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**BUZZ:
THE ECONOMIC FORCE OF THE CITY**

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Abstract

Despite great progress made in the theory of agglomeration in recent years, a number of gaps remain in our ability to understand why cities continue to have such attractive power in the new economy. Many of the most recent theories of agglomeration attempt to understand cities or clusters as loci of knowledge development and exchange, critical to higher levels of innovation and growth. Yet they do not theorize directly the mechanism which must be at the heart of this process, i.e. face-to-face contact. F2F contact is, we argue, an especially rich and efficient technology of communication in many areas of today's economy. Moreover, it is a form of relation which overcomes certain key moral hazard and confidence problems at the heart of the contemporary economic process, and under certain circumstances, it raises effort levels above what they would otherwise be. It allows efficient selection and matching processes to occur, so that effective partnerships can be formed, or what we term being "in the loop." All in all, F2F contact is at the heart of a key advantage of the city today, its "buzz."

Keywords: agglomeration, urbanization, moral hazard, information, communication, face-to-face contact, transaction.

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1. AGGLOMERATION REMAINS STRONG

One of the established facts of economic geography is that the force of agglomeration remains strong, even though transportation and communication costs continue to decline. There is substantial evidence, for example, that the transportation and communications improvements that occurred in the United States between from the late 18th to mid-19th centuries, including the construction of the railroad system, were accompanied by increasing urban concentration of economic activity, not its reduction (Pred, 1966, 1974; Fishlow, 1965; DeVries, 1984; Hall, 1998). Relative city sizes remained stable over the 20th century in the United States (Black and Henderson, 1998), and this pattern of stability (parallel growth in cities) is true of other advanced countries such as Japan and France (Eaton and Eckstein, 1997). Moreover, there is mostly persistence of the same activities in the same cities; only a few industries really change their geographical centers or entirely abandon them, once they are initially locked into a location (Brezis and Krugman, 1997; Storper and Walker, 1989; Henderson, 1998); US industrial location patterns at the three-digit level from the mid-nineteenth century onward have been remarkably stable (Kim, 1995; Dumais et al, 1997). Thus, there is strong evidence that innovations in physical transport infrastructures such as the canal system, the railroads, and the Interstate Highway System, and informational infrastructures such as the postal service, the telegraph, and the telephone, have not brought about the end of the urbanizing tendencies of modern capitalism; quite the contrary, they tend to reinforce industrial localization and the consequent growth of cities (Teaford, 1986).

This is why having an adequate theory of the geographical concentration of economic activity is so important, and why it cannot rely merely on the supposed constraints to spreading out which come from the existence of positive transport costs. In this light, theories of

agglomeration have progressively turned away from physical transport costs as their causal mechanism and have come to concentrate on immaterial transactions, those which focus on the transmission and exchange of information, knowledge and ideas; cities are increasingly conceived of as places where immaterial exchanges are facilitated, which leads cities to be propitious to the creation of new knowledge, and hence to be centers of innovation. Cities used to be centers of agglomeration of material production; now the motor force of agglomerations is the production and communication of ideas, knowledge and information. Yet while considerable progress has been made in theory and measurement of these transactions (Scott, 1988), there remain significant gaps in what economists and geographers have to say about them.

In this paper, we argue that the heart of the matter lies in the various effects of face-to-face contact, which we will refer to collectively as the "buzz" of the city. This is not a new idea, but it seems possible today to specify what it is about face-to-face contact that creates buzz, and why buzz should be an economically-important enough force to contribute significantly to the agglomeration of economic activity and persons in an age where both physical transportation costs and the costs and ability to transmit information have declined so significantly.

2. THEORIES OF AGGLOMERATION AND CITY GROWTH

Table 1 presents an inventory of current theories of why economic activities and people might agglomerate in cities, in a world of declining spatial transactions and transportation costs. Reflections have centered on three principal reasons for why activities continue to concentrate in geographical space: (1) backward and forward linkages of firms, including access to markets; (2) the clustering of workers; and (3) localized interactions which promote technological innovation. Different versions of these three basic forces are presented in Table 1, in the interest of capturing the detail of different versions of these explanations.

Table 1: AGGLOMERATION AND URBANISATION: THEORIES

Area of explanation	Causal agent and behavior	Causal mechanism for agglomeration	Outcome for economy	Limitations to the theory/evidence
I. Input-output linkages: backward	Firms: search for suppliers, suppliers search for clients.	Search/matching because of specialisation uncertainty or numbers (capacity) uncertainty. Presupposes high spatial transport-transactions costs	clustering of intermediate input producers: specialisation: better capacity utilisation, raises productivity	Many kinds of agglomerations don't display a high level of local intermediate trade.
I. Input-output linkages: forward	Firms: search for markets	Firms: large numbers of workers (consumers) = scale. Firms seek other firms as markets = search/matching because of capacity uncertainty. Presupposes high spatial transport - transactions costs	Specialisation-clustering (intermediate) or diversification clustering (final outputs). Maximise scale, raise productivity.	Chicken-and-egg for final markets (and highly transport cost/information cost sensitive). For intermediates, depends on transport costs and information costs between firms
II. Thick labor markets for specialised skills	Specialised workers: search for jobs, under condition of high turnover and "narrow fit"	Search/matching because of numbers or specialisation uncertainty. Agglomeration = large numbers of demanders and suppliers	more but shorter UE periods, higher wages for workers; firms avoid labor hoarding but get benefits of specialisation	applies only to part of urban labor market, much of which is traditional employment relation. Applies only where skills are well-defined.
II. Urban labor markets as places where careers are formed and people "learn"	Workers :seek to maximise lifetime career possibilities and wages	Search/matching under specialisation/ uncertainty: diverse economy, large numbers = more turnover = higher probability of learning and career growth	Lifetime earnings and skill growth greater in big labor markets	Probably applies to very highly skilled and highly specialised industries. Doesn't identify precisely how people learn and role of proximity.
III. Technological spillovers between firms, within industry	People: information	Networks: circulation of specialists or "stars" within high turnover, large numbers labor market	Higher rate of innovation, cities specialised and leading in particular sectors	stars and specialists should have well-structured long-distance networks, unless information strongly tacit. Doesn't explain spillovers between industries.
III. Technological spillovers	Goods (trade): information	Markets: goods "carry" information	Very specialised goods circulate in a limited space with first-mover exposure effects: innovation synergies	Most goods circulate long-distance nowadays
III. Technological learning and creativity: Jacobs	People, firms, objects, environment	Diversity and its corollary, the unexpected, lead to inventiveness and creativity.	diversified economy should be more creative and productive	Definitions are vague, causal mechanism not clear. Hence difficult to measure or verify
III. Technological learning: Marshallian	people and firms share "atmosphere"	Interfirm clustering generates proximity, hence the unexpected, not limited to stars. Primary explanation is linkages (above). Secondary consequence is something like networks or habits that lead to innovation.	clustering should be more dynamically productive because more innovative	Evidence thus far is mixed. Theory is suggestive, but vague on explanation of exactly how "atmosphere" functions or why it is necessary.

2.1 Forward and backward linkages:

Essentially, forward and backward linkages of firms are accounted for by the interaction of increasing returns to scale and some sort of spatial transaction cost. Returns to scale means that firms seek to concentrate production in few locations and spatial transactions costs mean that the most profitable locations will be those that are close to suppliers of intermediate goods and to larger markets for both final and intermediate goods. In the simplest version returns to scale arise internally in firm or plant level production, and spatial transactions cost might simply be shipping costs (for example, Fujita, Krugman and Venables 1999). Forward and backward linkages may be particularly important for highly specialised inputs and outputs. In the case of inputs, they may involve high quality or innovative products. Narrow scope (specialisation) reduces potential output levels unless it can be compensated with many clients. Moreover, transactions are complex because the information needed to procure specialised inputs is complex and this raises transactions costs. Specialised outputs have a "central place" dilemma: they require big markets to support big capacity, and tend to be found only in places with relatively big markets. If this concerns final outputs, it generally means big cities; but if it concerns intermediate outputs, it generally means specialised cities, which concentrate large numbers of demanders of a relatively specialised kind of input.

Localised returns to scale and transactions costs are also strongly related to the level of uncertainty. Uncertainty comes from forces which make it difficult to stabilise output levels sufficiently to make transactions between firms large enough in volume to reduce the costs of carrying them out at great distance. One version of this is simply because of small or irregular capacity due to naturally fluctuating markets, which we call search/matching under numbers uncertainty. The urban environment, by concentrating relatively large numbers of suppliers and

demanders, overcomes numbers uncertainty, permitting input smoothing by firms and maximizing "uptime" by workers, with considerable gains in productivity. The thus the law of large numbers in a restricted geographical context creates increasing returns, both by minimizing the transactions costs of search and matching and by allowing firms to more efficiently use overall capacity.

2.2 Labor markets:

Search/matching dynamics also underlie the dynamics of urban labor markets, where the equivalents are specialised skills rather than specialised products. Indeed, the two -- labor market matching and inter-firm linkages -- are closely interrelated aspects of production systems whose environments are unstable, either because of rapidly shifting markets, cyclical markets, specialised outputs or innovative outputs, whether in services or goods production. The consequences for firms and workers are nearly identical as in the linkage cases. Firms need specialised workers but do not want to make the long-term commitments to them that would stabilise their employment relations. To avoid hoarding workers, they need access to a large pool of them. Likewise, if workers are to invest in specialised skills, they will either require long-term employment relations, or the possibility of rapid and efficient search and rehire in an environment of high turnover (Rotemberg and Saloner 2000; Jayet, 1983).

Let's pause for a moment and note that all the explanations of agglomeration considered thus far have an important transport or transactions cost component to them. When firms or workers search for inputs or jobs under conditions of uncertainty, it is difficult to organize the physical transport of goods or persons in a way that minimizes their transport costs, as can be done when there is large volume and extreme regularity in these kinds of transactions. Though daily commuting fields have extended greatly, they remain a strong constraint on the functioning

of high-turnover or open-ended career labor markets. This principle applies as well to much of the urban service economy: services which are delivered face-to-face would have very high transport costs if their provision were spread out, and there is a circular and cumulative interaction between concentration of population and concentration of services in cities for this reason.

The constraints are not just physical transport costs, however; complex search/matching processes (for people or physical inputs and outputs) usually exist in sectors where the underlying uncertainty of what is to be done is what impedes standardisation and routinisation of production organization. This means not only small-scale and temporal irregularity in transactions, but also complex informational requirements: the information cannot be entirely standardized or codified from one transaction to the next. So, immaterial transactions costs are usually quite high and contribute to the force of agglomeration. Nonetheless, though we can be quite confident about this reasoning, one of the major problems in empirical research on agglomeration is that it is difficult to theorise and measure separately the contributions to geographical concentration of informational/ immaterial transactions costs from those of physical transport costs.

2.3 Technological spillovers, learning, and the "creativity" of cities

The third area of the explanations found in Table 1 is technological innovation, a key dimension of long-term economic growth. The notion that the city is a locus of inventiveness is hardly new; it goes back to observations that can be found in Adam Smith, figures prominently in Marshall, and was renewed by Jane Jacobs in a more journalistic way in the post-war period. In this regard, there is some fragmentary but fairly convincing direct evidence that cities -- both big diversified ones and specialised ones -- are centers of innovation and technological progress, i.e.

centers of the production of ideas and knowledge, whether it be applied in pure ideas form (as in services) or to the production of hard outputs (technologies) (Feldman and Audretsch, 1999; Jaffe, Trachtenberg and Henderson, 1993). The notion frequently adduced to explain these facts is that spatial proximity improves flows of information that innovators use in being innovative. Recently, some theorists have suggested that as a result, agglomerated economic activity is the locus of technological "spillovers," which are said to raise the rate of innovation and hence increase the potential rate of productivity growth in particular and economic growth in general. This is a thorny and difficult area of theory and measurement, but one that may contain the most promising explanations for why agglomeration continues to be such a powerful force even in an age characterised by steep declines in transportation and communications costs.

It is promising precisely because technological spillovers are essentially those of knowledge and information. One might think that immaterial transactions would have marginal costs close to zero; knowledge and information are weightless, and with broad-band ICTs, it has now become possible to transfer relatively complex sorts of verbal and visual information and to do so rapidly or even in real-time. Since immaterial products can be transported virtually without cost, intellectual activities are amenable to procurement at a distance - the design in Detroit, advertising in New York and strategy in Chicago. Yet, although the clients of specialized intellectual firms are sometimes far-flung, their competitors usually are not. Firms producing such specialized immaterial products tend to cluster tightly together in financial 'districts' and downtown office buildings, such as Wall Street, the City of London, Hollywood, and the Loop. Furthermore, it is common for specialized immaterial producers to have branch offices in major cities near the location of deployment of their ideas, suggesting that the 'shipping' of an intellectual product may be as costly as shipping a tire or an axle (Leamer and Storper, 2001).¹

¹There is also a branch of theory which holds that technological spillovers occur in

Nonetheless, theory is quite weak on accounting for why such specialist firms and individuals cluster in the first place and even weaker in developing concepts that might be measured. The most powerful and tractable theory of technological spillovers has to do with the circulation of people. For example, in Glaeser's (2000) model of learning in people can learn from contact with more skilled individuals in their own industry, and that the number of contacts an individual makes per period is an increasing function of city size. Large cities therefore facilitate learning, and are particularly attractive locations for young people.

Knowledgeable workers actually circulate as agents of knowledge exchange between firms, and hence allow these firms to participate in continual recombinations of knowledge, adjustment of their products (frequently intermediates) to the changing needs of the industry or to new applications or uses. Along these lines, it has been shown that "star scientists" do indeed concentrate geographically and have their most intense relationships with leading innovative firms in certain science-based innovative sectors (Zucker and Darby, 1998).

The theory is itself not very precise about causal mechanisms. It seems unlikely that it could be simply the kind of search/matching under conditions of specialisation-uncertainty, since knowledgeable workers are recruited specifically for their knowledge via well-established professional networks. The concept of "specialisation" is not adequate to the job here, unless we consider that technological spillovers are simply an unintended by-product of the high levels of

geographical space via trade in goods. Goods themselves contain information which is transmitted by their trade, and this helps others to become more innovative, via imitation and competition. This would appear to be a force for international or long-distance information transmission, but only in very rare cases would it seem to be a force for agglomeration, since even if the producers themselves are agglomerated, it is unlikely that their products never circulate outside a restricted local space. It could be the case for certain highly specialised intermediate inputs, or articles representing highly refined and highly localised cases. But these are certainly small and insignificant exceptions). Therefore, it is something about proximity between people as a force in technological spillover, leading to innovation, that must be understood.

turnover found in places such as Silicon Valley, the City of London, or Hollywood. This seems inadequate from both theoretical and empirical points of view.

Moreover, if -- as seems likely -- this is really a theory about networks, we know that specialised workers -- especially scientists and engineers -- tend to have well-developed long-distance networks. That is, technological cooperation and exchange is well worked-out at long distance nowadays. Certainly, local face-to-face interactions inside the workplace are what make a unit valuable to a long-distance network, but the networks do exist. So the question is whether there are *other* local effects, not captured by these professional networks, that somehow allow people inside workplaces to be "at the cutting edge," and hence especially valuable to long distance networks. The theory does not address this, however, and that is precisely the problem.

This local circulation of talent might seem to apply better to traditional or non-science-based, non-professional industries. A well-regarded clothing or furniture designer, for example, might be thought to have more localised networks than a star scientist or a hot-shot investment banker, and that something of the sensibilities of such persons might then "rub off" on people around them, and heighten the abilities of those people to be innovative. But if this is the case, we are no longer in a situation of networks and circulation, but of a theoretical problem of identifying what it means to "rub off."

In sum, thus far what we have on innovation are essentially two versions of theories of search/matching, some network theories, and reflections about market areas and trade, as forces behind agglomeration.

There are, in addition, two older notions about cities or agglomerations and what we today call innovation, but this was not the terminology employed by the authors of these notions. Jane Jacobs (1960) advanced the idea that cities enjoy an economic advantage because of their diversity. This diversity, because it is highly packed into limited spaces, facilitates the

haphazard, the serendipitous contact among people. In contemporary terms, this could be seen as a key to better and more varied circulation of information among innovators, which makes them more efficient at asking the right questions, combining existing knowledge in new ways, and hence coming up with better ways of doing things. Recently, some observers have suggested that the information used by innovators has a tacit component: it is difficult to set down in blueprints or to codify completely, and hence it is difficult to communicate at a distance. The communication of this complex, non-codified information is thus what is most efficiently carried out in a restricted geographical space, by direct contact between people. In other contemporary theories of creativity developed by social psychologists (such as those of Bateson 1973 or Csikszentmihalyi 1996), it is argued that creativity depends on several different ways of processing information at one time, from the standard deductive way to analogical, metaphorical, and parallel methods. This could well make them particularly stimulated by diversity and serendipity, as Jacobs had earlier suggested.

In another vein, Alfred Marshall, one of the main inspirations for contemporary students of the type of agglomeration known as the "industrial district" (referring to the spatial concentration of many competitors, as well as important parts of their input supply structures), also suggested the importance of direct and unplanned contact between economic agents. In studying the textile districts of Lancashire, Marshall advanced two very different ideas about their underlying force. In some passages, he made much of the fact of local competition as the source of efficiencies deriving from spatial concentration. In other passages, he thought about the qualitative dimensions of this concentration, culminating in his famous observation that "the secrets of industry become no mysteries....they are....in the air." This has been taken to be an early recognition that geographical concentration leads to information spillovers that have something to do with technological innovations that heighten productivity, and hence the notion

that specialised agglomerations may have long-term technological advantages for the producers located in them, for some industries at any rate. This is a different story from that of Jacobs, in that it is the fact of specialisation and social belonging to a specialised community which socialises the "secrets" of industry, not the kind of diverse and haphazard city life described by Jacobs. Certainly, the -- now vast -- literature on specialised industrial districts suggests that Marshall was on to something (see, *inter alia*, Becattini, 2000; Crouch, LeGales, Trigilia and Voelzkow, 2001). Numerous attempts have been made to transform his notion into a theory of networks: people belong to industrial communities, and they share information through their membership in the community. The network seems overly restrictive as a theory of this process, however, because virtually all the voluminous and rich descriptive evidence suggests that sometimes people know each other in these places, but sometimes they don't, and that even when they do, they are often careful not to share information that could be directly pirated by their competitors. So, we are left with an interesting notion that begs a theory: what does "atmosphere" consist of, and how does it work, if it is not reducible to networks?

It is striking that none of the theories of technological or information spillovers in local space that we have reviewed thus far, with the possible exception of Jacobs, places face-to-face contact at the center of the problematic and Jacobs does not theorise it precisely. In all the rest, there is reliance on other kinds of mechanisms, such as circulation of persons between firms, or professional or customary networks of persons, or tacitness, which are then, respectively, the vehicle or architecture of information circulation, or the nature of the information itself. Assuming that these are important parts of the process, the theories still say virtually nothing about what these people do -- how they act -- when they circulate and come into contact, and why they do what they do. The central issue, face-to-face contact of people in regular physical proximity of each other, has been avoided.

It is this major missing element in the theory of agglomeration and urban growth today that we propose to explore and develop below. Moreover, we shall argue that it is not essential solely for accounting for certain processes of technological or knowledge spillover, but the ways an urban economy motivates the effort that can lead to specific kinds of innovation.

3. BUZZ: FACE-TO-FACE CONTACT

What is the economic usefulness of face-to-face contact, of being together? Table 2 attempts to summarise the key forces. The first two rows outline the advantages of speech as a communications technology. It allows a high frequency of communication that is not possible through other media. We refer to the fact that communication which takes place with face-to-face (henceforth, F2F) contact takes on many different levels at the same time -- verbal, physical, contextual, intentional, non-intentional -- and the way in which this is essential to the transmission of complex, tacit knowledge.

Searle (1969) and Austin (1962), in their notion that "language is behavior" provided the basis for showing precisely the limits of strictly conversational interactions: real dialogue, they suggest, is a complex socially-creative activity. Sociologists such as Goffman (1959) and Garfinkel (1987) have shown that all complex interaction involves a linguistic and visual "performance," which they liken to being on stage, playing a role, where the visual and corporeal cues are at least as important to knowing what is being "said" as the words. Following on these theorists, we want to argue that face-to-face communication derives its richness and power not just from allowing us to see each other's faces and to detect the intended and unintended messages that can be sent by such visual contact. Co-presence -- being close enough literally to touch each other - allows visual "contact" and "emotional closeness," the basis for building human relationships. F2F communication not just an exchange; it is a *performance*, where

speech and other kinds of actions, and context, all come together to communicate in a very complex way on many different levels at the same time. The second row refers to the advantages of F2F contact for the receiver. These are parallel to the sender's capacities, notably the parallel, analog ways of processing multidimensional information. But they affect not only intentional, deliberate F2F contact, as in relationships where people decide to see each other. These powerful tools are also available in the case of just "being there" in a random or semi-random fashion, around people and contexts that one bumps up against in a complex, diversified urban environment. In this sense, the receiving capacities that we have under these circumstances allow us to pick up on the "buzz," and to get out of network-dominated communication channels.

Table 2: "BUZZ" AND THE CITY

CAUSE	FUNCTION	EFFECTS	OUTCOMES
1: F2F performance: speech as rapid information exchange	Communicating/ Transmitting	Parallel sending of many kinds of information about message and sender's intentions.	Efficient communication under uncertainty, especially tacit knowledge
1: F2F performance: speech and body language	Understanding/ receiving/ observing	Decoding through parallel processing of many things and context	Acting or responding correctly under uncertainty when a message is intended.
2: F2F performance: incentives and verifiability	Coordinating/ Committing/ Aligning incentives	Co-presence is an investment of time = a forfeitable bond if relationship not pursued. Also, parallel processing about intentions = precursor to trust	Ability to trust and bond where messages and their content is inherently uncertain
3: Socialisation and screening. Producing and sharing codes.	Selection of partners	Signaling that one can judge allows one to "be in the loop." Once in the loop, one has to judge correctly, again	First-mover advantages in innovation and learning
3: F2F performance, display.	Motivating	"Rush:" Bio-physiological effects of competition, desire: generate more and better effort	productivity, creativity, inventiveness, energy

In the third row, we refer to the notion that with tacit knowledge there is always residual uncertainty and hence the need to minimise the incentives for one agent to free ride or manipulate the other. This can arise because of the reliability of the message itself, but it can also concern the degree to which the sender is committed to resolving uncertainty over time, in an iterative manner, through some sort of "commitment" to the relationship to the receiver. It can be developed either by aligning incentives, or by developing trust. F2F contact is a solder for this type of trust, because it represents a valuable investment with high opportunity costs, and it is much more difficult to be insincere F2F than it is in other forms of contact.

In the fourth row, we note what it is that permits individuals to enter into certain kinds of communicational processes in the first place: their identification of partners and their socialisation with those partners. We only spend time meeting with people who satisfy a range of criteria. Some of these are set by formal screening mechanisms (eg education) and others by informal screening mechanisms -- being 'in the loop'; the city has an important role in fostering these informal screening mechanisms. Related to these ideas is the concept of socialisation, central to sociological theory, and going well beyond economists' notions of human capital, screening, and selection. It refers to the production of the individual as a social being who belongs to a social world, who can signal to others that she belongs, and hence receive from others the rewards of belonging. Socialisation is inevitably produced in large measure through face-to-face contact, from family, schooling, and the social environment in one's community and in one's work life. Socialisation is a vast subject to which we cannot do justice in this paper. In economic sociology, socialisation is held to be central to the social activity of producing and sharing the "codes" by which particular kinds of social interaction can unfold (Coleman, 1990). Thus, it enables individuals to show that they have certain criteria of judgement, which in turn signal to others that they belong to a certain social world. Signaling that one can judge, in other

words, enables one to get into and stay "in the loop," and the exercise of these criteria of judgement enable one to know what is going on in that loop, what counts and what doesn't count.

Socialisation, then, is a likely key to moving into certain kinds of concrete contact networks; it is "upstream" of networks in a causal sense, and it is what allows certain individuals to get and use information in an innovative, first-mover kind of way. This argument emphasises social membership as the precondition for certain kinds of concrete interaction processes such as network membership.

The final effect of F2F contact, both intentional and random or anonymous, goes beyond communication itself. Psychologists who have researched pleasure have shown that it has a bio-physical life which is cyclical: it is a state of differentiation from the norm. Thus, when we achieve pleasure, it requires changing the state of perception and feeling from a previous state. Moreover, pleasure quickly recedes, because it blends into the previous state, once achieved. This can be easily grasped in thinking about the cycle of sexual pleasure, but also if one thinks about consumption, where the object of desire often creates a cycle of rising and then declining pleasure, and renewal comes through additional consumption or use (Scitovsky, 1976). The desire to be like what one sees and which gives us pleasure is a strong motivator, and this desire is at once imitative and, in some social contexts, competitive. F2F contact provides the strongest, most embodied signals of such desire. Buzz, in other words, is strongly motivating, in a sense which is psychological and bio-physical: it leads to the formation of desires and to the mobilization of effort to realize them. Buzz produces a "rush." It is no surprise that even with the sophisticated computer monitoring that can be carried out on employee performance today, that very few workplaces, as centers of F2F contact, have disappeared. It is not just that it is easier to monitor employees when they are present, it is also that such presence is motivating, because it contributes to desire, imitation, and competition, and the fear of shame from failure

(Scitovsky, 1976; Kahneman, et al, 1998).

In the remainder of the paper we analyse some of the themes in table 2 in greater detail. We start with the F2F as a communication technology (section 3.1). We argue that F2F contact is a particularly efficient means of communication under certain circumstances, such as when we need to form relationships with other able and hardworking people but cannot verify these attributes fully in advance, nor observe them directly. This leads us to look at selection of the in-group, the set of prospective partners with whom we choose to work, where F2F contact -- both through generalized 'being there' or buzz and through meetings, is the key communication technology for doing so. In section 3.2 we take up the idea that F2F is a mechanism that reduces the potential for free-riding and other incentive problems between partners, problems which are particularly in evidence when performance cannot be verified and observed.

3.1 Why people meet

3.1.1 F2F contact as a technology of communication:

Codifiable information has a stable meaning which is associated in a determinate way with the symbol system in which it is expressed, whether it be linguistic, mathematical, or visual. Generally speaking, codifiable information is cheap to transfer because its underlying symbol systems can be widely disseminated through information infrastructure, thus reducing the marginal cost of individual messages. Acquiring the symbol system may be expensive or slow (language, mathematical skills, etc), as may be building the transmission system, but using it to communicate information is cheap. By contrast, much information is only loosely related to the symbol system in which it is expressed. This includes much linguistic, words-based expression (the famous distinction between "speech" and "language"), particularly what might be called "complex discourse" (Searle, 1969). For example, one can master the grammar and the syntax of

a language without understanding its metaphors. This is also true for some mathematically expressed information, and much visual information. If the information is not codifiable, merely acquiring the symbol system or having the physical infrastructure is not enough for the successful transmission of a message. Bateson (1973) refers to the "analogue" quality of tacit knowledge: communication between individuals which requires a kind of parallel processing of the complexities of an issue, as different dimensions of a problem are perceived and understood only in relation to one another. Tacit knowledge can often only be successfully communicated as metaphor (Nisbet, 1969), but metaphors are highly context-dependent (Lakoff and Johnson, 1980). This is because though metaphors are rich, they also presuppose a great deal of common knowledge on the part of those who are supposed to understand them. Thus, the transmission of codifiable information has strong network externalities, since once the infrastructure is acquired a new user can plug in and access the whole network; by contrast, we shall argue, the transmission of uncodifiable information may have very limited network externalities, since the successful transmission of the message depends on infrastructure that is largely committed to one specific sender-receiver pair, and F2F contact is a critical such technology.

Moreover, F2F contact provides an efficient technology of transaction, in that F2F encounters provide a depth and speed of feedback that is impossible in other forms of communication. As organizational theorists Nitin Nohria and Robert Eccles (1992: 292) point out:

‘...relative to electronically-mediated exchange, the structure of face-to-face interaction offers an unusual capacity for interruption, repair, feedback, and learning. In contrast to interactions that are largely sequential, face-to-face interaction makes it possible for two people to be sending and delivering messages simultaneously. The cycle of interruption, feedback and repair possible in face-to-face interaction is so quick that it is virtually instantaneous.’

And sociologist Erving Goffman(1982) noted that "a speaker can see how others are responding to her message even before it is done and alter it midstream to elicit a different response.'

F2F contact is not just an efficient immediate technology of communication. It has long-term upstream effects on the ability to communicate itself: it socialises individuals, and hence gives them tools for signalling more efficient verification of the possible suitability of partnering. Such partnering requires mutual trust and mutual understanding. The parties therefore need to 'know' each other, or have a broad common background, acquired through socialisation, which precedes their direct contact, but whose characteristics are continuously verified through their direct contact. This notion has a long history in the social sciences, but it tends to be forgotten. Michael Polanyi (1966:4) noted that "we know more than we can tell," suggesting that tacit knowledge is deeply rooted in action, commitment and involvement in a specific context.

The distinction between codifiable and noncodifiable messages comes up implicitly in the economics literature on 'search' goods and 'experience' goods (Nelson,1974). A 'search' good has a transparent value, evident upon initial inspection. An 'experience' good has a nontransparent value that depends on the user and that is experienced slowly over time. Markets that match faceless buyers and faceless sellers can mediate the exchange of search goods, but the exchange of experience goods requires trust, understanding and in some cases, long-term relationships. Suppliers have an incentive to maintain quality only if they are not anonymous, but establish reputations with their customers. The question is then how reputations are established and how such experience transactions are realised, and once again we shall argue that direct human contact remains a critical form of their realisation.

3.1.2 How people meet: being in the in-group

This analysis suggests that F2F contact is going to be especially important for certain kinds of economic processes. Many professional occupations require partnership, often temporary, between individual workers. This ranges from a contractual relationship with a client to the informal relationship of co-authorship. The returns to the partnership depend on the ability and effort of both partners, yet typically these things cannot be observed directly. How can people increase the probability of forming partnerships with other able (and hardworking) people?

One response is the formation of professional associations, based on formal certification and some institutionalised screening mechanism, such as professional examinations. Where this is not possible (as for example in cases where the profession's performance criteria cannot be codified and hence institutionalised) an alternative is the development of an informal network: being 'in the loop' or in the in-group. People in the loop know who is in and who is out, and in-members can increase their probability of success by pairing with other in-members.

What is the informational basis of such a group? Where screening and certification of individuals' ability or effort is not possible there has to be open (although not necessarily costless) membership to all. However, members are then able to observe the success or failure of projects that are undertaken, and can use this to judge members and as a basis for their possible exclusion from the group. Crucially, the in-group must be small enough that members cease to be anonymous and an excluded member is known to all other members. Someone who has been excluded from the group cannot in future pass him or herself off as a member: the threat 'you'll never work again in this town' has force.

In some professions this information structure can be maintained across wide distances. Academic professions (perhaps above all others) have national or international in-groups,

members of which are continually judging each other, and membership of which is conditional on continuing success. In other fields, we think that such an information structure can only be maintained across a restricted geographical area. In such fields as fashion, public relations, and many of the arts (including cinema, television, and radio), though there are international networks 'at the top,' in the middle of these professions, networks are highly localised, change rapidly, and information used by members to stay in the loop is highly context-dependent. In parts of the financial services and high technology industries, local networks intersect with long-distance contact systems. In almost anything relating to business-government relations, networks have a strongly national and regional cast. Even in the internationalised academic world, there are localised nodes of interactions within universities, and within internationalised networks: these are people who come together to brainstorm, open up new questions, carry out pre-paradigmatic research, develop new directions. All of these kinds of activities require 'in groups,' (which may be temporary), where competence is high. By examining the ways such an in-group forms, we can then realise how important a technology of communication such as F2F contact would be to such group formation.

It is worth sketching a model of group formation. Suppose that there are two types of workers, high ability and low ability. They all enter the labor market, and make a progress through it until eventually retiring. In the labour market they can be members of the 'in-group' or outsiders, indicated by the circles I and O on Figure 1. The figure indicates that proportion λ of the population enter as insiders, and $1 - \lambda$ outsiders, although we can start by thinking of λ as equal to one -- everybody initially wants to be in the group.

When workers are in the group, what happens? They form partnerships to undertake joint projects, and they do this not knowing whether their partner is high or low ability. The project is undertaken and the probability of it succeeding or failing depends on the ability of the partners,

success most likely if both partners are high ability and least likely if they are both low ability. Crucially, success or failure is observed, and partners in a failing project are expelled from the in-group with probability γ . They continue to work and to make matches, but not with in-group members. Expulsion means expulsion for life, precisely because being in the group means that anonymity is forfeited. People in the group know that they are to be judged on the basis of the success of their projects, and possibly branded by the failure of any project they undertake.

Failing projects will lead to the ejection of both low and high ability people from the group, although (because projects with low-ability partners are more likely to fail) relatively more low than high ability people are ejected. Consequently the labor force splits into two distinct groups -- the insiders and the outsiders. The average ability of the members of the in-group is higher, as are their expected incomes. In present value terms, high-ability insiders are the best off (high current income and low probability of future ejection) followed by low-ability insiders (high current income but higher probability of future ejection), followed by outsiders (low income because even high ability outsiders match, on average, with low ability partners).

This simple structure can be enriched by adding further choice possibilities for individuals. The first is to let people choose how much effort to put into the success of the project, consistent with Table 2, which suggests that F2F contact is essential not only to information exchange, but to imitation, motivation and hence effort. Effort is costly, but yields two sorts of payoffs. One is that it increases the probability that the project is successful, and thereby increases income from the project; we can assume that this is of the same value for all workers. The other is that by increasing the likely success of the project it also -- for members of the in-group -- reduces the probability of expulsion from the group. Since earnings in the group are higher than outside, this is valuable, and will lead to members of the in-group working harder than outsiders. Furthermore, the present value of being retained in the group each period is

generally greater for high ability people than low ability. (Because low ability people are more likely to find themselves ejected in future, regardless of their current effort level, it is less worthwhile for them to exert effort). We therefore see that allowing choice of effort means that insiders work harder than outsiders, and amongst insiders it is the high-ability that work hardest.

A further dimension of choice is added if initial membership of the in-group is costly, as it will be if it involves moving to a high-cost location, or investing in learning the rules and conventions of the in group. In this case not all individuals will seek membership of the in group (so $\lambda < 1$). However, even if the costs of membership are the same for high and low ability individuals, it will generally be the case that entry will be biased towards high-ability individuals -- precisely because, as we have already seen, the present value of membership is higher for these individuals.

Both effort and entry costs have the effect of further refining in-group membership, making it more elite. Differential effort input means that failure and ejection becomes more biased towards low ability individuals, and entry costs mean that fewer low ability individuals enter in the first place. Because of this, incumbent insiders will welcome opportunities to work harder -- explaining perhaps the culture of long hours in many professional activities. They will also welcome -- up to a point -- entry costs; although everyone pays them, high ability individuals may benefit from them as low ability types are screened out.

This simple model structure therefore illustrates how the absence of prior information about ability can lead to a segmented labor market based on observed performance. But what determines whether or not individuals are ejected when their project fails -- the parameter γ we referred to above? There are two issues, one to do with the desirability of ejection, and the other to do with its technical feasibility of ejection. From the point of view of high-ability incumbents raising γ is generally desirable; although even these people face some probability of involvement

in a failing project, the cost of this is outweighed by the benefits of ejecting others and refining the group. As we have already suggested, the technical feasibility of ejection depends on individuals forfeiting anonymity. If a failure can immediately re-enter the in group (the same one, or an equivalent in another location) then no selection occurs and groups do not form. This, we suggest, is the importance of F2F contact. Part of the buzz of the city is judging, and putting oneself up to be judged. Judgement matters as group members cease to be anonymous: if you have been observed to fail then group members will no longer seek to match with you and (with probability γ) you are permanently branded an outsider. The magnitude of γ is, in many activities, inherently spatial. In a faceless and anonymous world $\gamma = 0$, and in-groups cannot form. F2F contact removes anonymity and, by raising γ , creates the possibility of group formation.

In summary then, F2F contact, by removing anonymity, raises the probability of good, step-by-step iterative judgements about the abilities of others, where we cannot know exactly how able or hardworking they are in the beginning; it also makes individuals better at learning how to signal to others what abilities and effort levels they have; it provides a vehicle for making this information transparent in a low-cost way; but it also permits, in previous rounds of F2F contact, certain people to join and stay in. Thus, at any given moment, the ex-ante and the ex-post revelation of information blend in an unending circle of (1) joining-staying in or being ejected-better project completion, leading to (2) old members! new joiners! better project completion; and so on.

3.2 Trust and incentives in relationships:

3.2.1 Incentives, verifiability and trust:

Humans are very effective at sensing non-verbal messages from one another, particularly

about emotions, cooperation, and trustworthiness. Robert Putnam (2000:175) notes that ‘it seems that the ability to spot non-verbal signs of mendacity offered a significant survival advantage during the course of human evolution.’ Psychologist Albert Mehrabian (1981:iii) notes that ‘our facial and vocal expressions, postures, movements and gestures,’ are crucial; when our words ‘contradict the messages contained within them, others mistrust what we say -- they rely almost completely on what we do.’

Any message may be understood but not believed. There are strong questions of intentionality at work in communication. Knowing what the intentions of another actor are enable us to decode the practical consequences of what they are expressing to us (Husserl, 1968). Speech and action are tightly interrelated, but speech does not automatically reveal to us what another person intends to do (Searle, 1969). The credibility of a message thus often depends on mutual trust. Trust in turn depends on reputation effects or on multi-layered relations between the parties to a transaction that can create low-cost enforcement opportunities (Gambetta, 1988; Lorenz, 1992). Trust can be substituted by enforceability through internalization, but the latter cannot solve the problem of ambiguity, i.e. when complete contingent contracts are impossible (Williamson, 1985).

Trust also comes from the bonds that both parties establish to guarantee the truthfulness of the message. One important economic bond is the time and money costs of co-presence (schmoozing), which can far exceed the direct costs of sending the message. These costs, like advertising expenses (Klein and Leffler, 1981), amount to a forfeitable bond that enhances the validity of the message.

Also like advertising, there is a special incentive to continue to invest in the relationship in order to maintain the value of the relational asset that was created by earlier encounters (absent the second date, the value of the first date disappears). This will encourage the formation of

relatively few long-lasting deep relationships as opposed to many fleeting shallow ones.

To create a relationship bond, the costs must be substantial and transparent. E-mail, paradoxically, can be so efficient that it destroys the value of the message. The e-mail medium greatly reduces the cost of sending a message, somewhat reduces the cost of receiving the message, and it makes the costs mostly nontransparent. The low costs and the nontransparency greatly limit the value of the relationship bond. A return receipt only means that the recipient has opened the message, but the sender cannot be sure that enough attention has been devoted to it to absorb the content. Thus, for complex context-dependent information, the medium is the message. And when this is the case, the most powerful such medium for verifying the intentions of another is direct F2F contact.

3.2.2 F2F contact in joint projects as a means to overcome incentive problems

A joint project generally involves many stages. Typically the later stages -- writing the report, constructing the building or executing the transaction -- involve codifiable information. It is the earlier stages where information is more fluid. Is the project a good idea? Should one approach be followed or another? Answering these questions involves partners in the project undertaking research (possibly just thinking) and then sharing their results. Often neither the inputs (thought) nor the output (assessments) of this research are observable. A partner can conscientiously research the project, or simply free-ride, hoping that other members of the team will have done the work. In this section we investigate some of the incentives that are present in this situation, and discuss ways in which F2F might improve outcomes.

Suppose that two people are considering undertaking a joint project, the quality of which they are uncertain about. The project may be good or bad, and individuals share the same prior probability ρ that it is good. At the first stage they can independently undertake research and

obtain a signal of whether the project is good or bad. The signal obtained by player i may be favorable, g_i , or unfavorable, b_i . However, the signals are not accurate. The probability that a good project sends out a favorable signal is γ (so with probability $1 - \gamma$ it sends an unfavorable signal); for a bad project the probabilities of favorable and unfavorable signals are β and $1 - \beta$ respectively. If the players exert no effort then $\beta = \gamma$: the research is completely uninformative as a bad project is just as likely to get a favorable signal as a good one. However, we shall assume that an individual's research effort can reduce β , the probability that a bad project sends out a favorable signal. Denoting individual i 's effort e_i gives $\beta_i = \beta(e_i)$, $\beta'(e_i) < 0$.

At the second stage of the game players meet and truthfully reveal their signals. Using standard Bayesian techniques they compute the probability that the project is good; this probability is higher the more good signals have been received and the more effort has been expended (reducing the probability of getting a good signal from a bad project). They then decide whether or not to proceed. Proceeding further costs C and yields payoff A if the project turns out to be good, and zero otherwise; we assume $A\rho = C$, so (prior to research) the project yields zero expected surplus.

The basic logic of this game is illustrated in figure 2. The axes are the effort levels of the two players, and the lines OA and OB divide the space up into three regions. Between OA and OB effort levels are such that players will, at the second stage, choose to go ahead with the project only if they have both received good signals, $\{g_1, g_2\}$. However, below OB player 1 is putting in so little effort relative to player 2 (and hence 1's signal is so unreliable) that they proceed if 2 has a good signal and 1 a bad one $\{g_2, b_1\}$. Similarly, above OA they proceed with signals $\{g_1, b_2\}$. The curves labelled EU_1 are expected utility indifference curves for player 1, increasing to the right. These have kinks where they cross lines OA and OB, and the best response function for player 1 to each effort level e_2 is given by the bold solid lines, $e_1 = R_1(e_2)$.

We see that if e_2 is very low, then player 1 will ignore 2's signal and put in a constant amount of effort (in the region to the left of OA). Conversely, if e_2 is high enough, player 1 will free-ride, putting in zero effort (in the region below OB). At intermediate levels of e_2 player 1 puts in a positive level of effort, decreasing in e_2 . Just as the solid bold lines are the best responses of player 1 to 2's effort levels, so the dashed bold lines (their reflection around the 45° line) give the best responses of player 2 to 1's effort levels.

What are the equilibrium outcomes of this game? As illustrated in figure 2, there are three Nash equilibria, labelled E_S , E_1 and E_2 , occurring where the best response functions intersect. E_S is symmetric, in the sense that it involves both players putting in equal amounts of effort. E_1 and E_2 are equilibria where player 1 (respectively 2) exerts no effort; but given this, it is privately optimal for the other player to put in effort to the level illustrated. At these equilibria more projects are undertaken and the proportion of failing projects is larger than at E_S (although expected returns are of course positive). The game has a similar structure to 'chicken'², both players would like to do nothing, but if both do nothing then no effort is undertaken and there is consequently no expected surplus from the project.

As there are many equilibria, what can be said about which will occur? One standard way of resolving this issue is based on randomization. Each player assigns a probability to playing each of the equilibrium effort levels and then chooses randomly; equilibrium values of these probabilities can be computed. Thus, randomization between E_1 and E_2 gives a mixed strategy equilibrium with positive probabilities that both players put in effort, that just one does, or that neither do. Although there are some situations where randomization and mixed strategy

² Named after the game in which two Californian kids drive towards each other. The last to swerve is the winner.

equilibria are intuitively compelling (eg when the same game is played repeatedly) this does not seem to be the case in the present context.

An alternative resolution might be based on preplay communication between the players. One possibility is that one player is able to signal first, and credibly, that he will put in no effort: the other player accepts this as a given, and consequently does the work. The problem with this is, of course, that both players want this first mover advantage; but if neither does any work no information is revealed and there is no surplus from the project. An alternative is that they find a way of coordinating on one of the equilibria -- most naturally the symmetric one, E_S . A F2F meeting may be one way of achieving this coordination. It is quite difficult to go into a meeting maintaining a commitment to put in no effort. This is partly because of the inherent simultaneity of the meeting: the two players are placed in a situation where neither has a mechanism to commit to doing no effort. And it is partly because of the psychological effects of F2F contact; participants want to be held in esteem by others and this is likely to be fostered by cooperation rather than conflict. With F2F it is thus difficult for one player to maintain the position that he will put in no effort and free ride on the other.

A third resolution is found if we add an intermediate stage to the game. In the game above the first stage was individual research and the second stage the sharing of results and decision whether or not to incur the cost (C) of proceeding with the project. Now, suppose instead that players, after they have done their private research, have to decide whether or not to attend a meeting. Attending the meeting has a real cost and, crucially, they make the decision of whether or not to attend on the basis of their *own* information: it is in the meeting that information is shared and the decision on whether or not to go ahead with the project is taken. How does this change the situation? If the meeting cost is high enough then players that have done no research (as well as those who have received an unfavorable signal) will not find it

worthwhile to attend the meeting. This means that points E_1 and E_2 cease to be equilibria. Doing nothing is no longer privately profitable, because you have to pay a cost (that of attending the meeting) before you find out your partner's information; the cost is not worth paying given your original information. The situation is as illustrated in figure 3. Best response functions now have a single intersection at point E_S where both players are putting in positive effort levels. The meeting therefore reduces the set of equilibria to the unique one at which both players put in effort.

This analysis, while highly stylised, formalises two different possible roles that meetings may have. One is as a form of preplay communication to coordinate on one of the possible equilibria. The other is as a way of increasing the cost of free-riding; a player who makes no effort will not find it worthwhile attending the meeting, so cannot make a positive return from the project.³

3.3 The role of buzz

We have established that F2F contact is important at many stages in the game of coordination under informational and effort uncertainty: as a key element of the socialisation that in turn allows people to be candidates for membership in 'in groups;' in actually getting into and staying in such groups; and in overcoming potential problems of incentives. Many of these moments are urban, especially when projects are constantly forming via selective pairing of members of in-groups, and where there is constant selection of outsiders into the in-group,

³ Notice that we have not assumed that the meeting can agree upon and enforce the optimal work program; enforcement is impossible because effort is unobservable. A meeting plays the role of narrowing the set of *equilibrium* (self-enforcing) outcomes.

through socialisation and initial performance.

Physical co-presence is vital to knowing what to look for, how to identify it, and what to do with it. The force of this type of F2F contact is what we shall call the "buzz" of the city or the agglomeration. Buzz, as we shall now define it, incorporates the upstream conditions of knowing what is happening; intentional face-to-face contacts; and unintentional or more diffuse face-to-face "rubbing elbows," or the force of "being there." Thus, buzz is much more than the "circulation of information," or participation in "networks." It is, respectively, what enables the first to happen, and the way that the second functions.

4. THE DYNAMICS OF BUZZ, CODIFICATION AND AGGLOMERATION

The emphasis on buzz -- indeed on the city in general as a site of immaterial linkages -- might seem paradoxical to some, since just at the time when we are emphasising the importance of face-to-face contact, the advent of broad-band internet communications would appear, finally, to provide us the means to avoid it. There is no question that the Internet has enabled certain kinds of complex communication to occur at a distance which were previously constrained by proximity (Leamer and Storper, 2001). At the same time, however, such infrastructure improvements as the Internet, air travel, and reduced transportation costs in general actually increase the demand for communication that requires face-to-face contact.

Indeed, the history of economic geography is in many ways one of coordination over space which is strongly shaped by two opposing forces:

(1) The constant transformation of complex and unfamiliar coordination tasks into routine activities that can be successfully accomplished at remote but cheaper locations. (e.g. commodification), and thus an ongoing tendency toward deagglomeration or dispersion of production. This is reflected in the codification of information, stabilization of meanings, and the

reduction of incentive problems (opening up the possibility of more complete contracting), so that less F2F contact is needed.

(2) Bursts of innovations that create new activities requiring high levels of complex and unfamiliar coordination tasks. By increasing reactivity to the market and by cheapening relationships upstream in commodity chains (and inter-industrial relationships in general), cheaper transportation and communications tend to initiate new product cycles and interrupt old ones. Newer products and services mean more uncertainty and generate a demand for F2F contact in the way we have analyzed in the previous section. They generate a demand for new ‘loops,’ the unstable meanings that require F2F contact for parallel processing, overcoming incentive problems, and showing how one can perform. Thus, these relationships are highly dynamic: newness and uncertainty are always under pressure from the tendency to deepen markets, increase scale, codify information and hence stabilize the conditions under which economic agents coordinate with each other. This opens up the possibility of deagglomeration. These broad lines of development have many intermediate stages, characterized by hybrid forms of information and communication, and complex geographies which blend agglomeration and dispersion. Building on the three principal moments in the communication process which we have analyzed above (meeting; becoming a member or getting ‘in the loop;’ investing and performing in the relationship), we can suggest some of these:

1. Where the knowledge is highly random, because it is partially public, rapidly changing, and its applications are highly diverse. Much interaction occurs in pre-project terms, or true innovation. This is where buzz is most critical. People agglomerate in order to become part of the buzz, the milieu, to be socialised, to get the right clues, and hence to become part of the loop.

2. Where there are projects or institutionalized interactions, but these projects are highly innovative and subject to high degrees of uncertainty, or in markets characterized by pervasive uncertainty and incompleteness: people get together to engage in parallel processing of highly complex and uncodified information, and to establish trust and commitment, in the face of incomplete representations of the project and its payoffs. There is a 'milieu' -- that is, there are members of a loop who know each other -- characterized by 'secrets in the air.'

3. Where there are disciplines and fields, and organizations that correspond to efforts to perform in these fields. Trust and commitment usually exist up to a point (credentials, reputation effects, etc) these people are both in informal loops and in organised networks. But parallel processing is still necessary, and so is reaffirmation of the commitment to the project, which is risky. Still, interactions can occur through network interactions at a distance and through occasional planned F2F contact (Nohria and Eccles, 1992).

4. Where there are more definite projects, payoffs can be better estimated, there are more routine interactions, such as work teams and workplaces. Why do people get together here? To maximize the benefits of parallel processing and potential randomness (the hallway or lunchtime conversation). The trust and incentives are already established by the organisation.

Nonaka (1994) advances the notion of an organizational dialectic between tacit and codified knowledge, in which he refers to different stages in interactions in the firm, something like those we have outlined above. Like the product cycle, we suggest that there are distinctive geographies to each stage (though we do not suggest they necessarily follow one another) in

knowledge development and its associated communicational structures. The geography of the relationships listed above should involve successively lower degrees of agglomeration, from 1(highest) to 4 (lowest). The informal buzz milieu (1) is most agglomerated and urbanised; project-by-project or 'milieu' interactions (2) are somewhat less, and may exist in specialised production regions more than big cities; networks, often at a distance, but consisting of persons who have been tested for admission to the 'loop' through the first two steps (3), have a complex and nested geography of nodes and linkages; and, finally, there are workplaces and extended contact networks (4). This might also be thought of capturing something like the 'cycle' for knowledge, communication and contact, from extreme tacitness and proximity to less and less tacit and offering the possibility for other geographies of contact. A further, fifth step would cross the 'threshold' into codification of knowledge and open up many other locational possibilities as deagglomeration becomes feasible.

5. BUZZ AND F2F CONTACT VERSUS OTHER TYPES OF COORDINATION

Buzz and F2F contact are, as we noted earlier, one of several reasons for agglomeration, and of course there are many environments in which agglomeration is not economical. Table 4 shows that there are six principal means of coordinating economic activities, in view of the kind of knowledge that needs to be transacted within the activity at hand, and in light of its external environment. By external environment is meant the size and stability of the input and output pools that are drawn upon. For example, where large numbers of what is needed are always available, the environment for procurement is effectively stable; the same is true of markets for outputs. In the second and third rows we find two kinds of less stable environment, according to the classical distinction established by Frank Knight (1921): fluctuations which are amenable to some kind of statistical estimation or prediction, which he called "risks," and those which are not,

which he called true "uncertainty."

Notice that the reasons for agglomeration which were identified in Table 1 all appear in Table 4: search and matching under numbers uncertainty; search and matching because of specialisation-induced uncertainty; and limited numbers network processes. The distinctiveness of buzz as a mode of coordination can be seen in that buzz is advantageous when knowledge is tacit and the environment is highly uncertain. It may supplement other modes of coordination when those other modes exist, as for example when specialised urban labor markets function via large numbers matching processes, but where the pooling effect (with circulation of profession-based information) is the primary reason for agglomeration. Table 4 shows when buzz is the primary form of coordination of an economic process (not when it is uniquely present).

Table 4 MODES OF COORDINATION

Environment of Coordination:	Knowledge used in coordination		
	TACIT	CODIFIED	UBIQUITOUS/ TRANSPARENT
MASS: LARGE NUMBERS	Networks	Bureaucracy	Anonymous markets; Ordinary society
RISK: PREDICTABLE FLUCTUATIONS	Specialisations: large numbers search/ matching	Large numbers search/ matching without specialisation	
REAL UNCERTAINTY	"Buzz." Interpersonal relations		

Two additional modes of coordination emerge in Table 4: bureaucracies (i.e. organisations such as firms or States), and markets. These are not among the modes of

coordination identified to explain the force of agglomeration. Neither bureaucracy nor fully-functioning markets have high requirements for geographical proximity of the agents who coordinate. In the latter case, the ubiquity of the information necessary, and the large numbers of demanders and suppliers, make possible long-distance transactions between the agents in the system. Bureaucracies are generally used to coordinate when there are sufficiently large numbers of inputs and outputs to offset the overhead costs of bureaucratisation, and when the information needed to coordinate among agents can be codified.⁴ Both of these characteristics lend themselves to the geographical stretching out of relations between different bureaucratic units or between producers and their clients/markets. The demands for proximity between agents of each mode of coordination are shown schematically in Table 5.

Table 5

PROXIMITY REQUIREMENTS OF DIFFERENT MODES OF COORDINATION

Bureaucracy	Low
Networks	Medium
Search/matching under numbers uncertainty	Medium
Search/matching because of specialisation	High
Anonymous markets	Low
Buzz	High

⁴Although certain State bureaucracies operate, in reality, through highly changing and politicised contact networks, in which case it is not the formal bureaucratic rules which are dominant, but being in the loop (Crozier, 1964).

6. BUZZ CITIES, OTHER CITIES

Any given city is likely to reflect some combination of the forces of agglomeration, according to the mix of sectors comprising its economic base. All agglomerations are not alike: there are different things going on in each of the different agglomeration processes within the contemporary city, just as the ways that economic activity is coordinated within agglomerations (via the four main processes underlying agglomeration that we have identified here) and how it is coordinated in other kinds of territories (bureaucracies and markets), give fundamentally different casts to these economies and their dynamics.⁵

A distinction is commonly made between cities with specialised as opposed to functional agglomerations. Functional agglomerations consist of pieces of different sectors, but which rely on common input structures and may have common clients. Buzz is not present uniquely in the biggest and most diversified and tertiary cities, though it is strongest in them. But cities with specialised agglomerations may have buzz as well, as in the cases of specialised industrial districts, where an industry depends on informal communication to achieve certain kinds of innovation. This buzz is likely to take a different empirical form from that found in the largest cities, in that it has a strong interpersonal relations or ‘organised milieu’ component. It differs from the organised network phenomenon to be found in agglomerated high-technology industries, in that the protocols of scientific communication do not structure communications in these cases; it is interpersonal relations which do.

Not all specialised urban agglomerations have buzz, however. As we have stressed,

⁵In addition, this focus on agglomerative forces should not blind us to the other reasons why cities continue to exist: the locally-generated demand for goods and services consequent upon the concentration of population (due to agglomeration) gives cities a strongly self-reproducing existence, and the historical path-dependencies of prior external economies which are hard to break down, even when -- were the world to start with a *tabula rasa* -- other locational patterns would be optimal.

there are agglomerations that exist primarily as large number search and matching systems, where buzz is likely to be a secondary aspect of their existence. This could, by the way, be true for certain large cities as well, which may simply function as a collection (created by historical accident of locational overlap of several activities in the same place, but with few functional interconnections among them at the local level) of large number search and matching systems. Certain large American cities such as Philadelphia come to mind, in contrast to Chicago or New York or Los Angeles. Philadelphia is a set of large, overlapping high turnover factor markets ; New York is these as well, but is a buzz city. Paris is something like a combination of Philadelphia and New York in this regard (Veltz, 1996).

Still, the major contemporary "buzz" cities are more and more oriented toward the kinds of activities which the Internet and other transportation and communications improvements make more and more reactive and whose outputs are more and more differentiated. The larger and more globally-linked metropolitan areas are enjoying stronger economic growth than the economy in general, as they reinforce their positions as centers of inventiveness, creativity, the management of non-standardised transactions and parts of production chains, i.e., the functions that steer and guide an increasingly elaborate division of labor in modern capitalism as a whole. The economies of these central places are increasingly comprised of core agglomerations of (a) creative and cultural functions (including industries linked to this, such as fashion, design and the arts); (b) tourism; (c) finance and business services; (d) science, technology and high technology and research; and (e) power and influence (government, headquarters, trade associations, and international agencies). They contain various mixtures of the four principal forces for agglomeration identified here, but above all, they've got the buzz because they are big enough to concentrate a certain number of sectors, all of which require F2F contact. The synergies between these activities -- synergies which operate through buzz -- confer important first-mover

advantages on their participants and generate economic rents. This is one of the reasons why, even if the biggest cities do not have overall growth rates that are above economy-wide average and, in spite of their high congestion and living costs, they continue to generate real incomes that are significantly above economy-wide averages. This is one of the principal reasons why agglomeration continues to have such force.

Appendix:

Parameter values: $A = 150$, $C = 50$, $\rho = 1/3$, $\gamma = 0.8$, $\beta_i = (\gamma^{-2} + e_i)^{-0.5}$.

Probabilities are all computed by Bayes theorem.

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