assume for the moment that whether an agreement has been kept by each party is *observable* by all parties. No doubt this is a strong assumption, but as with 'verifiability', it is a useful starting point. Once we draw conclusions from it, we will be able to infer how communities could modify their institutions in situations where the assumption doesn't hold even approximately. That said, anyone who has visited villages in poor countries will know that privacy is not a fundamental right there. In tropical villages that I have visited, cottages are designed and clustered in such a fashion that it must be hard for anyone to prevent others from observing what they are about.

By a social norm we mean an accepted rule of behaviour. A rule of behaviour reads like: 'I will do X if you do Y'; 'I will do P if Q happens'; and so forth. For a rule of behaviour to *be* a social norm, it must be in the interest of each person to act in accordance with the rule if all others act in accordance with it; that is, the rule should correspond to a Nash equilibrium. To see how social norms work, let us return to our numerical example to study whether cooperation based on a *long-term relationship* can be sustained between A (we now call him the patron) and B (we now call her the client).

Imagine that the opportunity for A and B to do business with each other is expected to arise over and over again; say, annually. The time taken for B to produce her output is assumed to be well within a year. Let t denote time. So t assumes the values 0, 1, 2, . . . , and so on, *ad infinitum*; with 0 standing for the current year, 1 standing for the following year, 2 standing for the year following that, and so on, *ad infinitum*. Although the future benefits from cooperation are

discounts the future benefits from cooperation. (We will see that in the present example, it doesn't matter what B's discount rate is. For expositional ease, though, I assume that both individuals discount their future costs and benefits at the rate r.) The assumption is that when making calculations in the current year (which is $t = 0$), each divides his or her benefits in any future year t by a factor $(1 + r)^t$. (The term $(1 + r)^t$ denotes $(1 + r)$ multiplied to itself t times.) So, if r is positive, $(1 + r)^t$ exceeds unity for all future t; and since benefits in year t are divided by $(1 + r)^t$ when making calculations in the current year, the importance of those benefits decays by a fixed percentage r each year when viewed from today. The smaller is r, the greater is the weight placed on the benefits of future cooperation. We now show that, provided r is small, the pair could in principle enter a successful long-term relationship, where each year A advances \$4,000 to B, sells the goods B has produced for \$8,000, and pays her \$3,000. The formal theory of long-term relationships was developed by the mathematicians Robert Aumann and Lloyd Shapley, and extended by the economists Drew Fudenberg, Eric Maskin, Ariel Rubinstein, and others. What I present here is an illustration of how the theory works.

Consider the following rule of behaviour that A might adopt: (i) begin by advancing \$4,000 to B, (ii) sell the goods if she produces them during the year, (iii) share the proceeds according to the agreement, and (iv) continue doing so every year so long as neither party has broken the agreement; but (v) end the relationship permanently the year following the first defection by either party. Similarly, consider the following rule of behaviour that B might adopt: so long as neither party has reneged on the agreement, work faithfully for A each year; but refuse ever to work for him the year

cooperation is the sanction. Game theorists have christened this most unforgiving of rules the 'grim strategy', or simply *grim*. We show next that grim is capable of supporting the long-term relationship if r is not too large.

First consider *B*. Suppose *A* has adopted grim and *B* believes that he has. He will advance her the capital at the beginning of year 0. *B*'s best course of action is clear: keep to the agreement. For suppose she reneges on the agreement. She would lose $1,000 (her share of $3,000 minus the $2,000 she would earn producing home goods), but gain nothing in any future year (remember, *A* has adopted grim). This means that no matter what *B*'s discount rate is, she couldn't do better than to adopt grim if *A* has adopted grim.

The harder piece of reasoning is *A*'s. Suppose *B* has adopted grim and *A* believes she has. If he has advanced the working capital to her, she will have worked faithfully for him in year 0. *A* now wonders what to do. If he reneges on the agreement, he would make a $4,000 profit ($8,000 minus the $4,000 he could have earned with his capital even if he had not entered into the relationship with *B*). But since he believes *B* to have adopted grim; he must also believe that *B* will retaliate by never working for him again. So, set against a single year's gain of $4,000 is a net loss of $1,000 (the forgone profit from the partnership) every year, starting in year 1. That loss, calculated in year 0, is the sum, $\$(1{,}000/(1+r) + 1{,}000/(1+r)^2 + 1{,}000/(1+r)^3 + \ldots$ *ad infinitum*), which can be shown to add up to $\$1{,}000/r$. If $\$1{,}000/r$ exceeds $4,000, it isn't in *A*'s interest to break the agreement, which means that he can't do better than to adopt grim himself. But $\$1{,}000/r$ exceeds $4,000 if and only if r is less than ¼, or 25% (per year). We have therefore proved

Economists have found evidence of grim in social interchanges, but it would appear to be in force mostly where people also have access to formal markets. In Desta's world, though, grim is not in evidence. Sanctions are graduated, the first misdemeanour being met by a small punishment, subsequent ones by a stiffer punishment, persistent ones by a punishment that is stiffer still, and so forth. How are we to explain this?

Where formal markets and long-term relationships co-exist, grim could be expected to be in operation. Grim involves permanent sanctions, which is a needed device for preventing people from engaging in opportunistic behaviour when good short-term opportunities appear nearby from time to time. But if, as in Desta's village, there are few alternatives to long-term relationships, communitarian arrangements would be of high value to all. Adopting grim would be an overkill in a world where people discount the future benefits from cooperation at a low rate. For that reason, the norms that are adopted involve less draconian sanctions than grim. A single misdemeanour is interpreted as an error on the part of the defector, or as 'testing the water' (to check if others were watching). This is why graduated sanctions are frequently observed.

Here then is our general finding: social norms of behaviour are able to sustain cooperation if people care sufficiently about the future benefits of cooperation. The precise terms and conditions will be expected to vary across time and place; what is common to them all is that cooperation is mutually enforced, it isn't based on external enforcement.

There is, however, a piece of bad news: people could end up not

equilibrium: *A* doesn't advance the $4,000 worth of raw material to *B*, because he knows that *B* won't work for him; she would refuse because of the fear that *A* won't keep his promise to share the proceeds; a fear that is justified, given that *A* intends not to share the $8,000 with her once she has produced those goods; and so on. Failure to cooperate could be due simply to an unfortunate pair of self-confirming beliefs, nothing else. No doubt it is mutual suspicion that ruins their chance to cooperate, but the suspicions are internally self-consistent. In short, even when appropriate institutions are in place to enable people to cooperate, they may not do so. Whether they cooperate depends on mutual beliefs, nothing more. I have known this result for many years, but still find it a surprising and disturbing fact about social life.

Could the pair form a partnership if r exceeds 25%? The answer is 'no'. As grim is totally unforgiving, no other rule could inflict a heavier sanction for a single misdemeanour. The temptation *A* faces to defect is less if *B* adopts grim than if she were to adopt any other rule of behaviour; which implies that no rule of behaviour could support a partnership if r exceeds 25%. Studying grim is useful, because it allows us in many examples, such as the present one, to determine the largest value of r for which cooperation is possible.

We now have in hand a tool to explain how a community can skid from cooperation to non-cooperation. Ecological stress – caused, for example, by increasing population and prolonged droughts – often results in people fighting over land and natural resources (Chapter 7). Political instability – in the extreme, civil war – could in turn be a reason why both *A* and *B* become concerned that *A*'s source of capital will be destroyed or confiscated. *A* would

Mathematicians call the points at which those switches occur *bifurcations*. Sociologists call them *tipping points*. Social norms work only when people have reasons to value the future benefits of cooperation.

Contemporary examples illustrate this. Local institutions have been observed to deteriorate in the unsettled regions of sub-Saharan Africa. Communal management systems that once protected Sahelian forests from unsustainable use were destroyed by governments keen to establish their authority over rural people. But Sahelian officials had no expertise at forestry, nor did they have the resources to observe who took what from the forests. Many were corrupt. Rural communities were unable to switch from communal governance to governance based on the law: the former was destroyed and the latter didn't really get going. The collective vacuum has had a terrible impact on people whose lives had been built round their forests and woodlands.

Ominously, there are subtler pathways by which societies can tip from a state of mutual trust to one of mutual distrust. Our model of the partnership between *A* and *B* has shown that when r is less than 25%, both cooperation and non-cooperation are equilibrium outcomes. The example therefore tells us that a society could tip over from cooperation to non-cooperation owing merely to a change in beliefs. The tipping may have nothing to do with any discernible change in circumstances; the entire shift in behaviour could be triggered in people's minds. The switch could occur quickly and unexpectedly, which is why it would be impossible to predict and why it would cause surprise and dismay. People who woke up in the morning as friends would discover at noon that they are at war with

community that was previously racked by civil strife involves building trust. Non-cooperation doesn't require as much coordination as cooperation does. Not to cooperate usually means to withdraw. To cooperate, people must not only trust one another to do so, they also have to coordinate on a social norm that everyone understands. That is why it's a lot easier to destroy a society than to build it.

How does an increase or decrease in cooperation translate into macroeconomic statistics? Our numerical example captured a salient point, that an increase in cooperation raises incomes by permitting a more efficient allocation of resources: *A*'s working capital was put to better use under cooperation, as was *B*'s labour. Consider now two communities that are identical in all respects, excepting that in one people have coordinated at an equilibrium where they trust one another, while people in the other have coordinated at an equilibrium where they don't trust one another. The difference between the two economies would be reflected in their total factor productivity, which would be higher in the community where people trust one another than in the one where they don't. Enjoying greater income, individuals in the former economy are able to put aside more of their income to accumulate capital assets, other things being equal. So GDP growth there is higher. Mutual trust would be interpreted from the statistics as a driver of economic growth.

Communities and markets

How did people who now interact with one another get to connect in the first place? In Desta's village the answer is simple: mostly they have known one another from birth. Personal

and *exclusive*. Members have names, personalities, and attributes. An outsider's word isn't so good as an insider's.

In contrast, the hallmark of transactions enforced by the law of contracts is that they can take place among people who don't know one another. In Becky's world, people are mobile, a pattern of behaviour not unrelated to the fact that they are able to do business even with people they don't know. Becky frequently doesn't know the salespersons in the department stores of her town's shopping mall, nor do they know Becky. When Becky's parents borrow from their bank, the funds made available to them come from unknown depositors. Literally millions of transactions take place each day among people who have never met and will never meet. Often, the exchanges take place only once, unlike exchanges based on long-term relationships. *Markets* are prime examples of institutions offering such opportunities. In contrast to communities, markets are *impersonal* and *inclusive*. Witness the oft-used phrase: 'My money is as good as yours'.

Property rights

Property rights to a commodity are the rights, restrictions, and privileges regarding its use. The subject is central to economics because it is closely related to the incentives people have to use goods and services in one way rather than another. Ill-defined property rights to a commodity usually spell bad news, because no one is fully able to capture the benefits that can be obtained from it; which is another way of saying that, all things considered, no one has an incentive to put the commodity to its most efficient use. For brevity, we will assume that ownership of a commodity includes (i)

Chapter 3
Communities

People throughout history have been known to devise ingenious ways to cooperate. One way is to make the benefits and burdens in one engagement depend not only on what takes place there, but also on what happens in some other engagement. In Desta's village the same set of households share the local commons, offer one another loans, join the *iddir*, and help one another out in times of need. The interesting point isn't that the same group of people are in a number of long-term relationships (who else is there to form long-term relationships with?), but that the relationships are tied to one another.

Tied engagements

To see how ties can help, suppose that in the patron–client relationship we studied in the previous chapter, the discount rate A (the patron) uses to value the future benefits of cooperation with B (the client) exceeds 25% (or ¼) per year. We know that for want of trust, the pair would be unable to form a partnership. But now imagine that, in addition to the usual [illegible]

to the market for products. The product can fetch $6,000 in the market and A is in a position to procure it. A considers approaching C with a proposal to form a partnership: the $6,000 would be used first to compensate the pair; the surplus would then be divided equally between them. Each would enjoy a profit of $1,000 annually. For what values of r is a partnership between them viable?

As C's motivations in the potential relationship are similar to B's in the previous example, we needn't study them again. But we do need to work through A's reasoning, because the numbers matter. So let us start in year 0. Suppose C has adopted grim. If A advances his capital to her but reneges on the agreement once she has produced the output, he gains $3,000 ($6,000 minus $3,000) that year. Set against it is the $1,000 he would lose every year, starting in year 1. That loss, calculated in year 0, is $1,000/$r$. If $1{,}000/r$ is less than 3,000, A will renege. If, on the other hand, $1{,}000/r$ exceeds 3,000, A can do no better than to adopt grim himself. Since $1{,}000/r$ exceeds 3,000 if and only if r is less than ⅓ (approximately 33%), the pair are able to form a long-term relationship if A's discount rate is less than ⅓ per year. So suppose r *is* less than ⅓. Then A is able to form a relationship with C, but not with B (r exceeds ¼, remember; and ⅓ exceeds ¼).

We are now able to show that A could form a relationship with B if the three were to tie the pair of undertakings. Let the proposal be to create both partnerships, but with the understanding that if any party in any year was to act opportunistically, *both* relationships would be terminated. In order to formalize this, let the rule of behaviour adopted by B (respectively, C) now read: begin by cooperating with A and C (respectively, B) and continue to

in either relationship. Each of the parties has adopted grim once again, but grim here comes with an added sting.

It's easy enough to confirm that B would adopt grim if A and C adopt grim and that C would adopt grim if A and B adopt grim. The interesting exercise is to determine A's incentives to cooperate if B and C adopt grim. As both clients would terminate their relationship with him if he behaved opportunistically with either, A would defect from both relationships if he defects at all. What remains is to calculate A's gains and losses if he defects from both relationships in year 0. If he does, he gains \$7,000 now (\$4,000 from his partnership with B; \$3,000 from his partnership with C). Set against that is the value of all the future benefits from cooperation he will have to forgo. That loss is $\$(1{,}000 + 1{,}000)/r$. It follows that A can't do better than to adopt grim himself if \$7,000 is less than \$2,000/r; which is to say, if r is less than $2/7$. Since $2/7$ exceeds $1/4$ (it lies between $1/4$ and $1/3$), the condition under which A and B are able to cooperate is weaker. Suppose r is less than $2/7$ (per year), but greater than $1/4$ (per year). By tying the relationships, both can be created; whereas, if they are kept separate, only the one between A and C can form. The intuition behind the finding is clear. A faces greater temptation to defect from his agreement with B than the one with C, which is why the circumstances under which a relationship could form with B are more restricted than they are with C ($1/4$ is less than $1/3$). By tying the two relationships, A's temptation to break his relationship with B is reduced ($2/7$ exceeds $1/4$).

While C doesn't lose from the move to tie the partnerships, she doesn't gain either. Only A and B gain. So B has every reason to offer

Further refinements are needed when people who wish to trade with one another are separated by distance. Community responsibility systems in Italy during the 12th and 13th centuries helped people to obtain credit and insurance. Transgressions by a party were met in a collective way: the group to which the injured party belonged imposed sanctions on the group of which the transgressor was a member. In such arrangements it is communities, not individuals, that acquire a reputation for honesty. Tying relationships in this manner creates incentives for members of a peer group to keep an eye on one another. The institution reduces the costs people incur in keeping an eye on one another.

The drawback of tied relationships among people having different interests is that they require further coordination. If, in our numerical example, B possessed not only her own skills but those of C as well, and if she had the time to work for A in both ventures, it would be simpler for A to offer both partnerships to B, with the proposal that *they* be tied. The relationship would involve only A and B, requiring less coordination.

Networks

The distinction between personal and impersonal transactions is not sharp. Even in a sophisticated market (modern banking), reputation plays a part (credit rating of the borrower). But the distinction is real. Meeting new people in Becky's world is often accidental, but people spend resources in order to make new acquaintances. Why? One reason is that new acquaintances may be in a position to provide *information*.