

Trust

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Abstract

Trust pervades every aspect of our daily lives, from business transactions to dealings with loved-ones, yet why we trust some in certain instances but not others is little understood. At an aggregate level, surveys of trustworthiness show enormous differences across countries, from 3% in Brazil to 65% in Norway. This article reports on new research that has characterized the legal, social, economic, and environmental factors that cause trust to be high or low. It also reports on laboratory experiments that demonstrate that trust has a neurophysiological basis. This research shows that low trust is a fundamental cause of poverty, but also that trust is directly influenced by government policies and particular human interactions. The article concludes with implications of this research for a variety of business situations.

¹ I thank my co-authors Stephen Knack, Robert Kurzban, and William Matzner, for useful comments on this paper, and for the productive collaborations we continue to have.

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Did you hear the joke about the ex-Enron executive's new business? It's called 'Why Lie? Just Give Me All Your Money.' While accounting fraud is not funny, this joke gets to the core issue of making an investment: do you trust the other party? If you have a sense that you cannot trust the executive across the table, 'good faith' assurances may be required. Or more upfront cash. Or a gaggle of lawyers. Trust enters our lives in hundreds of ways, but its effects are particularly compelling in business, since the myriad contingencies associated with a new hire, a new project, or any venture involving other human beings are impossible to forecast and plan for.

An ongoing research program by myself and a number of collaborators has uncovered how trust impacts business investment and the economy, how trust can be built, and the neurophysiology of trust. These findings provide insights that can be applied to everyday interactions – with subordinates and executives at work, with rivals, and even in one's home life. I dare say that every social interaction involves trust, and yet trust among human beings is little understood. This article reports new findings on trust from several perspectives.

Does trust matter?

The first question to tackle is whether trust is sufficiently important to warrant investigation (and continued reading of

this article!). Figure 1 reports the percentage of respondents, by country, to surveys who responded affirmatively to the first part of the question 'Generally speaking, would you say that most people can be trusted, or that you cannot be too careful in dealing with people?' This question seeks to capture 'generalized trust', which is whether two randomly selected individuals can trust each other. The surveys were done in person in 1996 using the native language, and the questions correspond to impressions of the respondents' own countries. Strikingly, the data vary by an order of magnitude: while only 3% of those surveyed in Brazil and 5% in Peru say their compatriots are trustworthy, 65% of Norwegians and 60% of Swedes believe this to be so. The United States comes in at 36%, down from 50% in 1990; the U.K. has been holding steady at 44% for the past decade.

You should not conclude from the figure that trust is necessarily lower in poor countries. Indeed, the third-highest trust country is China, and trust is higher in India than in the U.S. More rigorously, when the effect of income on trust is removed statistically, the same pattern endures: trust is high in Scandinavian and East Asian countries and low in South America, Africa, and the formerly communist countries.

If you do business in these countries, differences in trust levels are probably not news to you. In fact, the distribution of business



Figure 1: Trust levels across countries

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investment reflects trust levels. The simple correlation between national rates of investment (gross investment/GDP) and trust is strongly negative; when trust is low, investment lags. The same negative correlation holds for GDP growth and trust. This can be understood in terms of 'transactions cost economics.' Trust facilitates transactions by reducing the number of contingencies that must be considered when 'doing a deal.' A deal sealed with a handshake between principals can only occur in a high-trust situation. Let the lawyers work out the details – we have a deal. Conversely, when trust is low, negotiations are protracted, and therefore more costly. When transaction costs are higher, fewer transactions occur and investment and economic growth are lower.

Trust is among the most powerful stimulants for investment and economic growth that economists have discovered. In seeking to understand why some countries are poor and others are rich, it is, therefore, crucial to understand the foundation for interpersonal trust.

Institutions and trust

Imagine that you need to borrow a thousand dollars now, without collateral. Who do you ask? A family member perhaps, or a colleague? Definitely not a stranger on the street! Cooperation among related non-human species is well-documented, and is governed by 'Hamilton's Rule'. This rule states that any potentially costly behavior, including cooperative behavior, is more likely to occur when there are more genes shared by the two animals. Blood is thicker than water. More generally, who you interact with determines how much you trust a random person in the population. This insight is the seed of the leading model of generalized trust.²

For some reason, economists have not thought very much about the social, political, and legal environments in which transactions occur. The Zak and Knack model addresses this issue and asks if any degree of trust is possible in a one-shot interaction (i.e. absent reputational effects) when individuals are purely self-interested. To answer this question, we built a mathematical model of diligence to determine whether being cheated depends on the social environment (how similar or

dissimilar are those around us; for example, think of the high degree of ethnic homogeneity in Norway, and how strongly social norms are enforced); the legal environment (how effectively contracts are enforced; for example, how readily redress can be obtained if one believes he or she has been cheated); and the economic environment (we show that as incomes rise, people will behave as if they trust others more because their time cost to investigate their trading partner is high so they will accept a bit more cheating).

This model predicts that trust will be high in those countries that 1) are ethnically, linguistically, and religiously homogeneous; 2) have more equal distributions of income; 3) have low levels of economic discrimination (or exploitation); and 4) have higher incomes. Trust arises from purely selfish individuals because it reduces transactions costs. It makes no sense to spend a week arguing with the grocery clerk because you believe he has overcharged you by 10 cents. In this case, you behave as if you trust the grocery clerk (even if in your heart you may not); it is observed levels of trust that are measurable and it is this that the model predicts. Now, if this clerk overcharges you by U.S.\$100, it is probably worth some of your time to try to get the money back. If the clerk will not satisfy your demands, in high trust countries there are institutions that are designed to resolve disputes. Alternatively, if the grocery store manager lives in your neighborhood, or is married to your daughter or son, there are several social routes that can be used to resolve this conflict and keep trust high, for example through social ostracism or familial pressure.

The model's four factors are able to explain 70% of the variation in the trust data shown in Figure 1. Quite a tidy fit for data with such broad differences. We subsequently mapped differences in trust to variations in investment, economic growth, and thus living standards. Our analysis shows that a 15% increase in the proportion of people in a country who think others are trustworthy raises income per person by 1% per year for every year thereafter. For example, if trust in the U.S. increased from 36% to 51%, the average income for every man, woman, and child would rise by about U.S.\$400 per year thereafter due to the additional business investment and job

² Zak, P. J., and S. Knack, 2001, 'Trust and Growth,' *The Economic Journal*, 111, 295-321.

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creation. You can see that the impact of trust on living standards is quantitatively large: U.S.\$400 per year corresponds to an additional U.S.\$30,000 in lifetime income.

Our analysis also shows that if trust is sufficiently low (below 30% for the average country in Figure 1), then the investment rate will be so low that income will stagnate or even decline. Economists call this a 'poverty trap', and we show that the primary reason for a poverty trap is ineffective legal structures that result in low levels of generalized trust, and therefore little investment. Further, the threshold level of trust necessary for positive economic growth is increasing in per capita income; that is, the poorer a country currently is, the more trust is required to generate sufficient investment to raise living standards. This makes the low-trust poverty trap difficult to escape from. These predictions of the model are strongly supported in the data, and illustrate the spectacular effect of trust on growth.

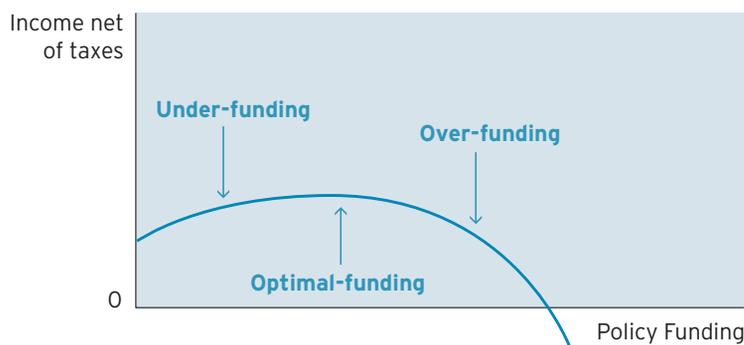


Figure 2: Optimal policy funding

Public policy and trust

The research described above can be summarized in one sentence: Differences in trust cause differences in living standards. Some policy-makers have also identified the role of trust on economic growth. For example, U.S. Treasury Secretary, Paul O'Neill, stated in the Wall Street Journal in 2001 that 'There are, to be sure, pervasive barriers to investment [in Russia]. The most serious is a lack of trust... But trust can be built.' As O'Neill understood, policy-makers interested in bettering the lives of their constituents should concern themselves

with building trust. In a recent research paper,³ Stephen Knack and I examined whether trust can be built through public policy, and if such policies are cost-effective economic stimulants.

We began by identifying public policies that affect the four factors that produce trust from Zak & Knack (2001). We then built a mathematical model that a policy-maker could use to determine the optimal amount of spending on each policy if one wanted to maximally increase individuals' living standards. Determining optimal spending is necessary since, for example, we show that cell phones raise trust, but their ability to increase trust will eventually slow, certainly once everyone has a cell phone, but probably much before that. And, of course, cell phones have a cost that must be funded by an additional tax. Figure 2 illustrates policy funding optimality.

Of all the factors that produce trust, social norms arise endogenously and appear most difficult to change via policy. Thus, we have opted to exclude it from our analysis. Social heterogeneity has a substantial effect on trust, and the aspect of heterogeneity most amenable to policy is income inequality. We also investigated the ability to increase the effectiveness of institutions that impact contract enforcement. Lastly, we examined factors that could directly affect trust, including education, increased interpersonal communication, and enhanced civil liberties and other types of freedoms.

We find that many policies increase trust, and some do so through multiple routes. Our analysis shows that

- Education increases the quality of formal institutions that enforce contracts, decreases income inequality, and directly raises trust
- Press freedoms and civil liberties increase the quality of civil institutions
- Telephones and roads directly raise trust
- Income transfers reduce inequality and thereby raise trust.

These findings are significant: trust can be raised by public policy. But can any of these policies stimulate income growth more than they cost to implement? Using the sample of countries in Figure 1 for which we have trust data and the policy-funding criterion shown in Figure 2, we determined the most

³ Knack, S., and P.J. Zak, 2003, 'Building Trust: Public Policy, Interpersonal Trust, and Economic Development,' Supreme Court Economic Review, 10.

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Policy	Cost per capita	Income gain per capita	Efficient?
Education	\$463	\$2,711	YES
Mobile phones	\$463	\$90	NO
Land Phones	\$463	\$49	NO
Transfers	\$286	\$445	YES
Freedoms	???	\$5,135	???

Table 1: Policies to raise trust and growth

efficacious policies to increase living standards by raising trust. Table 1 reports the cost and benefits of trust-raising policies. Only two unequivocally increase incomes more than they cost to implement: education and income transfers. The former occurs because of the three ways that education raises trust, producing a substantial impact on the economy. The latter occurs because of the substantial negative impact of income inequality on trust, even despite the fact that it costs about one dollar in administrative costs to transfer one dollar to someone. Lastly, we note that freedoms have a powerful effect on trust (presumably by increasing the freedom of association and making institutions and individuals more accountable). Unfortunately, there is not a generally accepted method of determining the cost of freedom – a point that is particularly poignant in this era of global terrorism, which seeks to destroy free societies.

The environment of trust

Once I discovered that the social-institutional-economic milieu could be modified to raise trust, the next question I explored was the way that individuals respond to changes that engender trust. My intuition was that at an individual level trust is not a calculative activity (i.e. determining costs and benefits), but a visceral sense that one has that a person can be trusted or not. You may have had this experience yourself. You meet someone new and quite quickly have a feeling that she or he is a 'good' or 'trustworthy' person or otherwise. Most people are unable to articulate exactly what it is about a person that makes them trustworthy, but are able to classify their beliefs in someone's trustworthiness quite readily. Recent research by

neuroscientist Ralph Adolphs and colleagues⁴ shows that patients with lesions in the amygdala (an area of the brain associated with emotions and social cognition) are unable to determine an individual's trustworthiness based on photographs of faces that normal subjects adjudge to be trustworthy or untrustworthy.

Is there a biological basis for trust? Thomas Jefferson wrote in 1814 that 'These good acts give pleasure, but how it happens that they give us pleasure? Because nature hath implanted in our breasts a love of others, a sense of duty to them, a moral instinct, in short, which prompts us irresistibly to feel and to succor their distresses.' A large area of literature in biology has examined social behavior in non-humans. This literature has shown that the neuroactive hormone oxytocin facilitates conspecific social attachments. Since trust requires social cognition, I wondered if oxytocin was Jefferson's pleasure-inducer and would elicit trust in humans. Identifying the physiologic basis for trust not only gives us insights into the mechanisms that produce trust, but can also guide us on effective institutional designs to raise trust.

Oxytocin is a reproductive hormone and initiates uterine contractions during birth, and facilitates lactation. This small molecule is essential for maternal and paternal bonding to offspring in mammals, and is also implicated in 'pair bonding' (remaining with a mate after the reproductive act) in some mammal species. The easiest way to raise oxytocin, other than giving birth or breastfeeding, is to have sex. Touch, grooming, a warm bath, vibration, and eating also raise oxytocin. This

⁴ Adolphs, R., D. Tranel, and A. Damasio, 1998, 'The human amygdala in social judgement,' *Nature*, 393(6684), 470-4.

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hormone activates the parasympathetic nervous system by signaling that the environment is safe and that we can relax. Oxytocin also induces a mild sense of contentment, reducing one's heart rate, respiration, and causing stress hormones to decrease. This description suggests that oxytocin is a candidate physiologic mechanism that produces trust.

With the help of a team of graduate students, I collected data on 85 factors that are known to affect oxytocin and estrogens; the latter modulates the uptake of oxytocin by neural tissue. We took this indirect approach as international data on oxytocin levels are unavailable. The results of our analysis are compelling⁵. Again using the international trust data in Figure 1, we statistically identified three classes of hormone-correlate variables that affect trust levels (after removing the effects of income levels on trust). We termed the first data class biosocial, which is made up of birth rate, telephone usage, breastfeeding rate, home ownership, and the proportion of Muslims and Hindus in each country. These factors either directly raise oxytocin, or are associated with sociality that has been shown to raise oxytocin in animals. Biosocial has a strong positive effect on trust.

The second factor, which we termed ecological, is made up of measures of CO₂ emissions, biodiversity, water pollution, population density, and sexual frequency. The first three items are estrogen antagonists (block the uptake of estrogen at receptors), and therefore inhibit the action of oxytocin, while the latter two raise oxytocin. The estrogen antagonists appear to dominate, as ecological is associated with lower trust levels. This indicates that a dirty environment (independent of income effects) is detrimental to trust.

The third factor is called phyto, and is a combination of nine types of phytoestrogens (plant-based estrogens) that are contained in soybeans and other legumes, garlic, parsley, tea, wine, and many other foods. Countries with high phytoestrogen consumption have higher levels of trust (for a given level of income). Biosocial, ecological, and phyto do not operate by impacting the four social-institutional-economic factors that Zak & Knack (2001) demonstrated produce trust, but have a

completely separate impact on trust levels. Indeed, the three factors (along with per capita income) are able to explain 97% of the variation in trust levels shown in Figure 1.

This research suggests that the human body responds to environmental conditions by changing hormone levels. Neuroendocrinologist Kristen Uvnäs-Moberg writes that 'a casual relationship may exist between endogenous oxytocin and 'personality.'⁶ My research shows that one's 'personality' may change as the familial, ecological, social, legal, and institutional environments change. When these changes endure, the 'set-point' of oxytocin appears to change, affecting generalized trust.

The neurobiology of trust

I next embarked on a direct test of the role of oxytocin in producing trust in a laboratory experiment⁷. This is how the experiment was run. An advertisement for the experiment was emailed to students at a large southwestern public university. Subjects (undergraduate and graduate students) who showed up earned U.S.\$10, and were given a secret code to mask their identity (i.e. the other subjects and the experimenters were unable to identify them so their decisions remain confidential). Subjects were asked to enter a large computer lab, read instructions about the experiment, and sign a consent form. Then, using proprietary software, half of the subjects (there were three experimental sessions with 12, 14, and 16 subjects), were assigned the role of decision-maker 1 (DM1) and were told they would be given an additional U.S.\$10. They could send any integer amount (including zero) of this extra U.S.\$10 to any other student in the lab to whom they have been randomly, and anonymously, matched. They were told that whatever amount they sent would be tripled and then given to their matched partner. So, if they sent U.S.\$4, the other student will receive U.S.\$12. Then, the second student, denoted decision-maker 2 (DM2), can send any integer amount (including zero) back to DM1 at which point the experiment ends. The amount DM1 sends to DM2 is a measure of trust, and the amount DM2 returns to DM1 is a measure of trustworthiness. This experiment is sometimes called the 'investment game' as DM1 is investing money with DM2, hoping for a positive return. Note that subjects were not deceived in any way during the experiment

5 Zak, P. J., and A. Fakhra, 2002, 'The neuroendocrinology of trust,' Center for Neuroeconomics Studies Working Paper.

6 Uvnäs-Moberg, K., 'Physiological and endocrine effects of social contact,' in *The Integrative Neurobiology of Affiliation*, Carter, C. S., I. Lederhendler, and B. Kirkpatrick, eds., New York Academy of Sciences.

7 Zak, P. J., R. O. Kurzban, and W. T. Matzner, 2003, 'The neurobiology of trust,' Center for Neuroeconomics Studies Working Paper.

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(i.e. were made fully aware of their, and their partner's, options), and were paid in cash at the experiment's termination.

Standard economic theory predicts that trust in this experiment should be zero. Why? The Nash equilibrium (the pair of optimal decisions based on the forecast of what the other person will do), is for DM2 to return zero to DM1 and take all the money for himself or herself. A rational DM1, anticipating that DM2 will keep all the money he or she has received, should not send any money to him or her but keep the U.S.\$10 instead. Laboratory experiments belie theory's prediction. This interaction has been run on hundreds of subjects, and about 50% of first movers trust the person to whom they are paired, and of DM2s who receive money, 75% return some to DM1s. This high degree of trust in the laboratory was quite a mystery to economists, because they had not considered that trust could activate a neurobiological attachment mechanism.

In my experiment, after each subject decided on the amount of money to transfer within their dyad, he or she was escorted to an adjacent room and four small vials of blood were drawn from a vein in their arm. We processed each subjects' blood to obtain plasma and serum in which oxytocin, and seven other hormones that interact with oxytocin, were measured. We then correlated oxytocin levels with subjects' decisions.

We found that the more DM2s were sent by DM1s, the more their oxytocin rose, and the more they returned to DM1s. That is, oxytocin rises when someone trusts you, and facilitates trustworthiness. This finding shows that we trust others because it 'seems' the right thing to do, activating social attachment mechanisms. We found no evidence that other hormones (e.g. stress hormones like cortisol, or hormones associated with aggression like testosterone) influence trustworthiness. Nor did any of the 172 social, familial, or emotional factors we surveyed, except a single measure of a positive attitude. This indicates that subjects' oxytocin levels were responding to the experimental stimulus and not some external factor. It also shows how strongly human beings are biased towards being trusting and trustworthy, since the physiologic attachment mechanism that evolved in mammals to care for their

offspring was activated in such a sterile setting: physical contact and face-to-face communication were absent since the interaction occurred by computer, and complete individual anonymity was maintained.

The distribution of oxytocin receptors in the human brain suggests that the decision to trust another human being is largely unconscious and utilizes the 'social brain.' In humans, oxytocin receptors are massed in the amygdala, the hypothalamus (which regulates the 'autonomic' nervous system, including breathing, heart rate, etc.), and areas associated with memory. These brain regions have abundant connections to an area in the brain associated with attention and identifying errors in the environment (the anterior cingulate cortex), which in turn project to decision-making regions (the prefrontal cortex). What this means is that oxytocin influences decision-making, but in a way that is largely outside the realm of conscious perception as the structures where it is active are outside of the large frontal cortex that distinguishes humans. Trust appears to be driven by a 'sense' of what to do, rather than a conscious determination. Current experiments by my lab are examining particular regions of the social brain where oxytocin is active to further elucidate the neurobiology of trust.

The business of trust

There are a number of lessons that can be drawn from my research for interactions in business environments. These can be broken down into three categories: individual interactions, group activities, and international transactions.

When meeting clients, fellow employees, and your superiors, you can activate social attachment mechanisms and raise their trust in you in many ways: if the topic is important, meet in person, shake hands, make frequent eye contact, share a meal, and inquire about your colleague's family. Follow up contacts by telephone produce greater attachment than with email, and sending holiday and birthday greetings helps to sustain attachments. When your interaction with others is caring and honest, they will be more willing to put their trust in you (avoid a simulacrum of care as the social brain is adept at identifying cheaters).

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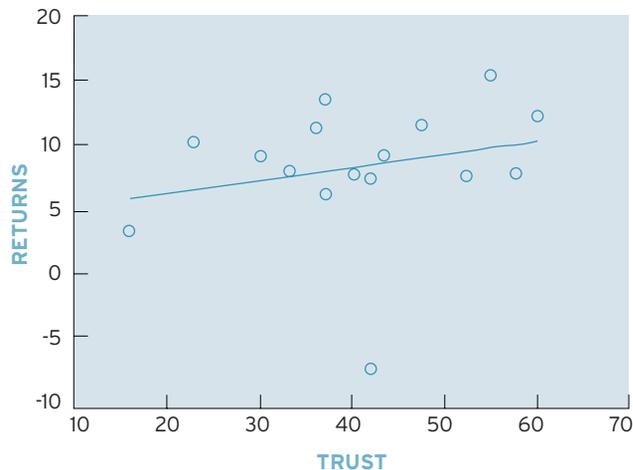


Figure 3: Annual OECD inflation-adjusted stock market returns and trust

For relationships with employees in your firm, 'morale-building' programs that have been used by many companies are likely to activate physiological attachment mechanisms and produce greater trust. If these programs raise the set-point for oxytocin, then trust and productivity will increase when employees are at work. Such programs include family and child-care leave programs; flextime; on-site childcare; permitting employees time off to perform volunteer work; group get-togethers; team-building outings, including ones that involve physical activity and group solidarity; and on-site or subsidized exercise facilities. An effective way to raise oxytocin, which is used by many organizations including agencies of the U.S. government, is on-site massage therapy. It is not only the psychological effect of the employer 'caring' about employees, but that this caring manifests in human touch that is important.

Finally, when doing business in foreign countries where trust is low, make sure you have sufficient recourse if your trading partner is not trustworthy. There is a Russian proverb 'Doveryai, no proveryai' (Trust, but verify), that is good counsel in these situations. For example, require 'good faith' money to be held in escrow; involve CFOs or CEOs in deals rather than just underlings; understand the degree of recourse available using foreign government agencies if you are cheated; utilize a local agent who has social or ethnic ties to your trading partner; consummate deals in stages to limit risk; and ask for verifiable evidence of completion.

Firms in countries where trust is high are simply better business partners, and these countries are better places to invest. Figure 3 plots the annual inflation-adjusted return in the stock market for 16 OECD countries from 1990-2000. Higher trust countries clearly generate higher returns. While trust is essential to business transactions, its impact on our lives is even more important. The social philosopher John Stuart Mill wrote in 1848 that 'The advantage to mankind of being able to trust one another penetrates into every crevice and cranny of human life: the economical is perhaps the smallest part of it, yet even this is incalculable.'