, on the other, is an important underlying insight of this paper. While the results are formulated in terms of shared beliefs, I will also indicate

[1] Open disagreement, i.e., the fact that players may agree to disagree, implies that players must have differing priors (Aumann 1976). I will discuss this assumption at the end of Subsection 2.1.

which results extend directly to shared values (in the sense of shared preferences).

An interesting and important observation about these results is that the *benefits* of homogeneity or of a strong culture tend to center around the organization's efficiency at doing what it does: better delegation, less monitoring, higher satisfaction and motivation, faster coordination, better communication, and less influence activities. The *costs* of homogeneity or a strong culture, on the other hand, center around (not) finding the right thing to do: less experimentation and less information collection. One way to interpret this is that a strong culture tends to favor exploitation over exploration.[2]

In a second step, I then translate the costs and benefits identified above to the context of mergers and acquisitions. In particular, with corporate culture defined as shared beliefs and values, culture clash is then caused by the merging of two groups that are each internally homogenous but different from each other (in terms of their beliefs and preferences). This generates the following results:

1. The overall level of delegation will decrease after a merger. A manager in the merged firm is more likely to delegate if she and her subordinate come from the same pre-merger firm than if they come from different pre-merger firms.

2. The overall level of utility and effort (i.e, of satisfaction and motivation) will decrease after a merger. An employee in the merged firm will on average have higher satisfaction and motivation if he and his manager come from the same pre-merger firm than if they come from different pre-merger firms.

3. The overall level of information collection (to convince others) will *in*crease after a merger. A subordinate in the merged firm will collect more information (to convince others) when he and his manager come from different pre-merger firms than when they come from the same pre-merger firm.

[2] In some cases, it is important to be clear about the dimensions of exploitation and exploration. A firm can, for example, have a strong culture of innovation, thus exploring the product space. But innovation is typically costly and therefore not always optimal. In such cases, firms with a strong culture of innovation will tend to over-innovate rather than exploring non-innovation. Such firm is then an explorer in the product space but an exploiter in the strategy space.

4. The overall level of experimentation will *in*crease after a merger. Two employees in the merged firm are more likely to undertake different actions when they come from different pre-merger firms than when they come from the same pre-merger firm.

5. Coordination will take more time after a merger. Two employees in the merged firm will coordinate more quickly when they come from the same pre-merger firm than when they come from different pre-merger firms.

6. The overall level of influence activities will increase after a merger. Two employees in the merged firm are more likely to engage in influence activities when they come from different pre-merger firms than when they come from the same pre-merger firm.

7. The overall distortion of communication will increase after a merger. A subordinate in the merged firm is more likely to distort communication when he and his manager come from different pre-merger firms than when they come from the same pre-merger firm.

This interpretation of culture clash is consistent with the informal observation that employees will sometimes years after a merger still refer to a colleague's pre-merger origin firm as an explanation for his or her behavior.

It is useful to point out that – beyond their importance in their own right, which is the focus of this paper – these predictions have another important use: they provide readily observable and thus testable predictions for a theory of 'culture as shared beliefs.' In particular, one challenge for testing theories of culture is the difficulty of measuring people's beliefs, which is about as hard as measuring people's preferences or private benefits. The predictions above get around that issue by using a person's pre-merger firm as an indirect indicator for his or her beliefs.

By nature, the economic approach in this paper focuses (on purpose) on a specific definition of corporate culture and on a specific set of causal mechanisms. Such focused approach has both costs and benefits. On the benefits side, it leads to a very transparent analysis and to very specific predictions. On the cost side, the analysis may omit potentially important elements and mechanisms. In particular, an implicit assumption, which cannot be checked on principle but requires further theoretical or empirical analysis, is that the mechanisms in this paper are sufficiently orthogonal to those that are not considered to make such reduced or focused analysis useful. One potential indirect (though not necessarily conclusive) test of this condition are the theory's predictions themselves: if the assumption is wrong (in a relevant way) then that should cause the predictions to be rejected. I return to this issue in the discussion of the literature.

The Literature. The role of culture clash in mergers and acquisitions has received considerable attention in the management literature (see Schoenberg (2000), Schweiger and Goulet (2000), and Cartwright and Schoenberg (2006) for reviews and references). Most of this research has focused on the 'cultural distance' hypothesis, which says that larger cultural differences should consistently lead to more costs and higher risks in cross-cultural interactions (Hofstede 1980). The empirical results, however, have been inconclusive or even inconsistent (Stahl and Voigt 2004, Teerikangas and Very 2006), which has been attributed to the lack of clarity on what is or should be tested, both in terms of the culture concept and in terms of the outcomes. Most of the research, for example, uses some measure of national culture as the independent variable and focuses on overall performance – instead of more detailed outcomes – as the dependent variable. One way to deal with these issues, as suggested by Teerikangas and Very (2006), is to enrich the analysis, for example by explicitly incorporating the multi-level nature of culture or by explicitly incorporating the dynamic nature of culture clash. This paper follows the alternative approach of trying to simplify rather than to enrich. I focus, in particular, on a very simple notion of corporate culture and study more detailed, lower-level outcomes. While such approach reduces the richness of the issues, the hope is that it may give a solid understanding of at least part of the phenomenon. How important that part is, is an empirical issue. It is encouraging in this respect that the theory is able to generate a wide range of implications and that Van den Steen (2005a) – which used the same approach – recovered many stylized facts on corporate culture. These observations suggest that this may potentially capture an important part of the issues, at least from a performance perspective. Relative to this existing management literature, the contribution of this paper is then to systematically derive – by means of a simple formal model – a wide range of results on the effects of culture and culture clash.

Apart from the management literature on culture clash, this paper also builds on, and adds to, the economic literature on agency, which has studied several of the outcomes in this paper in more detail. Both Aghion and Tirole (1997) and Dessein (2002), for example, consider the impact of 'congruence of objectives' in their models of delegation and show that managers delegate more when the objectives are more similar. Crawford and Sobel (1982) studied communication between players with different objectives and concluded that communication is more informative when the players' preferences are more similar. This is closely related to the problems of relying on the information of an interested party (Milgrom and Roberts 1986). Rotemberg and Saloner (1995) and Dewatripont and Tirole (1999) showed that different preferences may increase players' incentives to collect information, although differing beliefs introduce a truly new dimension (Van den Steen 2002). Finally, Crémer (1993) shows that shared information may improve the alignment of actions in a team-theoretic model, which may be interpreted as coordination. Of these contributions, only Crémer (1993) considered the relationship to corporate culture. While the current paper adds new results to this agency literature, such as the effect of homogeneity on experimentation, on coordination, on influence activities, and on the incentives to collect information, its main contribution in this area is (in my view) the fact that it looks at the agency literature from a different angle – by taking homogeneity, or shared beliefs and values, as a key common theme throughout the literature – and that it thus links the agency literature as a whole to the widely studied phenomenon of corporate culture. This paper is to my knowledge the first to suggest this link between the general agency problem on the one hand and corporate culture on the other.

The relationship of the management and economic literature on corporate culture itself – such as Burns and Stalker (1961), Donaldson and Lorsch (1983), Schein (1985), Kreps (1990), Kotter and Heskett (1992), Crémer (1993), Lazear (1995), Carrillo and Gromb (1999), Hermalin (2001), Rob and Zemsky (2002) – to the current view of culture as homogeneity is discussed in depth in Van den Steen (2005a), which studies sorting and shared experience as sources of homogeneity. This literature on corporate culture has, with the exception of Crémer (1993) and Hermalin (2001), been very informal about the costs and benefits of culture. Kotter and Heskett (1992), for example, describe some benefits of a strong culture, such as the fact that 'employees tend to march to the same drummer' or that 'shared values and behaviors make people feel good about working for a firm', but without being specific about the mechanisms and thus about the conditions when this is more or less likely to happen. Analogously, Kreps (1990) claims informally that culture (defined as a rule to apply in unforseen contingencies) can help with coordination and with protecting employees against abuses by their superiors. Hermalin (2001) formally analyzes effects of corporate culture but from a very different angle than this paper. In particular, Hermalin (2001) assumes that adoption of culture lowers a firm's overall marginal cost but raises its overall fixed cost and then analyzes which firms will adopt culture and how competition in culture will play out. Relative to this literature, the contribution of this paper is both to be more explicit (through its formal approach and its very simple model) and to be more systematic about the costs and benefits of culture – defined explicitly as shared beliefs and values – and culture clash.

There is finally also a (smaller) economic literature on different aspects of leadership and vision and their relationship to homogeneity, but the study of performance effects has essentially been incidental in this literature. Rotemberg and Saloner (2000) show how a manager's biased beliefs give employees who happen to work on the projects that are favored by those beliefs incentives to work hard. Van den Steen (2001, 2005) shows 1) how a manager's beliefs influence what projects employees actually choose, 2) how the interaction between beliefs and utility attracts employees with similar beliefs as those of the manager, and 3) how the resulting alignment of beliefs increases utility, effort, and coordination. Besley and Ghatak (2005) assume that employees of a certain type (which captures the employees' sense of mission) get higher private benefits from success when they work with a principal of a similar type and then show that, in equilibrium, there will be assortative matching and employees who are matched with similar-minded principals will – thanks to their intrinsic motivation – have lower-powered extrinsic incentives or work harder for the same incentives. Relative to this literature, the current paper studies a much wider range of costs and benefits of homogeneity and also relates these results to culture clash.

The next section introduces the baseline model and studies a series of variations to derive the different effects. In particular, subsections 2.2 through 2.8 study the effects of homogeneity on delegation, monitoring, effort, utility, information collection, experimentation, coordination, influence activities, and communication. Subsection 2.9 shows which results extend to the situation where players have differing preferences instead of differing beliefs. Section 3 translates the results to implications for culture clash, while section 4 concludes.

2 Costs and Benefits of Homogeneity

2.1 The Baseline Model

I present here the baseline model, on which I will build – in the next subsections – a number of variations to identify different costs and benefits of homogeneity. This baseline model captures the situation of a group of people who are engaged in a joint project. While one of them is the formal leader or manager, all of them care to some degree about the final success of the project. To keep the exposition focused, I will henceforth assume that this joint project is actually a firm, although the model could also capture, for example, an alliance or long-term market relationship.

Consider thus a firm that consists of a manager, denoted M, and J members, denoted 1 through J. The firm will face a choice between two *mutually exclusive* courses of action – or ways of doing things – $a \in \{A, B\}$. For example, action A could be the status quo while action B is the use of a new technology or the launch of a new product. Or action A is punishing failure to keep people focused while action B is rewarding failure to encourage innovation. Who makes this choice depends on the effect under study and will thus be specified in the later subsections.

Actions A and B each pay some profit $Z > 0$ upon success and 0 upon failure and have respective probabilities of success $\rho_A, \rho_B \in [\,0, 1\,]$. The actions A and B thus have expected payoffs $Z\rho_A$ and $Z\rho_B$ where Z essentially measures how important the decision is. The probability of success ρ_A of action A is a random variable $\rho_A \sim U[0, 1]$ and is publicly drawn before the decision. All players will thus agree on the value of ρ_A by the time the choice between A and B is made, as indicated in Figure 1. This assumption simplifies the exposition and analysis but is not necessary for the results. The value of $\rho_B \in [0, 1]$, on the other hand, is unknown but each player has a subjective belief about ρ_B. Let $r_{B,i}$ be player i's expected value for ρ_B.[3] These (prior) beliefs are commonly known and may differ across players. In other words, players can agree to disagree on the probability that the new product or technology will be a success or on the effect that punishing failure has on long-term profitability. Aumann (1976) showed that such open disagreement requires that players have differing priors. I will discuss this differing priors assumption below.

Each member of the organization, say i, is risk-neutral and cares about the firm's overall payoff.

[3] In most of the paper only the expected value of ρ_B matters. I will make more specific assumptions when the full distribution matters.

1	2	3
The value of ρ_A is revealed.	Choice between A and B.	Payoffs are realized.

Figure 1: Timing of baseline game.

In particular, assume that i gets a share α_i of the firm's payoff. The assumption that employees care about the firm's success reflects, for example, the fact that their future income within the firm and their future market wages typically depend on their firm's success.[4] To break ties, I will also assume that when otherwise indifferent, each player chooses or prefers A.

As discussed later, most of the results also obtain when employees do not disagree on the optimal course of action (and care about firm performance) but instead have personal preferences for A or for B. Such personal preferences over actions can capture, among other things, the players' values.

Measuring Similarity of Beliefs Since homogeneity of beliefs is at the core of this analysis, I need a measure for the similarity of two players' beliefs. To that purpose, I will use the Euclidean distance between the means of the beliefs of i and j

$$\delta_{i,j} = |r_{B,i} - r_{B,j}|$$

Apart from being intuitive and well-known, this measure is also very effective in the current context since all results can be expressed directly in terms of $\delta_{i,j}$. Moreover, it turns out that the probability that players i and j undertake the same action is $(1 - \delta_{i,j})$, so that this measure fits well with the idea of culture as 'the way we do things around here'. This establishes a direct equivalence with the measure used in Van den Steen (2005a).

The Differing Priors Assumption The model assumes that people can openly disagree, i.e, they can agree to disagree, which requires players to have differing priors (Aumann 1976).[5]

[4] These preferences could be endogenized by allowing the players to contract on compensation, but at the cost of considerable added complexity. Since this does not seem to generate important new insights in the context of this paper and since the exogenous preferences are also of independent importance, I just keep it as an exogenous assumption.

[5] The assumption that players have no private information is made for analytical convenience. If players also had private information, they would update their beliefs but disagreement would remain (Morris 1997).

The assumption of (unbiased) differing priors captures the fact that people may have different 'mental models' or 'belief systems' or different intuition which leads people with identical data to draw different conclusions. Consider, for example, a manager's belief whether a particular person or group of people is trustworthy and how that may influence her decision whether to do business with that person or group. Or whether a particular new technology or recent development will break through. This kind of issues and the consequent potential for open disagreement is common in organizations, especially for questions of strategy or organizational policy. Indeed, the fundamental role of 'belief systems' or 'mental models' in organizations has been stressed by academic studies of managers and managerial decision making (Donaldson and Lorsch 1983, Schein 1985).[6] This thus makes differing priors a very natural setup to study organizations and their potential conflicts.

While the differing priors assumption is not so common in economics, it does have a long tradition with, among others, Arrow (1964), Wilson (1968), Harrison and Kreps (1978), Varian (1989), Morris (1994, 1997), Scheinkman and Xiong (2003), Yildiz (2003), Van den Steen (2004), Brunnermeier and Parker (2005), Boot, Gopalan, and Thakor (2006), and Guiso, Sapienza, and Zingales (2006). There has been a rapid rise in recent years, in part due to the growing popularity of behavioral economics which often implicitly assumes differing priors. There is also a burgeoning empirical literature such as Chen, Hong, and Stein (2002) or Landier and Thesmar (2009). The logical and epistemic foundations have been discussed in, among others, Morris (1994), Gul (1998), Yildiz (2000), and Van den Steen (2001).

A natural question is where such differing priors would come from in a Bayesian framework? There are two ways to think about this. Since the prior for this game is a posterior from earlier updating, many forms of bounded rationality (of which the player is not aware) will lead to differing priors, even when starting from a common prior. Unconsciously forgetting some of the data used to update beliefs, for example, would do. A second – more philosophical and more controversial – argument is that people may be born with differing priors: in the absence of information there is

[6] Open disagreement is obviously not limited to organizational or management issues. Most of us strongly believe that the earth revolves around the sun rather than the other way around. There was a time that people believed the opposite equally strongly. And few of us actually have first-hand experience with this phenomenon. We all hold these very strong beliefs 'on authority'. Not everyone is equally convinced however, as is illustrated by the website www.fixedearth.com. Equally surprising to many are the differences in beliefs about evolution (http:www.religioustolerance.org/ev_publi.htm), even among college-educated adults.

no reason to agree and priors are just primitives of a model. In this paper I am agnostic about the source of the disagreement and just explore its consequences.

A final question is why players don't simply discuss and collect new data until they reach agreement. The choice here is essentially a time and cost trade-off, and in many cases persuasion or discussion is just not the right option. In particular, many important beliefs are deeply engrained and difficult to change, while further data collection may be prohibitively costly and time consuming. Moreover, the process of convergence of beliefs is more complex than it may seem at first sight.[7] So it will often be more effective to just allocate decision rights to a person than to try to reach consensus. Imagine the deadlock if a Dean or CEO could only make a decision if there is full and true unanimity in the organization.

I now turn to the analysis of the different effects of homogeneity in such a context, starting with delegation and monitoring.

2.2 Delegation and Monitoring

Delegation is, to the first order, a trade-off between losing personal control over the decision and having the most appropriate person make the decision. The cost of losing personal control is that, due to differing priors or preferences, the delegee may choose a different action than the delegator would. The gain from delegating the decision to the most appropriate person can take different forms. For example, Aghion and Tirole (1997) and Van den Steen (2006) showed that delegation may increase respectively the incentives to collect information and the incentives to implement or execute the project, while Dessein (2002) considered the case that the delegee has more information. The simplest motivation is actually that decision-making takes time and effort, especially if follow-up is necessary to make sure the decision gets implemented. If lower level employees have a lower (opportunity) cost of time and effort then it is efficient to delegate. To capture that latter situation,

[7]While in most cases, more data tend to lead to convergence, this is definitely not guaranteed in a setting with differing priors. There are indeed both empirical (Lord, Ross, and Lepper 1979) and theoretical (Diaconis and Freedman 1986, Acemoglu, Chernozhukov, and Yildiz 2006) reasons why that may not be the case. Acemoglu, Chernozhukov, and Yildiz (2006) show, for example, how potential disagreement over the *interpretation* of new information is sufficient to prevent convergence. The psychology literature on polarization shows empirically how differential reading of identical information may sometimes lead to divergence. This does not mean that convergence will not happen, only that it is a more difficult process than often imagined. This will particularly be the case when the disagreement derives from different 'mental models' or 'world views', since these often imply different interpretation of data.

1 | 2

Delegation and Monitoring
- a M decides whether to delegate.
- b M chooses level of monitoring effort e. (Cost $c(e)$ sunk.)

Action Choice and Payoffs
- a The value of ρ_A is revealed.
- b Choice between A and B.
- c Payoffs are realized.

Figure 2: Timing for delegation and monitoring.

I will simply assume here that centralization of the decision causes an exogenously specified cost $c_c \geq 0$ to the manager.[8]

Once a manager has delegated the decision, she can still influence the outcome by monitoring the delegee. Such monitoring is an intermediate option between completely centralized and completely decentralized decision making. For simplicity, I assume that monitoring gives the manager with some probability a chance to 'correct' the employee, i.e., to make sure that the employee takes the decision that the manager would have taken.

To formalize this delegation and monitoring setting, consider the following variation on the model in Subsection 2.1, with timing as in Figure 2. At the start of the game, manager M decides whether to delegate the decision to employee i or to keep the decision centralized (at cost c_c to the manager). If M decides to delegate, she can still monitor i. In particular, when M spends personal effort $e \geq 0$ on monitoring, at a private cost $c(e)$, M can with probability $P(e) \in [0, 1]$ force i to take the action which M believes is best. Assume that $P(0) = c(0) = 0$, $P'(e), c'(e) > 0$, and $P''(e) < 0 \leq c''(e)$. To break ties, I also assume that when otherwise indifferent, the manager delegates and/or does not monitor.

The following proposition then says that the manager will delegate if the employee's beliefs are sufficiently similar to her own and that, conditional on delegation, the manager will monitor less these employees who have more similar beliefs.

Proposition 1 *There exists a $\hat{\delta}$ such that the manager M delegates to employee i iff the difference in beliefs $\delta_{M,i} \leq \hat{\delta}$. When the decision is delegated and for given $r_{B,M}$, the level of monitoring e by M increases in the belief heterogeneity $\delta_{M,i}$.*

[8]Here and elsewhere, whether costs are incurred by the organization or privately does not affect the qualitative results. The choice is made based on analytical convenience and how natural each assumption is.

Proof : According to M, the decision's expected payoff when making the decision herself is

$$Z\left[\int_0^{r_{B,M}} r_{B,M}\,du + \int_{r_{B,M}}^1 u\,du\right] = Z\frac{1+r_{B,M}^2}{2}$$

When the decision is made by i without monitoring, the decision's expected payoff according to M becomes

$$Z\left[\int_0^{r_{B,i}} r_{B,M}\,du + \int_{r_{B,i}}^1 u\,du\right] = Z[r_{B,M}r_{B,i} + \frac{1-r_{B,i}^2}{2}] = Z\frac{1+r_{B,M}^2-\delta_{M,i}^2}{2}$$

This combines to

$$\alpha_M Z\left[P(e)\frac{1+r_{B,M}^2}{2} + (1-P(e))\frac{1+r_{B,M}^2-\delta_{M,i}^2}{2}\right] - c(e) = \alpha_M Z\left[\frac{1+r_{B,M}^2}{2} - (1-P(e))\frac{\delta_{M,i}^2}{2}\right] - c(e)$$

when delegating and exerting effort e at monitoring. Since this expected payoff is supermodular in e and $\delta_{M,i}$, the optimal monitoring effort $\hat{e}$ will increase in $\delta_{M,i}$. Applying the envelope theorem shows that the payoff from delegation decreases in $\delta_{M,i}$. Since the expected payoff from centralization is $\alpha_M Z\frac{1+r_{B,M}^2}{2} - c_c$, there will indeed be a $\hat{\delta}$ such that M delegates iff $\delta_{M,i} \le \hat{\delta}$. This implies the proposition. ∎

The intuition for the result is that as the manager and employee have more different beliefs, the employee is more likely to make the wrong choice from the manager's perspective. Belief differences thus give the manager more reason to keep control, either by not delegating or by monitoring.

It also follows from the proof of Proposition 1 that more important decisions (i.e., decisions with higher Z) will be less delegated and more monitored. An interesting variation from an empirical point of view is a situation where the manager faces a number of decisions with different importance (i.e., decisions with different Z) and can choose among a number of employees with different $\delta_{M,i}$ (where each employee can make – and thus be delegated – only one decision).

Proposition 2 *The manager will delegate more important decisions to employees with lower $\delta_{M,i}$, i.e. to employees with more similar beliefs.*

Proof : This follows immediately from the proof of Proposition 1. ∎

2.3 Effort and Utility

Culture and culture clash will also affect employees' motivation and satisfaction, i.e., their effort and expected utility. In particular, when an organization needs to choose a course of action and the members of that organization fundamentally disagree on the right course of action, then at least some members will feel that the organization goes down the wrong path. This lowers their expected utility from being part of the organization and will lower their motivation since they will feel that their effort is spent on the wrong project.

To study these ideas formally, consider the model of Subsection 2.1 where the decision is always made by the manager M. Let me focus first on the effect of belief differences on expected utility. The following proposition says that employee i's expected utility (or satisfaction) decreases with the difference in belief between the employee and the manager.

Proposition 3 *For a given employee i with belief $r_{B,i}$, i's expected utility decreases with the difference in belief $\delta_{M,i}$.*

Proof : Employee i's expected utility is $\alpha_i \left(Z \frac{1+r_{B,i}^2-\delta_{M,i}^2}{2} \right)$, which implies the result. ■

To study the effect of the homogeneity of beliefs on effort (or motivation), consider again the setting of Subsection 2.1 with M as the decision maker. Assume that, simultaneously with M's decision, employee i can spend effort $e \geq 0$ on implementing or executing the project, at a private cost $c(e)$. In particular, let the project payoff now be $ZQ(e)\rho_a$. Assume that $Q(0) \geq 0$, $c(0) = 0$, $Q'(e), c'(e) > 0$, and $Q''(e) < 0 \leq c''(e)$. Note that effort is assumed to be a complement to the quality of the decision: effort is worth more on a project with high ρ_a than on a project with low ρ_a. This reflects the idea of implementation effort or execution effort: implementing a good project has a higher payoff than implementing a bad project.

The following proposition then says that implementation effort increases as beliefs of manager and employee are more similar.

Proposition 4 *For a given employee i with belief $r_{B,i}$, i's effort e decreases in $\delta_{M,i}$.*

Proof : Employee i's expected utility is now $\alpha_i \left(Q(e) Z \frac{1+r_{B,i}^2-\delta_{M,i}^2}{2} \right) - c(e)$, which implies the result by monotone comparative statics (Milgrom and Roberts 1990). ■

These results fit the account by Collins and Porras (1994) of organizations with a strong culture. In particular, they painted a picture of energized organizations with high levels of satisfaction, but also pointed out that people who don't fit in tend to feel the polar opposite. The results are also related to Van den Steen (2005b) who showed how, due to these utility differences, a manager's strong belief leads to sorting in the labor market – attracting employees with similar beliefs – and how that alignment then leads on its turn to higher effort and utility.

While the analysis up to this point identified utility, effort, delegation, and monitoring as benefits of homogeneity, and thus of a strong culture, there are also costs. Some of these are analyzed in the next two subsection, which study information collection and experimentation.

2.4 Information Collection

A first important benefit of differences in beliefs – or open disagreement – is that it makes people (who care about the outcome) collect more information to 'convince' the other players. The intuition is that each player expects that, on average, the newly collected data will confirm his or her belief and thus 'convince' the other player, i.e., move the belief of the other player closer to his own (Van den Steen 2002, Che and Kartik 2007). This 'convincing' effect is unique to a situation with open disagreement or differing priors and is very different from the effects in influence-type models such as Milgrom and Roberts (1986), Rotemberg and Saloner (1995), or Dewatripont and Tirole (1999).[9]

To see this formally, consider again a variation on the model of Subsection 2.1 with the manager M as the decision maker. Employee i can publicly collect new information at the very start of the game, i.e., prior to the realization of ρ_A. Assume in particular that when i spends effort $e \geq 0$, at private cost $c(e)$, then with probability $P(e) \in [0, 1]$ both i and M will observe the outcome of an experiment on B (which, by nature, follows a binomial distribution with parameter ρ_B). As before, assume that $P(0) = c(0) = 0$, $P'(e), c'(e) > 0$, and $P''(e) < 0 \leq c''(e)$. To formally analyze the incentive to collect such information, the full distribution of the players' belief about ρ_B also needs to be specified. To keep the analysis tractable, I will assume that each player j's prior follows a Beta distribution with parameters $(r_{B,j}N, (1 - r_{B,j})N)$. This is equivalent to assuming that j

[9]These models rely either on the fact that the players can bias the information collection (by choosing from biased sources or by only reporting favorable information) or on the fact that collecting extra information introduces an element of randomness, which is good if your favorite action is currently lagging.

started from a uniform prior on ρ_B and observed N experiments of which a proportion $r_{B,j}$ were a success. The following proposition then says that employee i's effort to collect more information (to convince his manager) increases with the difference in beliefs between himself and his manager.

Proposition 5 *For a given employee i with belief $r_{B,i}$, the effort e that i spends on collecting information increases in the level of belief heterogeneity $\delta_{M,i}$.*

Proof : Let $\hat{r}_{B,j}(r_{B,j}, X)$ with $X \in \{S, F\}$ denote j's updated belief after a success (S) or failure (F). With a Beta prior (that corresponds to N observations), it follows that $\hat{r}_{B,j}(r_{B,j}, S) = \frac{Nr_{B,j}+1}{N+1}$ and $\hat{r}_{B,j}(r_{B,j}, F) = \frac{Nr_{B,j}}{N+1}$. To simplify calculations, I will normalize utility by $\alpha_i Z$. Employee i's expected normalized utility upon a success is $\frac{1+\hat{r}_{B,i}(r_{B,i},S)^2-[\hat{r}_{B,M}(r_{B,M},S)-\hat{r}_{B,i}(r_{B,i},S)]^2}{2} = \frac{1}{2}+\frac{(Nr_{B,i}+1)^2}{2(N+1)^2}-\frac{N^2\delta^2_{M,i}}{2(N+1)^2}$ while upon a failure it is $\frac{1}{2}+\frac{(Nr_{B,i})^2}{2(N+1)^2}-\frac{N^2\delta^2_{M,i}}{2(N+1)^2}$. So the normalized expected utility after generating information is (according to i)

$$
\begin{aligned}
& r_{B,i}\left[\frac{1}{2}+\frac{(Nr_{B,i}+1)^2}{2(N+1)^2}-\frac{N^2\delta^2_{M,i}}{2(N+1)^2}\right]+(1-r_{B,i})\left[\frac{1}{2}+\frac{(Nr_{B,i})^2}{2(N+1)^2}-\frac{N^2\delta^2_{M,i}}{2(N+1)^2}\right] \\
&= \quad \frac{1}{2}+\frac{r^2_{B,i}}{2}+\left[\frac{(1-r_{B,i})r_{B,i}}{2(N+1)^2}\right]-\frac{N^2\delta^2_{M,i}}{2(N+1)^2}
\end{aligned}
$$

Without that extra information, the normalized utility would have been $\frac{1}{2}+\frac{r^2_{B,i}}{2}-\frac{\delta^2_{M,i}}{2}$. So the gain from extra information is $\frac{(1-r_{B,i})r_{B,i}}{2(N+1)^2}-\frac{N^2}{2(N+1)^2}\delta^2_{M,i}+\frac{\delta^2_{M,i}}{2}$ or $\frac{(1-r_{B,i})r_{B,i}}{2(N+1)^2}+\frac{2N+1}{(N+1)^2}\frac{\delta^2_{M,i}}{2}$ which is strictly positive and strictly increasing in $\delta_{M,i}$. This proves the proposition. ■

The gain from collecting information – derived in the proof – consists of two terms. The first term, which contains the factor $r_{B,i}(1-r_{B,i})$, is the benefit from reducing the variance of the beliefs, i.e., the gain from having a more precise estimate. The second term, which contains $\delta_{M,i}$, is the gain from convincing the other player. In particular, each player believes that he will convince the other since each believes – by definition – that, on average, the data will confirm his view (over the belief of the other player). The gain from this 'convincing effect' increases as the players have more different beliefs: there is no gain from convincing someone who already agrees with you.

2.5 Experimentation

A second important benefit of having a diversity of beliefs in the organization is that there will be more experimentation.[10] While a full formal analysis of experimentation typically requires a multi-period model with a larger range of actions, the key point and the key mechanism in this paper can actually be captured in this simple one-period setting. In particular, experimentation is essentially about trying different things and learning about the payoffs of different actions. I will show here that when players have more different beliefs, they will indeed experiment more in this sense of trying more different things and learning more about the payoffs of different actions.

To see this formally, consider a variation on the baseline model of Subsection 2.1 where two players, i and j, both simultaneously choose an action and the overall payoff of the organization is the average of the payoffs of the two actions. Formally, let Y_i denote the action chosen by player i, then the organization's payoff is $Z(\rho_{Y_i} + \rho_{Y_j})/2$.

Proposition 6 *The expected number of actions tried increases in the belief heterogeneity $\delta_{i,j}$.*

Proof : Since the firm's payoff increases in both actions' payoffs and since each player is risk-neutral and cares about the organization-wide payoff, each player will simply choose the action that he believes is most likely to be a success. Let, without loss of generality, $r_{B,i} \leq r_{B,j}$. The probability that the players will choose different actions is then $\int_{r_{B,i}}^{r_{B,j}} du = \delta_{i,j}$. It follows indeed that the expected number of actions tried increases in $\delta_{i,j}$. ■

In the context of experimentation, one should obviously be very careful about assuming risk-neutrality and especially about assuming that players care about organization-wide payoffs. Introducing risk aversion in this model would have two counter-acting effects. First, players would find it optimal to choose more different actions in order to diversify risk. Second, however, players would also prefer actions with low uncertainty, which pushes towards choosing the better-known action. Both these effects would shift the amount of experimentation but do not seem to affect the comparative static with respect to $\delta_{i,j}$. Assuming that people care about their own payoff rather than the organization-wide payoff, on the other hand, would cause players to free-ride on the experimentation of others. Again, my conjecture is that this effect will move the average level

[10] I thank Gustavo Manso for the interesting discussions and suggestions on this issue. For an insightful analysis of how incentives interact with experimentation, see Manso (2006).

of experimentation, but preserve the comparative statics with respect to homogeneity of beliefs identified here. These issues require more formal study.

2.6 Coordination

An important and intriguing conjecture about corporate culture is that firms with a strong culture have an easier time coordinating (Kotter and Heskett (1992) and others). This conjecture obviously moves us back from the costs to the benefits of homogeneity and culture.

The study of coordination is more complex than it may seem at first since coordination can take on many forms and there is no obvious one best way to think about it. One very simple approach to coordination is to conceptualize it as the alignment of two actions in a continuous space, as is often done in team theory (Marschak and Radner 1972). The typical formulation is one in which the joint objective function of two players i and j has a term $-(x_i - x_j)^2$ where $x_i, x_j \in \mathbb{R}$ are the simultaneous action choices of the players. Using such model, Crémer (1993) shows how shared information can improve alignment. His model could also be used to show that the players' actions are more aligned when their prior beliefs are more similar, as measured by $\delta_{i,j}$. While this is a very tractable approach, it has the disadvantage that it can be difficult to match this model with real settings. For example, without the assumption that the cost of miscoordination is convex, which is often difficult to defend, the game tends to have multiple equilibria and the coordination problem just shifts from aligning x_i and x_j to coordinating on an equilibrium.

I will use here an alternative approach (that – as a side-benefit – can actually deal with some of the issues identified above). I start, in particular, from a non-cooperative 2-by-2 coordination game, as in Figure 3. In this case, two players simultaneously and non-cooperatively choose between two possible actions, A and B. They both strictly prefer to choose the same action, as implied by the expected utility inequalities in Figure 3. It follows that the game has two pure strategy equilibria: AA and BB. The problem is that the players may have differing beliefs about the payoffs (or different preferences over the equilibria). In particular, player 1 may believe that $E_1[u_1(AA)] > E_1[u_1(BB)]$, while 2 believes that $E_2[u_2(BB)] > E_2[u_2(AA)]$. This leads to obvious coordination issues. For example, while player 1 prefers the AA equilibrium he may choose B in anticipation of player 2 choosing B, given that player 2 prefers the BB equilibrium. But player 2

		Player 2	
		A	B
Payer 1	A	$E_1[u_1(AA)]$, $E_2[u_2(AA)]$	$E_1[u_1(AB)]$, $E_2[u_2(AB)]$
	B	$E_1[u_1(BA)]$, $E_2[u_2(BA)]$	$E_1[u_1(BB)]$, $E_2[u_2(BB)]$

$$E_1[u_1(AA)] > E_1[u_1(BA)]$$
$$E_1[u_1(BB)] > E_1[u_1(AB)]$$

$$E_2[u_2(AA)] > E_2[u_2(AB)]$$
$$E_2[u_2(BB)] > E_2[u_2(BA)]$$

Figure 3: Coordination Game

may make the symmetric reasoning and end up choosing A instead. After a few tries, however, one would expect players to coordinate on one or the other equilibrium. The overall conjecture is now that coordination is easier if the players' beliefs are more similar. Analytically, the challenge is that there is no established methodology to measure the 'difficulty of coordination' for such non-cooperative coordination setting. The purpose of this subsection is to suggest and apply a method to do exactly that: measure the difficulty of coordination when there are multiple equilibria. The approach is based on the experimental and theoretical literature on learning to play equilibria and on equilibrium selection. While the focus of that literature is to determine *which* equilibrium will be selected, these theories also inform us implicitly about the *difficulty* of actually reaching the selected equilibrium. I derive on theoretical grounds a measure for the difficulty of coordination which is consistent with *both* literatures and which is easily tractable. To that purpose, consider the general coordination game in Figure 3 where AA and BB are the two equilibria.

My starting point is the theory of learning. While most models that have been developed in that literature tend to give very similar results in this context, I will focus here for simplicity on models of belief-based learning, which correspond to $\delta = 1$ in the EWA model (Camerer and Ho 1998). In such belief-based learning models, each player tries to form beliefs regarding the other player's behavior, based on the other's past behavior. A typical example of this approach – which is essentially the basis of my formal analysis – is the following. Each player starts from the belief that the other will play each action with equal probability. Each player then chooses his best response to these beliefs. Upon observing the other player's action, each player updates his beliefs about what the other will do. When updating, both attach strictly positive and identical weights to their priors. Each player could, for example, assume that his prior belief corresponds to N previous observations of action choices. Given their new beliefs, the players choose again actions and update their beliefs. They continue to do so until they coordinate on an equilibrium. If player 1 originally chooses A and player 2 originally chooses B, then the time (i.e., the number of tries) to reach a coordinated equilibrium equals

$$\min\left(\frac{E_1[u_1(AA)] - E_1[u_1(BA)]}{E_1[u_1(BB)] - E_1[u_1(AB)]} - 1, \frac{E_2[u_2(BB)] - E_2[u_2(BA)]}{E_2[u_2(AA)] - E_2[u_2(AB)]} - 1\right) \tag{1}$$

and analogously if 1 chooses B and 2 chooses A. Finally, the time is zero when they prefer the same action. It turns out that the players in this case actually coordinate on the risk-dominant equilibrium as $N \to \infty$ i.e. as they learn sufficiently slowly. This process is thus related to the tracing procedure of Harsanyi and Selten (1988), which is among the most influential theories of equilibrium selection. Harsanyi and Selten (1988) predict that players will select equilibrium AA if and only if the Nash product of AA is larger than that of BB, i.e. if

$$\frac{(E_1[u_1(AA)] - E_1[u_1(BA)])}{(E_1[u_1(BB)] - E_1[u_1(AB)])} > \frac{(E_2[u_2(BB)] - E_2[u_2(BA)])}{(E_2[u_2(AA)] - E_2[u_2(AB)])} \tag{2}$$

Comparing equations (1) and (2) shows that the measure for expected time to coordination is closely related to a natural measure for how strongly one equilibrium risk dominates another, which is reassuring for a theory on how easy it is to coordinate.

To now formally study coordination in this particular context, consider the following situation. Players i and j have to decide independently which action to choose. The organization's payoff is again the average of the two players' payoffs but now plus an extra payoff of 1 when the players' actions match. The payoff matrix (in terms of subjective expected utilities) is thus as in Figure 4.

Proposition 7 *The expected time to coordination increases in the level of belief heterogeneity $\delta_{i,j}$.*

Proof : Assume without loss of generality that $r_{B,j} > r_{B,i}$. Denote $r_{B,i} - \rho_A = \Delta_i$ and analogous for Δ_j (so that

		Player j: A	Player j: B
Payer i	A	$1+\ \rho_A$, $1+\ \rho_A$	$\frac{\rho_A+r_{B,i}}{2}$, $\frac{\rho_A+r_{B,j}}{2}$
	B	$\frac{\rho_A+r_{B,i}}{2}$, $\frac{\rho_A+r_{B,j}}{2}$	$1+\ r_{B,i}$, $1+\ r_{B,j}$

Figure 4: Payoff Matrix

$\Delta_i < 0 < \Delta_j$ when coordination matters). The respective elements of expression (1) are then for $i = 1$ and $j = 2$

$$\begin{aligned}
\frac{E_1[u_1(AA)] - E_1[u_1(BA)]}{E_1[u_1(BB)] - E_1[u_1(AB)]} - 1 &= \frac{2+\rho_A - r_{B,i}}{2 + r_{B,i} - \rho_A} - 1 = \frac{2-\Delta_i}{2+\Delta_i} - 1 \\
\frac{E_2[u_2(BB)] - E_2[u_2(BA)]}{E_2[u_2(AA)] - E_2[u_2(AB)]} - 1 &= \frac{2+r_{B,j} - \rho_A}{2 + \rho_A - r_{B,j}} - 1 = \frac{2+\Delta_j}{2-\Delta_j} - 1
\end{aligned}$$

Which one is the smallest element changes when $\frac{2-\Delta_i}{2+\Delta_i} = \frac{2+\Delta_j}{2-\Delta_j}$ or $\rho_A = \frac{r_{B,i}+r_{B,j}}{2}$.

The expected time to coordination (given that $r_{B,i} < r_{B,j}$) is then

$$\begin{aligned}
&\int_0^{r_{B,i}} 0\,du + \int_{r_{B,i}}^{\frac{r_{B,i}+r_{B,j}}{2}} \left(\frac{2+u-r_{B,i}}{2+(r_{B,i}-u)} - 1\right) du + \int_{\frac{r_{B,i}+r_{B,j}}{2}}^{r_{B,j}} \left(\frac{2+r_{B,j}-u}{2+u-r_{B,j}} - 1\right) du + \int_{r_{B,j}}^{1} 0\,du \\
&= 8\int_{2-\frac{r_{B,j}-r_{B,i}}{2}}^{2} \frac{1}{v}\,dv - 2(r_{B,i}-r_{B,j}) = 8\log\left(\frac{4}{4-\delta_{i,j}}\right) - 2\delta_{i,j}
\end{aligned}$$

which increases in $\delta_{i,j}$. So it follows that the expected time to coordination increases in $\delta_{i,j}$. The argument for the case with $r_{B,i} > r_{B,j}$ is completely analogous after switching players and actions. ■

The intuition for this result is that a smaller difference in beliefs implies that a) the players are more likely to prefer the same equilibrium and b) when they do prefer different equilibria, the players are less likely to have a strong preference for one equilibrium over the other. As a consequence, they are more likely either to coordinate immediately (when they prefer the same equilibrium) or to settle quickly (when they prefer different equilibria but neither has a strong preference). Coordination is thus easier with more homogenous beliefs.

2.7 Influence Activities

The final two results are both about the effect of homogeneity on actions to get one's way. In particular, when people in an organization disagree on the optimal approach, they will spend time and effort to try to influence decisions in the direction that they believe is best. Such actions are generically called 'influence activities' (Milgrom and Roberts 1988). These actions can take the form of biased communication, personal or social pressure, alliances with implicit quid pro quos, etc. While this subsection considers generic influence activities, the next subsection will consider the special case of distorted communication. The key hypothesis here is that the level of influence activities will decrease as beliefs are more homogenous since people will less often disagree on the optimal approach and thus have less reason to try to influence the course of action.

To study generic influence activities formally, assume that someone in the organization – say employee j – will make the action choice and that employee i can affect that action choice by spending effort $e \geq 0$ on 'influence activities' at private cost $c(e)$. Assume that j will then undertake i's preferred action with probability $R(e) \in [0,1]$ and her own preferred action with the complementary probability. As before again, assume that $R(0) = c(0) = 0$, $R'(e), c'(e) > 0$, and $R''(e) < 0 \leq c''(e)$. The timing is indicated in Figure 5.

1	2	3	4
Employees i chooses e.	The value of ρ_A is revealed.	Employee j chooses between A and B, as influenced by e.	Payoffs are realized.

Figure 5: Timing of influence game.

The following proposition then says that influence activities indeed increase when players have more heterogenous beliefs.

Proposition 8 *For a given employee i with belief $r_{B,i}$, i's effort on influence activities increases in the belief heterogeneity $\delta_{i,j}$.*

Proof : Player i's payoff is $\alpha_i Z \left[R(e)\frac{1+r_{B,i}^2}{2} + (1-R(e))\frac{1+r_{B,i}^2-\delta_{i,j}^2}{2} \right] - c(e) = \alpha_i Z \left[\frac{1+r_{B,i}^2}{2} - (1-R(e))\frac{\delta_{i,j}^2}{2} \right] - c(e)$ so that the result follows by monotone comparative statics. ■

1 Communication

a Information $\hat{r}$ is revealed to employee i (with probability p).

b Employee i decides whether to communicate to M.

c Manager M updates her information.

2 Action Choice and Payoffs

a The value of ρ_A is revealed.

b Manager M chooses between A and B.

c Payoffs are realized.

Figure 6: Timing of communication game.

2.8 Communication

An important special case of influence activities is distortion in communication. In particular, employees may communicate only those pieces of information that move the beliefs of the decision maker closer to their own. It is useful to study this case separately, both because communication distortion is a very important type of influence activity and because focusing on this particular context gives a more precise prediction.

To study this phenomenon, consider the following variation on the baseline model, with timing as in Figure 6. The manager is again the decision maker. With probability $p \in (0, 1)$, however, employee i has private information regarding ρ_B. In particular, in that case, employee i observed the outcome of an experiment on B, $\hat{r} \in \{0, 1\}$, much like in Subsection 2.4. (Remember that such experiment follows by nature a binary distribution with parameter ρ_B.) I will also again assume that the prior of a player j is the Beta distribution with parameters $(r_{B,j}N, (1 - r_{B,j})N)$. Player j will then update her expected value to $\gamma r_{B,j} + (1 - \gamma)\hat{r}$ where $\gamma = N/(N + 1)$.

Employee i can (costlessly) communicate this information $\hat{r}$, if he has any, and such communication verifiably reveals all the available information. Employee i independently decides whether or not to communicate the information, but absent such communication M does not know whether i actually had private information or not. Finally, I assume for definiteness that in the presence of multiple equilibria the manager can force the equilibrium that she prefers.

The following proposition then says that employee i will more often hide information when he differs more in belief from the manager.

Proposition 9 *For given $r_{B,M}$, the probability of communication decreases in the belief heterogeneity $\delta_{M,i}$.*

Proof : To simplify the analysis, I will again normalize the expected utilities by $\alpha_i Z$. I now first determine the optimal communication strategy for player i. Obviously, if i does not have a private signal, then he cannot communicate it. Condition therefore on i having a private signal $\hat{r} \in \{0,1\}$.

Note that any time that i communicates $\hat{r}$, M updates her expected value to $\tilde{r}_{B,M} = \gamma r_{B,M} + (1-\gamma)\hat{r}$ so that i's expected utility then becomes $U_{i,c} = \frac{1+(\gamma r_{B,i}+(1-\gamma)\hat{r})^2}{2} - \frac{(\gamma r_{B,M}-\gamma r_{B,i})^2}{2}$.

I will now first argue that it cannot be an equilibrium that i never communicates (upon receiving a signal). In such equilibrium, M would not update her beliefs when not receiving a signal and i's expected payoff (upon receiving a signal $\hat{r}$ but not communicating it) would equal

$$U_{i,nc} = \frac{1+(\gamma r_{B,i}+(1-\gamma)\hat{r})^2}{2} - \frac{(\gamma^2(r_{B,M}-r_{B,i})^2+(1-\gamma)^2(r_{B,M}-\hat{r})^2+2\gamma(1-\gamma)(r_{B,M}-r_{B,i})(r_{B,M}-\hat{r})}{2}$$

For this to be an equilibrium, this latter expected utility must be always larger than the expected utility from communicating, i.e., it must always be that $U_{i,nc} \geq U_{i,c}$ or $0 \geq \frac{(1-\gamma)^2(r_{B,M}-\hat{r})^2+2\gamma(1-\gamma)(r_{B,M}-r_{B,i})(r_{B,M}-\hat{r})}{2}$. To see now that 'never communicate' cannot be an equilibrium, note that for any set of parameters, there exists an outcome $\hat{r}$ that violates this condition, namely $\hat{r}=0$ when $r_{B,M} \geq r_{B,i}$ and $\hat{r}=1$ when $r_{B,M} \leq r_{B,i}$.

Consider next the potential equilibrium where i communicates iff the signal $\hat{r}=1$. Let NC ('No Communication') denote the event that i does not communicate. Consider now manager M's updated belief upon no communication. Using Y/N to indicate whether the employee does get a signal or not, this becomes

$$E_M[\rho_B \mid \text{NC}] = E_M[\rho_B \mid \text{NC}\&Y]P(Y) + E_M[\rho_B \mid \text{NC}\&N]P(N) = \gamma r_{B,M} p + r_{B,M}(1-p)$$

I now first argue that this cannot be an equilibrium when $r_{B,M} \geq r_{B,i}$ because a player i with a signal $\hat{r}=0$ will want to communicate. To see this note that this player's expected utility when communicating equals $\frac{1+\gamma^2 r_{B,i}^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2}{2}$ while his expected utility when not communicating equals

$$\frac{1+(\gamma r_{B,i}+(1-\gamma)\hat{r})^2}{2} - \frac{(\gamma r_{B,M} p + r_{B,M}(1-p) - \gamma r_{B,i} - (1-\gamma)\hat{r})^2}{2}$$

or

$$\frac{1+\gamma^2 r_{B,i}^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2+(1-\gamma)^2 r_{B,M}^2(1-p)^2+\gamma(1-\gamma)(r_{B,M}-r_{B,i})r_{B,M}(1-p)}{2}$$

So this player will want to communicate if $\frac{(1-\gamma)^2 r_{B,M}^2(1-p)^2+\gamma(1-\gamma)(r_{B,M}-r_{B,i})r_{B,M}(1-p)}{2} \geq 0$ which is always the case when $r_{B,M} \geq r_{B,i}$. From this and the fact that 'never communicate' cannot be an equilibrium, it follows that in any equilibrium with $r_{B,M} \geq r_{B,i}$, player i will always communicate when $\hat{r}=0$. A completely analogous argument implies that in any equilibrium with $r_{B,M} \leq r_{B,i}$, the player i will always communicate when $\hat{r}=1$.

I will now derive the equilibrium. Consider the case when $r_{B,M} \geq r_{B,i}$. The equilibrium is completely pinned down once it is determined what player i does upon receiving a signal $\hat{r}=1$. Consider first the potential equilibrium where

i communicates if the signal $\hat{r} = 0$. Using Y/N to indicate whether the employee does get a signal or not, M's updated belief upon no communication becomes

$$E_M[\rho_B \mid \text{NC}] = E_M[\rho_B \mid \text{NC}\&Y]P(Y) + E_M[\rho_B \mid \text{NC}\&N]P(N) = \gamma r_{B,M} + (1-\gamma)(p + r_{B,M}(1-p))$$

This will be an equilibrium iff player i with a $\hat{r} = 1$ signal prefers not to communicate. His payoff from communicating equals $\frac{1+(\gamma r_{B,i}+(1-\gamma))^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2}{2}$ while his payoff from not communicating equals $\frac{1+(\gamma r_{B,i}+(1-\gamma))^2}{2} - \frac{(\gamma r_{B,M}+(1-\gamma)(p+r_{B,M}(1-p))-\gamma r_{B,i}-(1-\gamma))^2}{2}$ or

$$\frac{1+(\gamma r_{B,i}+(1-\gamma))^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2 + (1-\gamma)^2(1-r_{B,M})^2(1-p)^2 - 2\gamma(1-\gamma)(r_{B,M}-r_{B,i})(1-r_{B,M})(1-p)}{2}$$

So he prefers not to communicate iff

$$\begin{aligned} &\frac{1+(\gamma r_{B,i}+(1-\gamma))^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2 + (1-\gamma)^2(1-r_{B,M})^2(1-p)^2 - 2\gamma(1-\gamma)(r_{B,M}-r_{B,i})(1-r_{B,M})(1-p)}{2} \\ &\geq \frac{1+(\gamma r_{B,i}+(1-\gamma))^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2}{2} \end{aligned}$$

or $\delta_{M,i} \geq \frac{(1-\gamma)(1-r_{B,M})(1-p)}{2\gamma}$ which is always greater than zero.

So whenever $\delta_{M,i}$ is sufficiently large in this sense, there exists an equilibrium (for $r_{B,M} > r_{B,i}$) where i communicates iff he gets a signal that $\hat{r} = 0$.

Consider now the conditions under which there exists an equilibrium where i always communicates (for $r_{B,M} > r_{B,i}$). Note that under such equilibrium, M infers from no communication that there was also no signal. Consider now a player i with signal $\hat{r}$. If he does communicate the signal, his payoff becomes $\frac{1+(\gamma r_{B,i}+(1-\gamma)\hat{r})^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2}{2}$.

If he does not communicate, his expected utility becomes

$$\begin{aligned} &\frac{1+(\gamma r_{B,i}+(1-\gamma)\hat{r})^2}{2} - \frac{(r_{B,M}-\gamma r_{B,i}-(1-\gamma)\hat{r})^2}{2} \\ &= \frac{1+(\gamma r_{B,i}+(1-\gamma)\hat{r})^2}{2} - \frac{[(\gamma^2(r_{B,M}-r_{B,i})^2 + (1-\gamma)^2(r_{B,M}-\hat{r})^2 + 2\gamma(1-\gamma)(r_{B,M}-r_{B,i})(r_{B,M}-\hat{r})}{2} \end{aligned}$$

Remember now from before that (for $r_{B,M} > r_{B,i}$) i will always communicate $\hat{r} = 0$. So I only have to consider $\hat{r} = 1$. In that case, i prefers to communicate iff

$$\begin{aligned} &\frac{1+(\gamma r_{B,i}+(1-\gamma)\hat{r})^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2}{2} \\ &\geq \frac{1+(\gamma r_{B,i}+(1-\gamma)\hat{r})^2}{2} - \frac{\gamma^2(r_{B,M}-r_{B,i})^2 + (1-\gamma)^2(r_{B,M}-\hat{r})^2 + 2\gamma(1-\gamma)(r_{B,M}-r_{B,i})(r_{B,M}-\hat{r})}{2} \end{aligned}$$

or $(1-\gamma)^2(r_{B,M}-\hat{r})^2 + 2\gamma(1-\gamma)(r_{B,M}-r_{B,i})(r_{B,M}-\hat{r}) \geq 0$ or $\frac{2(1-\gamma)(1-r_{B,M})}{\gamma} \geq \delta_{M,i}$.

It follows that for $r_{B,M} \geq r_{B,i}$, 'always communicate' is an equilibrium iff $\delta_{M,i} \leq \frac{2(1-\gamma)(1-r_{B,M})}{\gamma}$ while 'communicate iff the signal is in the direction of $r_{B,i}$' is an equilibrium iff $\delta_{M,i} \geq \frac{(1-\gamma)(1-r_{B,M})}{\gamma} \frac{(1-p)}{2}$.

So there is an overlapping region where both are an equilibrium. Given the assumption that the manager is able to force the equilibrium selection that favors her, we have 'always communicate' whenever there are multiple equilibria. It follows that 'always communicate' is the equilibrium iff $\delta_{M,i} \leq \frac{2(1-\gamma)(1-r_{B,M})}{\gamma}$ so that communication is indeed more likely when $\delta_{M,i}$ is smaller. ■

Since communication is costless, i's decision to communicate (or not) is completely driven by his attempt to influence M's action choice. As with information collection, there is a trade-off between giving M more information to make a better decision and 'convincing' M by moving her belief more towards one's own. Note that $\frac{(1-\gamma)}{\gamma}$ is a measure of how much information the new signal contains (on a relative basis). If this measure is large then i will tend to always communicate $\hat{r}$: the new signal is then so informative that it swamps any difference in prior beliefs. When this measure is small, however, i will only communicate $\hat{r}$ if the signal moves M's belief in i's direction: the signal then contains so little information, in a relative sense, that the difference in prior beliefs still dominates and i then uses the signal to 'convince' M. To see now the effect of homogeneity, note that as the prior beliefs are more different, the importance of differences in prior beliefs increases relative to the importance of new information so that i is more likely to try to bias his communication and thus less likely to always communicate.

2.9 Beliefs versus Preferences/Values

The results up to this point were all about the effect of homogeneity of *beliefs*, i.e., about the effect of 'shared beliefs'. It turns out that, conveniently, many results can be extended quite easily to homogeneity of preferences, i.e., to 'shared values'. In particular, the following reinterpretation translates many of the results to homogeneity of preferences or shared values. Let ρ_A and $r_{B,i}$ denote the utilities that i gets when the firm undertakes respectively actions A and B and let $\alpha_i = 1$. The actions could be, for example, respectively an environmentally friendly and a polluting way of implementing a particular project. With this modification, the following results for homogeneity of preferences or 'shared values' follow immediately.

- Managers will delegate more, and more important decisions, to employees with more similar preferences or values. When delegating, they also monitor such employees less.

- Utility and implementation effort (i.e., satisfaction and motivation) will be higher in organizations with more homogenous preferences or values.
- Employees will coordinate more easily when their preferences or values are more similar.
- There will be less influence activities in organizations with more similar preferences or values.

The other results either do not extend or require more fundamental modifications to the model. In particular, because they are inherently about information, the results on communication, experimentation, and information collection all require (in their current formulation) $r_{B,i}$ to be interpreted as a belief in order to make sense. The result on information collection depends moreover in a much deeper sense on the assumption that the $r_{B,i}$ are differing priors. In particular, the intuition is deeply rooted in the fact that each player believes that new information will confirm his view against that of the other. There does not seem to be any way to interpret or reformulate this in terms of preferences.[11]

The reason why I formulated the baseline model in terms of beliefs rather than preferences or values is twofold. First of all, the belief-based model is more easily reinterpreted in terms of preferences or values than the other way around. Second, the idea that agency problems originate in honest disagreement rather than in private benefits is obviously very appealing in this managerial and organizational context (Donaldson and Lorsch 1983).

3 Mergers and Culture Clash

With all these results in hand, I now return to the motivating research question: how will mergers and acquisitions affect a firm's performance through the effect of culture clash? The logic to translate the earlier results to the context of mergers and acquisitions is relatively straightforward. In particular, building on the literature on corporate culture (Schein 1985, Kotter and Heskett 1992), Van den Steen (2005a) formally showed that firms will be more homogenous than society at

[11]Unless I assume that people engage literally in 'wishful thinking' when it comes to future information, but that implicitly assumes – biased – differing priors (regarding the expected realizations of future data).

large, among other things because people prefer to work with others who have similar beliefs and preferences, since such others will 'make the right decisions'. Two randomly picked employees of the same firm would thus be more likely to share beliefs than two randomly picked employees from different firms. In other words, firms are internally homogenous but different from each others.

The earlier results can then be translated on two levels. First, on an individual level, the degree of homogeneity will be larger (within the merged firm) between two people from the same pre-merger firm than between two people from different pre-merger firms. This implies predictions how the behavior of such people will differ, along the lines derived in the different subsections, depending on which pre-merger firms they belonged to. Second, on an organization-wide level, the overall degree of homogeneity will decrease through the merger. This implies predictions for the average behavior throughout the organization. To make this more concrete, consider the example of delegation. The predictions of the model will be that the average level of delegation will be lower in the merged firm than in the independent firms and that, within the merged firm, a manager is more likely to delegate to an employee from her own pre-merger firm than to an employee from the other pre-merger firm.

To study this formally, I will embed the variations of Subsections 2.2 through 2.8 in a simple merger game. The game starts from 2 firms with an equal number of J employees each. To fix the composition of each firm, imagine the following selection process for the manager and employees of firm k. First, M_k, the manager for firm k, is drawn at random from a population of potential managers with beliefs uniformly distributed on $[0,1]$. In other words, M_k's belief is realized according to $r_{B,M_k} \sim U[0,1]$. This manager will now hire the firm's J employees. The pool of potential employees also have beliefs uniformly distributed on $[0,1]$. As part of the hiring and selection process of a new employee, say j, manager M_k observes this potential employee j's (real or hypothetical) choice from $\{A,B\}$ when $\rho_A = .5$. M_k can thus make inferences about $r_{B,j}$, in particular whether $r_{B,j} \in [0,.5]$ or $r_{B,j} \in (.5,1]$. To capture the results of the literature on culture as homogeneity (Schein 1985, Kotter and Heskett 1992, Van den Steen 2005a), I will assume that the manager selects employees who share her belief on ρ_B: if $r_{B,M_k} \in [0,.5]$ then M_k will select potential employees with $r_{B,j} \in [0,.5]$ so that firm k's employees' will be distributed $r_{B,i} \sim U[0,.5]$, and analogously for the other case.[12] It is important to note that this distribution of (employee and managerial) beliefs is an empirical distribution of prior beliefs and thus contains no information about the true underlying value of ρ_B.[13]

The game now consists of two (hyper)stages. In the first (hyper)stage, the two firms can merge. I will assume that merging has some exogenous benefit B. To simplify the analysis, I will consider only $B > Z$ so that it is always in the best interest of both firms to merge. After the firms merge, the manager of the merged firm is selected at random from the two pre-merger managers, with each manager being equally likely. The other manager leaves the game. In the second (hyper)stage, one of the variations of Section 2 is played.

The proposition then makes two comparisons for each setting. First, it compares the average outcome in the merged firm to the outcome in each of the two independent (i.e., non-merged) firms. (A different way to express this formally is that it compares $B > Z$ to the case that $B < 0$.) Second, it compares the average outcome in the merged firm conditional on the two players coming from the same pre-merger firm to the average outcome conditional on the two players coming from different pre-merger firms. In all these comparisons, the employee(s) are randomly selected among all the relevant firm employees. In particular, I do not allow the manager to select which employee will participate in the interaction. The latter is definitely an interesting venue for further research.

The following proposition then states the results.

Proposition 10 *The average probability that a manager delegates (in a Subsection 2.2 subgame with a randomly selected employee) is higher in each of the independent firms than in the merged firm. The manager of the merged firm is on average more likely to delegate when facing an employee from her own pre-merger firm than when facing an employee from the other pre-merger firm.*

The average expected utility and effort (in a Subsection 2.3 subgame) is lower in the merged firm than in each of the independent firms. In the merged firm, an employee's utility and effort

[12]This would be the endogenous outcome of a search model in the style of Van den Steen (2005a) with sufficiently low search costs if there was some probability that it is the employee who chooses the action.

An alternative specification is to assume that employees of firm k are randomly drawn according to a uniform distribution over the subset $S_k = [r_{B,M_k} - \delta, r_{B,M_k} + \delta] \subset [0, 1]$. This approach, however, leads to corner issues that get analytically quite complex in this case (and hence may require the assumption that S_k is completely a subset of $[\,0, 1\,]$). The current specification avoids this complication.

[13]In particular, a player will not revise her or his beliefs upon meeting someone with a different prior. By extension, a player will not revise her or his beliefs upon observing the empirical distribution of priors. See also Subsection 2.1.

is on average lower when the employee and the manager are from different pre-merger firms than when they are from the same pre-merger firm.

The average effort to collect information (in a Subsection 2.4 subgame) is higher in the merged firm than in each of the independent firms. In the merged firm, the average effort to collect information is lower when the employee and the manager are from the same pre-merger firm than when they are from different pre-merger firms.

The expected number of actions tried per employee within one firm (in a Subsection 2.5 subgame) is lower in each of the independent firms than in the merged firm. In the merged firm, two employees from the same pre-merger firm are less likely to undertake different actions than two employees from different pre-merger firms.

The average expected time to coordination (in a Subsection 2.6 subgame) between two randomly selected employees is higher in the merged firm than in each of the independent firms. In the merged firm, the average expected time to coordination is higher when the two involved employees are from different pre-merger firms than when they are from the same pre-merger firm.

The average effort on influence activities (in a Subsection 2.7 subgame) is higher in the merged firm than in each of the independent firms. In the merged firm, the average effort on influence activities is higher when i and j are from different pre-merger firms than when they are from the same pre-merger firm.

The average probability of communication (in a Subsection 2.8 subgame) is higher in each of the independent firms than in the merged firm. In the merged firm, the probability of communication is on average higher when the employee and the manager are from the same pre-merger firm than when they are from different pre-merger firms.

Proof : Consider first the result on delegation. The first part of that result – that the probability of delegation is lower in the merged firm than in each of the independent firms – is implied by the second part – that the manager of the merged firm is on average more likely to delegate when facing an employee from her own pre-merger firm than when facing an employee from the other pre-merger firm. To see this, note that the average probability of delegating in each of the independent firms (which are completely symmetric) equals the expected probability of delegating in the merged firm conditional on the manager of the merged firm facing an employee from her own pre-merger firm (since the settings are on average identical). Furthermore, the average probability of delegating in the merged firm is a weighted average of the probability of delegating when the manager faces an employee from her own pre-merger firm and the probability of delegating when the manager faces an employee from the other pre-merger firm. The result then follows.

For the second part of the result on delegation, remember that the employees of each firm k are drawn either from $S_1 = [0, .5)$ when $r_{B,M_k} \in S_1$ or from $S_2 = (.5, 1]$ when $r_{B,M_k} \in S_2$ and that – following Proposition 1 – the probability of centralization is an increasing function of $\delta_{M,i}$ (since it is 0 for $\delta_{M,i} \le \hat{\delta}$ and 1 for $\delta_{M,i} > \hat{\delta}$). It then follows from Lemma 1 that the average probability of centralization (i.e., no delegation) by manager M_k is higher for employees of his own pre-merger firm than for employees of the other pre-merger firm and strictly so when the intervals of the two pre-merger firms differed. That proves the delegation part of the proposition. The proofs of the other parts of the proposition are analogous. ■

An important simplification in this analysis is the fact that the game has been formulated in a way that makes the merger decision independent of the eventual second-stage game.[14] While anticipation of the second-stage game will obviously influence the merger decision, it will be only one of many considerations in that decision. The implicit assumption here is thus that the second-stage game is a small factor relative to these other considerations. Since costs of culture clash, when anticipated, make a merger less likely and benefits make it more likely, the model predictions overestimate costs and underestimate benefits relative to what one should find empirically.

An interesting observation here – which parallels the earlier observation that the benefits of homogeneity, and thus of a strong culture, tend to be more related to exploitation while the costs tend to be more related to exploration – is that the costs of culture clash will tend to be felt immediately, by an increase in agency costs, while its potential benefits are realized only over the longer term through experimentation and information collection. In particular, culture clash will reduce the (shorter term) operational performance of the firm, but may lead over the longer term to a better fit with the environment. This also suggests that casual observation runs the risk of overestimating the costs relative to the benefits of culture clash (since the benefits won't be observed until much later).

[14] I thank Yuk-fai Fong for pointing out this implicit assumption.

4 Conclusion

This paper identified a series of specific costs and benefits of homogeneity and used these results to make concrete and testable predictions regarding the effects of culture clash in mergers and acquisitions.

The surprisingly pervasive nature of 'culture as homogeneity' – as identified in this paper – is driven by the fact that any agency issue originates in a difference in objectives between the principal and the agent and that shared beliefs and values will reduce such differences in objectives and thus fundamentally affect each and every type of agency issue, both positive and negative. The issues considered in this paper are delegation, monitoring, motivation, satisfaction, experimentation, information collection, coordination, communication, and influence activities. This observation suggests one simple reason why defining culture in terms of shared beliefs and values can be so powerful.

The paper then translates these results to make specific predictions on the effects of culture clash in mergers and acquisitions. An important overall observation is that the costs of culture clash will typically show up immediately and affect mainly the operational efficiency of the merged firms. The benefits of culture clash will take more time to emerge and will affect more the fit with the environment.

The paper clearly omits some important parts of the culture puzzle. Potential issues that come to mind are the role of culture in identity and in influencing one's preferences. These are interesting venues for further research.

5 Appendix: Lemma

Let g be an increasing function with $g(0) \geq 0$, $\delta_{i,j} = |r_{B,i} - r_{B,j}|$, M be a manager with belief $r_{B,M}$, and $S_1 = [0, .5)$ and $S_2 = (.5, 1]$ be two intervals.

Lemma 1 *If $r_{B,i}$ is drawn from a uniform distribution on S_k then $E[g(\delta_{M,i})]$ is strictly smaller when $r_{B,M} \in S_k$ than when $r_{B,M} \in S_{-k}$. If $r_{B,i}$ and $r_{B,j}$ are drawn from uniform distributions on respectively S_k and S_l then $E[g(\delta_{i,j})]$ is strictly smaller when $S_k = S_l$ than when $S_k \neq S_l$.*

Proof : Assume, without loss of generality (since the case with S_2 is completely symmetric), that $r_{B,i}$ is drawn from a uniform distribution on S_1.

Pick now one other player h (which can, for now, be either the manager M or an employee) with (fixed) belief $r_{B,h}$. If $r_{B,h} \in S_1$, then

$$E[g(\delta_{i,h})] = \frac{1}{2}\left[\int_0^{r_{B,h}} g(u)\,du + \int_0^{.5-r_{B,h}} g(u)\,du\right]$$

Note that this $E[g(\delta_{i,h})]$ is different from the $E[g(\delta_{i,j})]$ in the statement of the proposition since $r_{B,h}$ is fixed (for now) rather than drawn from a distribution on some S_l. A simple calculation of the derivatives for $r_{B,h}$ shows that this function is strictly convex in $r_{B,h}$, so that it is maximized at either $r_{B,h} = 0$ or $r_{B,h} = .5$. In both cases, $E[g(\delta_{i,h})] \leq \frac{1}{2}\int_0^{.5} g(u)\,du$

If, on the other hand, $r_{B,h} \in S_2$, then $E[g(\delta_{i,h})] = \frac{1}{2}\int_0^{.5} g(r_{B,h} - u)\,du$ or, by substituting $v = r_{B,h} - u$,

$$E[g(\delta_{i,h})] = \frac{1}{2}\int_{r_{B,h}-.5}^{r_{B,h}} g(u)\,du$$

with derivative for $r_{B,h}$ equal to $\frac{dE[g(\delta_{i,h})]}{dr_{B,h}} = \frac{1}{2}\left[-g(r_{B,h} - .5) + g(r_{B,h})\right] > 0$ so that $E[g(\delta_{i,h})] \geq \frac{1}{2}\int_0^{.5} g(u)\,du$. It follows that, for fixed $r_{B,h}$, $E[g(\delta_{i,h})]$ is always larger when $r_{B,h} \in S_2$ than when $r_{B,h} \in S_1$. This implies immediately the first part of the lemma by setting $h = M$. Moreover, by integrating over resp. S_1 and S_2, it also implies the second part of the lemma, which completes this proof. ■

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