

Cognitive distance, diversity and focus

Bart Nooteboom

Cognitive distance

Ron Boschma (2005) distinguished five kinds of proximity: geographical, cognitive, social, institutional and organisational. The notion of cognitive distance that I developed (Nooteboom 2000), was broad, and included distance in knowledge and competence, and social distance in the sense of moral distance: difference in ways in which people treat each other, in a wide interpretation of cognition, including both substantive and procedural knowledge, of how people view how they should deal with each other. Cognitive distance thus has an epistemic and a moral or social dimension.

Greater cognitive distance in collaborative relations reduces efficiency, due to lack of understanding, but increases innovative potential of Schumpeterian 'novel combinations'. 'Optimal cognitive distance' is large enough to yield novelty, and not too large to prevent understanding of it. This was tested and confirmed with an econometric model by Nooteboom et al. (2007). A proxy for cognitive distance was 'technological distance', measured as the difference between technological profiles composed from differences in the incidence of patents in different patent classes.

The model included the refinement that for radical innovation, cognitive distance needs to be relatively large, offering the cognitive diversity needed for Schumpeterian 'novel combinations', and needs to be relatively small in incremental innovation, avoiding inefficiencies due to misunderstanding. In the words of March (1991), exploration requires relatively large distance, exploitation relatively small distance. But all organisations need some internal proximity, compared to the distances between firms exhibited in markets. As argued by Friedrich Hayek (1945) the market is characterised by dispersed and differentiated local knowledge that makes competition a 'discovery process'. The model confirmed the hypothesis that for exploration optimal distance is larger than in exploitation: one can exploit knowledge or competence at a larger cognitive distance. Exploratory innovations were measured as the number of patents outside the patent classes firms had before the innovation.

Cognitive distance is bridged with the aid of 'absorptive capacity' (Cohen & Levinthal 1990): the ability to understand and cope with differences in knowledge and skill, including morality. This depends on cumulative knowledge and experience with people who think differently. Next to absorptive capacity there is rhetorical ability, to make oneself understood and help a partner to cross cognitive distance. The use of metaphor helps, in explaining unfamiliar things in terms familiar to the partner. In the model, absorptive capacity was measured as the number of patents accumulated in a certain period. A shortcoming of this is that it does not include the social dimension of distance as a function of experience in collaborating with people who think differently.

An unexpected outcome of the model was that with a higher absorptive capacity due to much accumulated knowledge, optimal cognitive distance increased, as expected, due to increased absorptive capacity, but the marginal increase of novelty potential decreased., so that one has to search at a larger distance to find something new. Geniuses are lonely, and need to go to exotic places to still catch something new. In other words, accumulated knowledge has both increasing and decreasing returns.

Organisational focus and entropy

A certain degree of cognitive focus is needed for an organisation to function more or less efficiently. It is needed to reduce the need to negotiate goals of action and terms of collaboration at every instant. I called it 'organisational focus' (Nooteboom 2009).

Organisations oriented at efficient production will have a narrow focus, and organisations oriented at innovation a wider one. Organisational distance then is, among other things, difference in the width and content of the focus. Cognitive proximity need not, however, be the same across the whole organisation. There can be pockets of 'corporate entrepreneurship', in marketing or research departments, with relatively large internal cognitive distance, or wide focus, increasing innovative potential, but still narrower than the variety present in a market of independent firms, but yielding the advantage of some resources with economies of scale. In this article, following Nooteboom (2021), the notion of focus is elaborated with the aid of the notion of 'entropy'.

The appropriate 'tightness' of focus depends on the industry, the strategic choice of exploration or exploitation, the technology involved, freedom or constraints in the environment, ethics adhered to, and the view on what is the good life. In biotechnology, for example, firms developing new active substances or new production methods are typically small, with wide focus, in exploration, while larger pharmaceutical companies conducting the testing for regulatory approval and large scale production and marketing of new end products typically have a narrower focus, oriented at exploitation.

An organism, organisation, region and country are all 'Complex Adaptive Systems'. Those are systems constructed from elements and the whole has properties that the elements do not have. The elements often come together in self-organisation. The elements and the system as a whole interact with each other and with the environment of the system, resisting the rise of entropy.

Entropy is another notion that can help in understanding structures of organisations and regions, and their diversity. Entropy is the number of alternative compositions of components that a system with given properties can have. If the properties are few or indiscriminate, entropy is large. The mathematical formula for entropy E of a system of n elements i of probability p_i is $E = -\sum_i^n p_i \log p_i$. For a system of 2 units of equal probability $\frac{1}{2}$, $E = 1$, called a 'bit'. For a system of four elements of equal probability, $E = 2$ or two bits. For a system with 8 elements of equal probability $E = 3$, or three bits. For a system with n states of equal probability, $E = \log n$. A computational advantage of the log function is that $\log 1/n = -\log n$. E increases with the number of elements n and with their 'evenness', equality of p_i , which is their probability of occurrence or prominence or weight or legitimacy. The effect of the number of elements is illustrated above, with n going from two to eight elements. The decrease of E with the 'unevenness' of p_i is as follows. For the case with three elements n with equal $p_i = 1/3$, $E = 1.58$ and with $p_1 = 2/4$, $p_2 = 1/4$, $p_3 = 1/4$, $E = 1.5$.

Theil (1967) used the entropy measure as a measure of concentration of sales in markets or production in industries. Concentration is associated a lack of variety. P_i here is the share of seller or producer i . If there is only one seller or producer, there is maximum concentration, $E = 1$, i.e. least entropy. The log function $\log n$ increases less than proportionally with n : it increases at a decreasing rate, its derivative being $1/n$. This entails that the increase of entropy

slows down. As disorder increases, the resistance to further increase increases. Further increase of 'evenness' becomes more difficult.

A puzzle concerning entropy is the following. Nature and culture are rife with 'Complex Adaptive Systems' (CAS), systems that are composed from subsystems, such as: neutrons, protons and electrons composing atoms, atoms composing molecules, molecules composing organs, organs composing bodies, bees composing colonies, people composing organisations, firms, consumers and institutions composing markets, people and institutions composing regions or nations, nations composing supranational entities like the EU. The puzzle is this. On the one hand CAS produce order, organisation ('complexity'), and in that sense they decrease entropy. On the other hand, in their development they involve more units, constitute new agglomerations and new functions, and thereby increase entropy. How can that be? It depends on their heterogeneity, complementarity of the parts. While the subsystems integrate into a new order, they lose autonomy. To create the unity or coherence of the higher system, with its new functions, the subsystems are constrained in their operation, become specialised, losing some functions or narrowing their range, and that constitutes less entropy. In a bee colony, bees are highly specialized as food seekers, gate keepers, soldiers, feeders of the queen bee, (Testa and Kier, 2000).

The formula of entropy is incomplete. One should consider not only the number and 'unevenness', diversity of units, but also their relations. It is through internal and external relations that identity is constituted, order is created. If relations break down, this is also a feature of decay, of increasing entropy. An incoherent bunch of disconnected entities has more entropy than complementary, interacting ones. In their present breakdown of communities, in society, with dissociated individuals, entropy is increasing. The formula for entropy could be extended as follows:

$E = -\sum_{i=1}^n p_i \log p_i + |1 - C/M|$, where C is the number of direct connections between units, and M is its optimum, and the vertical slashes indicate absolute value. What is optimal connection depends on the purpose of the system. The maximum number of connections is $n(n-1)/2$. That is not necessarily optimal, as in an organization where if all people, or all firms in a region, connect with all, there is noise that distracts from work. If $C=M$, i.e. the number of connections is at its optimum, the addition to entropy is 0. If $C=0$, if there are no connections, the addition is 1. If the number of connections is lower or higher than the optimum, there is addition to entropy. One can picture this as an $n \times n$ matrix with along both axes the n units, and a surface above the matrix that represents the value of interaction for each pair of units. It is likely to have a bulge, at the optimum: some connections have more value than others

In the literature on freedom, a distinction was made by Isaiah Berlin between 'negative' freedom, in the absence of external constraint, and 'positive freedom' in access to resources. (Baum and Nichols 2013). Here, in CAS, the subsystems lose negative freedom in constraints imposed or accepted for fitting in the higher system, but gains positive freedom in access to new functions offered by the higher level system. There is loss of one freedom, and gain of the other. This can also be applied to regions. In lack of coherence one can fail to realise the potential of variety, and in too tight coherence, one immobilises the system. A region should search for the right mix of negative entropy of focus and positive entropy of diversity.

Related variety and regional focus

Is there an equivalent of cognitive distance and organisational focus in regions? Within a region there can be more or less cognitive distance, between and within industries. Between regions there are differences of industrial composition, with associated cognitive distance. Comparable to optimal cognitive distance, Boschma discussed 'related variety', as some difference in a region in industrial composition but with some relatedness of those industries, in the sense of firms supplying each other and having complementary technologies or competencies. Some but not too much distance is economically beneficial (Frenken et al 2007).

Within regions, social distance between co-located firms may be small, due to shared culture, language and perhaps morality, and collaboration. In the network literature there has been a debate on the strengths of weak (Granovetter 1973) and strong (Coleman 1988) ties between individuals or organisations. The strength of a tie has several dimensions: frequency of interaction, duration, multiplicity (number of features included in the tie, such as finance, labour, materials, instruments, knowledge, advice), and specific investments. Specific investments have value only within the relationship, and are lost or worth less when the relationship breaks. They often need to be made when the relationship is aimed at the novel combinations of innovation. This specificity makes parties dependent and vulnerable to power play, and they will be made only when the relationship is expected to be sufficiently durable to recoup the investment.

Strong ties may have the benefit of trust, but may generate loss of diversity, of cognitive distance and flexibility. For an optimal arrangement I proposed a combination: strong internal, local ties for governance and trust, and weak external ties, outside the region, with larger cognitive distance in knowledge and competence, for the sake of diversity and innovation (Nooteboom 2004). Variety can also be enhanced by some turnover of personnel bringing in fresh ideas. Concerning knowledge, co-location may be needed for the face-to-face meetings needed for sharing tacit or 'sticky' knowledge (Ashheim and Isaksen 2002), which may be safer against spill-over to competitors, but uncodified, tacit knowledge does make one more vulnerable to loss of knowledge in personnel turnover.

Is there an equivalent of organisational focus on the regional level? To recall: the function of focus is to establish a basis for collaboration, in terms of a shared purpose, shared knowledge and morality, perhaps shared rituals, not to have to negotiate the order at every turn, to achieve a minimum of efficiency. On the regional level also there may be a shared purpose, to some extent, such as employment, safety, ecology, social cohesion, image, or attracting tourism. The purpose may be to develop into a equivalent of 'Silicon valley'. The focus requires a certain shared culture and morality.

An aim may be to reduce transaction costs: costs of finding supply and demand, in the reduction of search costs, by openness and proper use of information technology, reduce costs of crafting an agreement, and litigation in case of conflict. Intermediaries may help to conduct the difficult art of trusting relationships (Nooteboom 2002). These might be private consultancies, or offices of local government. This is discussed more extensively later.

The network literature recognises structural and positional effects. Structural effects are the strength of ties, already discussed, density of ties, i.e. the extent to which nodes are connected, and structural holes, i.e. few or no connection between groups of nodes. Crossing structural holes, connecting previously unconnected groups, can yield novel combinations, crossing cognitive distance, but can also yield opportunities for playing off parts of the network against

each other (Krackhardt 1999, Simmel 1950, Nooteboom 2006) This can apply also to regions, in connecting otherwise unconnected regions or nations.

Positional features are centrality, differentiated between 'degree centrality', i.e. the number of direct ties of a node to other nodes. This is subject to the so-called 'Matthew effect': the rich get richer; having many contacts makes one attractive for other nodes to connect to. Having many contacts can, however, also yield a disadvantage of being constrained in having to compromise with a diversity of interests. There is also 'betweenness centrality', which is the extent to which paths of connection in the network pass through the node, as a hub, a crossroads. This gives advantages of collecting knowledge from distant sources. It requires sufficient absorptive capacity. to profit from the diversity of throughcoming perspectives, which can lead to cognitive overload.

These positional features also can apply to regions. A region can aspire to be a hub, with high degree centrality, with many direct links, or betweenness centrality. The hub can be a destination, such as a touristic centre, monument, conference centre, international centre in some activity, such as the International Court Of Justice in the Hague, and the World Health Organisation in Geneva. The hub can also be not a destination but a transit port, such as an airline hub, Paris as a point you have to pass to reach other parts of France. A hub is vulnerable to Corona, due to restrictions on travel, unless the travel is virtual, in on-line connections as in a search engine or website on the Internet.

A region can also aspire to cross structural wholes, in being a point of connection between otherwise separate regions, for example in diplomacy, as a neutral intermediary between conflicting states. Such a role of intermediary or 'boundary spanner' can be difficult (Krackhardt 1999), between conflicting regions or regions at too large cognitive distance. One can be confronted with different perspectives that are difficult to align. Crossing cultural distance can produce mistrust of him/her by one's 'home group', a loss of respect and acceptance, in suspicions of being a 'defector' or even 'traitor' in catering to foreign views. In relations between regions also, one should seek optimal cognitive distance; large enough for diversity but not too large to foreclose understanding and compatibility.

The network effects interact with the effects of cognitive distance (Gilsing et al 2008). Small internal cognitive distance, lack of internal diversity, may be compensated by a dense network and a high degree of degree or betweenness centrality.

Evolutionary economics

Evolution rests on three principles: variety generation, selection and transmission. 'Universal Darwinism' (Campbell 1974, McKelvey 1982, Hull 1988) speaks of the 'interactors' or 'vehicles' (Dawkins 1983), that are selected and carry their potential characteristics or 'replicators' that are replicated in successors when they survive. Interactors/vehicles (in biology: organisms) interact with their selection environment, and are members of populations of similar but differentiated interactors (in biology: species). In biology the replicators are genes, on chromosomes. Variety is generated in chromosome crossover in sexual reproduction, copying errors, and mutation of genes. Variety is also generated by changes in the selection environment, destroying the advantage of incumbent species and generating opportunities for new ones. An evolutionary approach is useful because it contributes to the explanation of the origin and development of the human being and society

without prior 'intelligent design', and also clarifies the potential for their development, as well as its limitations.

Evolutionary theory has been applied to a wide range of socioeconomic phenomena, such as organisations (Aldrich 1999, Baum and Singh 1994, McKelvey 1982), industries (Hannan and Freeman 1977, 1984, 1989), economies (Hodgson 1993, 2002, Hodgson and Knudsen 2005, Metcalfe 1998, Nelson and Winter 1982, Witt 1993, 2004), knowledge (Campbell 1974), neural structures (Edelman 1987) and culture (Boyd and Richerson 1985, Hull 1988).

In economics, the interactors could be individuals or organisations, and the replicators could be ideas or organisational foci or routines. Regions can be seen as evolving, in competition with other regions, and having replicators in the form of local culture and institutions. In evolutionary economics scientific discovery and entrepreneurship generate variety. Markets and institutions do the selection, and education, training, expansion, and imitation do the replication. In regions, public offices of technology transfer might help finance, education, infrastructure, and transmission of technology. Industries may form populations, with shared technologies or organisational foci. Perhaps regions can form populations, on the basis of shared culture and language.

In behavioural science, the evolutionary perspective has a number of attractions. It explains development and spread of forms of organisation, culture, meanings and cognition under limited foresight, and hence limited planning. In economics and management, evolutionary theory keeps us from the error of an unrealistically rational, magical view of development as the design by somehow prescient, or even clairvoyant, managers, entrepreneurs and scientists, as well as from the opposite error of institutional or technological determinism, whereby forms of organization are dictated by external conditions of technology and market (McKelvey 1982). In the first, managerial actors are omnipotent, and in the latter actors are absent. Evolutionary theory helps to deal with what in sociology is called the problem of agency and structure, how structure constrains and enables agency, but is also produced by it. It forces us to recognize both the role of actors, with their individual preferences and endowments, in the processes of variety generation and transmission, and the enabling and constraining conditions for action, in structures of markets and institutions, in the process of selection. The theory forces us to recognize causes of change both within organizations ('autogenic') and outside them ('allogenic') (McKelvey 1982). It makes allowance for the radical uncertainty of innovation, and for evident and ubiquitous error and failure in human endeavor.

Of great intellectual but also moral importance, evolutionary theory also forces us to accept diversity as an essential element of societies and their development. The old practice, in economic analysis, of dealing with an industry on the basis of a 'representative firm' is a fundamental mistake. As Hayek recognized, knowledge is dispersed and differentiated. Competition in markets and fields of knowledge, with constraining and enabling effects of institutions, are straightforwardly seen as yielding a process of differential survival and retention of products, practices and ideas. There is plausibility in seeing entrepreneurship and invention as sources of variety generation, and to see personnel turnover, training, personnel transfer, imitation, consultancy and growth as mechanisms for the transmission of proven success.

However, anyone who has studied socio-economic evolution recognizes that in many respects it differs radically from biological evolution. It is not always clear who the interactors are:

ideas, theories, routines, people, organisations, or regions. Evolution requires some stability of the selection environment for selection to work, while the system of an economy seems to be in perpetual shift, due to political change, rapid innovation, and economies of scale that yield concentration and lobbying power. When the interactors have a large effect on their selection environment, creating their own survival conditions, evolution breaks down. Transmission entails communication, and in communication, the replicators of meaning get transformed more than in biology. In expression and assimilation, meanings get transformed and added to, so that this transmission is at the same time a source of variety

In sum, evolutionary theory gives interesting perspectives on sources of variety, and an alternative to thinking in terms of intelligent design, but it is not a fully adequate theory. Also, it is not easy to model the processes of innovation, selection and transmission, since they are not optimal outcomes, as in economics, but processes that may or may not lead to equilibrium and an optimum.

Institutional features of trust.

Trust is crucial in relationships between, within and between regions. It is too large a subject to fully discuss here, and I focus on effects of location, in the institutional arrangements of a region. Trust is emotional but can to some extent be rational, reflective, as opposed to an automatic, tacit, innate inclination to trust, at least within the group one feels to belong to. It can also be based on a rational analysis of why people might be trustworthy. Trust is, or should be, less about having trust and more about being trustworthy. This is illustrated in Table 1. This is about intentional trust, not competence trust. Beyond trustworthiness, there is a wider notion of reliability on the basis of trust or control.

Table 1. sources of intentional reliability

	OUTSIDE	INSIDE
CONTROL	<i>narrowing the room for conduct</i> Institutions and contract <i>affecting choice of conduct</i> reputation	hierarchy, directives hostages, incentives
TRUST	general trust, morality, ethics	private trust: family, clan, friendship, community, empathy

Japan

US

Source: Nooteboom (2002).

In the left half of the table one finds public factors, outside the relationship, on the right factors within the relationship. The outside factors depend on the region. In the top half of the table one finds control. This has two forms: affecting the room for action, by contract (outside the relationship) or hierarchy and directives (inside the relationship).

In the top left one finds contracts. This requires a reliable judicial system. Another part of control that requires attention of a region, is a reliable reputation system. Reputation is a matter of self-interest: one behaves well not to ruin the chance of a fruitful relation in the

future, with the present partner or another. A reputation system can be effected privately by specialist consultants, industry associations, or by municipal government offices that are considered to be trustworthy in their competence to judge, to separate gossip from true reports, and in their intention to do so fairly.

The drawback of contracts is that they take time and can be costly and can signal distrust which calls forth reciprocal distrust, which once settled is difficult to remove. That is not necessarily the case, since the contract may be devised for technical reasons, not to prevent opportunism, but to document who is to do what, for planning purposes, like minutes of a meeting (Klein Woolthuis et al. 2005).

In the top right of the table one finds the institution of organisation, with a hierarchy, issuing directives and giving incentives, and the instrument of hostages. A hostage is defined as something of value to the hostage giver but not the hostage taker, so that the latter will not hesitate to destroy the hostage when its giver does not honour obligations. It is an ancient instrument, with kings giving nobles from the court or family members as hostages. Now it can take the form of competition-sensitive information that spills over to the partner by accident or needs to be shared for the collaboration, and can then be divulged to one's competitors

Beyond control on the basis of legal institutions, reputation, hierarchy with directives, incentives and hostages, there is trust, beyond self-interest. The basis for this outside the relation, in the region, can be general trust, as a matter of culture and morality. The evolution of humanity has bred an instinctive feeling for collaboration, with give and take, with an inclination towards benevolence, needed already in the hunter-gatherer communities since 400.000 years (Tomassello 2016, Moseley 2019), but this competes with an instinct of self-preservation that is also engendered in evolution. This benevolence can be part of intrinsic, not extrinsic, instrumental motivation. How that works out depends on the region. This is not a matter of either-or: one can value both the intrinsic and the extrinsic value of a job or relationship

There has been a general decline of public trust and trust in institutions, contributing to the rise of populism. (Hosking 2019). That entails more complications than can be discussed here, in an intertwining of economic causes and identity politics (Hosking 2019, 103). Hoskins notes that the decline of trust in public institutions has a double effect, impacting also on trust in private parties, such as banks, private health care providers, pharmaceuticals, science, consultants and other professionals, in a blind trust by citizens on the basis of the assumption of oversight by public institutions, of many things that the citizen cannot judge, and is now seen to fall short

Table 1 can be used for the diagnosis of both a relation and a region, seeing what sources of trustworthiness are absent and present, and for therapy, seeking to add new sources of reliability.

Not specified in the table, there is also the possibility of go-betweens (Nooteboom 2002). They can serve to break through emotional deadlocks, and put deliberation on a more sober, rational track than the emotional suspicions that often accompany relations. Relations are often governed by unjustified suspicions, especially in case of the the 'Calimero Syndrome' of a small, vulnerable partner, who is overly suspicious because of it, residing in a 'loss frame', expecting and seeing opportunism everywhere. The go-between can relieve unjust

suspicious. He can advise on how to proceed in deliberation. He can serve as a guarantor or monitor, instead of a contract. He may have the advantage of safekeeping sensitive information, rather than divulging it in a contract, with the risk of it 'spilling over'. Trust is an ongoing process, and needs to be guarded against undue suspicion and misunderstandings. Again, as in the provision of a reputation system, go-betweens may be private consultancies or municipal offices.

The analysis helps to understand the difference between reliance and trust. Table 1. shows the sources of intentional reliability, outside and inside the relationship. Reliability can be based on control, in the upper part of the table, or on trustworthiness beyond control, in the lower part.

The scheme can also be used to understand differences between countries. It has been used, for example, for a comparison of trust between the US and Japan (Nooteboom 2019). In the US trust is largely based on contract and reputation. A disadvantage of that is that it is expensive, yielding high transaction costs, and slow, in the building of a contract and reputation. As Fukuyama (1995) claimed, the US has low generalized trust. But while he also claimed that Japan is a 'high trust society', the Japanese researchers Yamagishi and Yamagishi (1994) showed that generalised trust in Japan is low. There, relationships in business are largely based on hierarchy, in the top right of the table, and bonding in family and clans, in the right left part. In the Netherlands, I think, all sources are in play, with hierarchy being relatively weak. In both Japan and the Netherlands, American governance is being adopted more than in the past, in a juridification of relations, in contracts and litigation, in a more or less autonomous imitation of the US.

There is a positive bias in trust, as if it is always a good thing. But trust can go too far, in several ways:

- Trust in untrustworthy people is misplaced. If trust decreases because trustworthiness decreases, that is a good thing
- Blind trust. in disregarding the possibility or evidence of a lack of trustworthiness
- Trust out of desperation: there is no alternative. This connects with Albert Hirschman's recognition of 'loyalty' next to 'voice' and 'exit'. If there is no basis for deliberation, in voice, and no option of exit, in being pinned down or coerced to stay, there is only one option of staying put and making the best of it. In Russia under Stalin, people talked lovingly of 'little father' Stalin, in spite of his blatant terror. Psychologically, it was unbearable to face reality.
- The disadvantage of bonding in family or clan, as indicated for Japan, is that relationships are locked into such clans, excluding diversity from outside, which can be bad for innovation.
- One can have multiple, conflicting obligations, to job, family, personnel, customers, suppliers, environment, nation, that necessitate disloyalty to at least one, in a crisis, and one can be untrustworthy there by necessity.
- According to the philosopher Nietzsche, benevolence and pity as the result of the power play of the weak to protect them against the strong or exert vengeance on them.
- According to Bernard Mandeville (Copleston, Vol 5 part I, p. 188), private vices are public virtues. I would say that the duty of benevolence can eliminate the virtuous power of 'thymos', the urge to excell and perform, and deviate, of the entrepreneur, discoverer, sportsman, scientist etc.

However, one can be honest in some of those conflicts, ask for sympathy, offer recompense, or accept retribution. One can be trustworthy in one's untrustworthiness. Regions also should guard against excessive trust.

Concerning the process of trust, there are questions how to start, but also how to maintain a relationship and, certainly not less important, how to end a relationship in reasonably good faith. Suppose the partner is unknown, so that reputation does not work. One may be tempted to start with a contract, but that runs the risk of setting the relation off on the foot of distrust, which is difficult to turn around. If one has the time, one may start with small investments and up the ante as trust grows. That may be too slow. An alternative is to call in the help of a trustworthy go-between. In the ending of a relationship, one may spring it as a surprise on the partner, or one can warn him in advance, allowing him to reduce his dependence, stopping specific investments, and helping to find a new partner.

There is a literature on 'dynamic capabilities' (Teece and Shuen 1997, Teece 2007), i.e. capabilities to engage successfully in innovative, entrepreneurial activities, which is too large to discuss here, but here I just want to say that the ability to judiciously engage in trust is certainly one of them.

Trust is obstructed by prejudice of race, culture, religion, or nation. This is elaborated in the notion of 'parochial altruism' (de Dreu et al. 2014). That is the phenomenon that people are instinctively inclined to altruism within the group they feel to be a member of, while mistrusting outsiders. That yields an evolutionary puzzle. It is conducive to trust and solidarity within the group, but genes are owned by the individual, not the group. So how would an instinct of parochial altruism be inherited?. The hazard for a trusting society is that it will be invaded by opportunist outsiders who ultimately gain ascendance, due to better individual survival. It is true, as demonstrated in the game of 'hawk and dove', that after a while, when the number of collaborators (doves) dwindles, the opportunists (hawks) begin to lose out on victims, and a balance between collaborators and opportunists may arise, and not all collaborators die out. But mistrust, identification and punishment of outsiders, with punishment by a sufficient number, irrationally, at a cost to themselves, is a remedy to maintain a wider society of cooperators. This can be inherited culturally. Tragically, here lies the source of discrimination and exclusion of certain immigrants.

Parochial altruism hampers the positive value of diversity, as a source of a variety of scarce resources, in exchange, but there is more to it. Thought is always biased, and one always thinks, in part, on the basis of unreflected subsidiary assumptions or ideologies. The best opportunity one has of escaping that bias is opposition from someone else with a different slant on things. That is why diversity is good for innovation as well as intellectual and spiritual development. As noted, immigrants at some cognitive distance are potentially beneficial.

The solution to the discrimination and exclusion resulting from parochial altruism is to extend the boundary of the group one considers oneself to be a member of, as living in the same neighbourhood, for example, or trying to categorise the outsider by some other feature, such as a colleague at work, sharing a sport or task, or being the victim of the same hardship or injustice. For that, it is advisable to integrate immigrants as quickly as possible.

Parochial altruism goes together with group self-serving attributions, where positive properties or actions outside the group are attributed to circumstances, not to positive properties, and negatives are attributed to personal characteristics, while inside the group it is the reverse. (Smith & Bond, 1993, 179, 86). A region can have more or less parochial altruism, and this requires attention for the sake of a beneficial turnover of population, with immigrants, for the sake of diversity.

References:

- Aldrich, H. 1999, *Organizations evolving*, London: Sage.
- Ashheim, B.T. and A. Isaksen 2002, 'Regional innovation systems: The integration of local 'sticky' and global 'ubiquitous' knowledge', *Journal of Technology Transfer*,
- Baum, B. and R. Nichols (eds.) 2013, *Isaiah Berlin and the politics of freedom: Two concepts of liberty 50 years later*, London: Routledge
- Baum, J.A.C. and Singh J.V. 1994, 'Organizational hierarchies and evolutionary processes: Some reflections on a theory of organizational evolution', in Baum, J.A.C and J.V. Singh (eds.), *Evolutionary dynamics of organizations*, Oxford: Oxford University Press: pp. 3-20.
- Boschma, Ron, 2005, 'Proximity and innovation: A critical assessment', *Regional Science*, 39/1, p. 61-74.
- ..Boyd, R. and Richerson, P.J. 1985, *Culture and the evolutionary process*, Chicago: University of Chicago Press.
- Campbell, D.T. 1987, 'Blind variation and selective retention as in other knowledge processes', in D.T. Campbell, *Methodology and epistemology for social science*, Oxford: Oxford University Press, 393-434.
- Cohen M D., & D.A. Levinthal, 1990, 'Absorptive capacity: a new perspective on learning innovation', *Administrative Science Quarterly*, 35, p.128-25.
- Coleman, J.S. 1988, 'Social capital in the creation of human capital', *American Journal of Sociology*, 94, 95-120.
- Dawkins, R. 1983, 'Universal darwinism', in D.S. Bendall (ed.), *Evolution from molecules to man*, Cambridge: Cambridge University Press, pp. 403-25.
- Edelman, Gerald. M. 1987, *Neural Darwinism; the theory of neuronal group selection*, New York: Basic Books.
- De Dreu, Carsten, Daniel Balliet and Nir Halevy, 2014, 'Parochial Cooperation in Humans: Forms and Functions of Self-Sacrifice in Intergroup Conflict', in: *Advances in Motivation Science* 1, p. 1-47
- Frenken, K., Oort, F. v., & T.N. Verburg 2007., 'Related variety, unrelated variety and regional economic growth'. *Regional Studies*, 41/5, 685-697.
- Gilsing, V.A., B. Nooteboom, W.P.M. van Haverbeke, G.M. Duijsters, & A. v.d. Oord, 2008, Network embeddedness and the exploration of novel technologies: technological distance, betweenness centrality and density, *Research Policy*, 37, 1717-1731.
- Fukuyama, F., 1995, *Trust, The Social Virtues and the Creation of Prosperity*, New York: Free Press.
- Granovetter, M.S. 1973, 'The strength of weak ties', *American Journal of Sociology*, 78/6 1360-81
- Hannan, M. T. and Freeman, J. 1977, 'The population ecology of organizations', *American Journal of Sociology*, 88, 929-64.
- 1984, 'Structural inertia and organizational change', *American Sociological Review*, 49, 149-64.
- , 1989, *Organizational ecology*, Cambridge MA: Harvard University Press.
- Hodgson, Geoffrey M. 2002 'Darwinism in economics: from analogy to ontology', *Journal of Evolutionary Economics*, 12, 259-81.

- Hodgson G.M , and T Knudsen. 2005, 'Why we need a generalized Darwinism, and why generalized Darwinism is not enough', *Journal of Economic Behavior and Organization*, 61, 1-19.
- Hayek, F. 1945, 'The use of knowledge in society', *American Economic Review*, 35, 519-30.
- Hull, D.L. 1988, *Science as process; An evolutionary account of the social and conceptual development of science*, Chicago: University of Chicago Press.
- Janow, Richard 2003, 'Shannon entropy applied to productivity of organisations', *IEEE Xplore*.
- Klein Woolthuis, Rosalinde, Bas Hillebrand and Bart Nooteboom, 2005, 'Trust, Contract and Relationship Development', *Organization Studies*, 26/6, p. 813-840.
- Krackhardt, D. 1999, The ties that torture: Simmelian tie analysis in Organizations' *Research in the Sociology of Organizations*, 16, 183-210.
- McKelvey, W. 1982, *Organizational systematics: Taxonomy, evolution, classification*, Berkeley: University of California Press.
- March, James .G. 1991, 'Exploration and exploitation in organizational learning', *Organization Science*, 2(1), 101-23
- Metcalf, J.S. 1998, *Evolutionary economics and creative destruction*, London: Routledge.
- Moseley, Roger 2019, *Morality, A natural history*, Fort st. Victoria: Friesen Press
- Nelson R. R. and Sidney Winter 1982, *An evolutionary theory of economic change*, Cambridge: University Press.
- Nooteboom, Bart, 2000, *Learning and innovation in organisations and industries*, Oxford University Press.
- 2004, *Inter-firm collaboration, learning and networks*, London: Routledge.
- 2006, B. Nooteboom, 'Fragment: Simmel's treatise on the triad', *Journal of Institutional Economics*, 2/3: 365-383
- 2009, *A cognitive theory of the firm*, Cheltenham UK: Edward Elgar.
- 2021, *Process philosophy, a synthesis*, London: Anthem publishers
-, 2019, 'Uncertainty and the Economic Need for Trust', in: Masamichi Sasaki, and Robert M. Marsh, 2012, *Trust: Comparative Perspectives*, Cheltenham UK: Edward Elgar.
- Nooteboom, B., W.P.M. van Haverbeke, G.M. Duijsters, V.A. Gilsing & A. v.d. Oord, 2007, Optimal cognitive distance and absorptive capacity., *Research Policy*, 36 (2007): 1016-1034.
- B. Nooteboom, Fragment: Simmel's treatise on the triad, *Journal of Institutional Economics*, 2/3 (2006): 365-383
- Simmel, G. 1950, 'Individual and society', in K.H. Wolff (ed.), *The sociology of Georg Simmel*, New York: Free Press
- Six, F, B. Nooteboom & A. Hoogendoorn 2010, 'Actions that build interpersonal trust: a relational signalling perspective', *Review of Social Economy*, 68/3 (2010), 285-315.
- Smith, Peter B. and Michael Harris Bond 1993, *Social psychology across cultures*, London: Prentice Hall
- Spender, J.C.1989, *Industry recipes*, London: Basil Blackwell
- Teece, D 2007, 'Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance', *Strategic Management Journal* 28, 1319-50
- Teece, D. and A Shuen 1997, 'Dynamic capabilities and strategic management', *Strategic Management Journal*, 18/7, 509-33
- Testa, Bernard and Lemont B. Kier 2000, 'Emergence and dissolution in the self-organization of complex systems', *Entropy*, 2, 1-25
- Theil, Henri 1967, *Economics and information theory*, Chicago: Rand Mc.Nally.
- Tomasello, Michael 2016, *A natural history of human morality*, Cambridge MA: Harvard University Press.
- Witt, Ulrich 2004, 'On the proper interpretation of 'evolution' in economics and its implications for production theory', *Journal of economic methodology*, 11, 125-146.
- Yamagishi, T. and M. Yamagishi, 1994, 'Trust and Commitment in the United States and Japan', *Motivation and Emotion*, 18, p. 129-66

