



Infrastructure
Canada

**LINKAGES, INFRASTRUCTURE, AND THE FUTURE
OF CANADIAN COMMUNITIES, LARGE AND SMALL:
A FRAMEWORK FOR ANALYSIS**

Mario Polèse
INRS Urbanisation, Culture et Société
Université du Québec

Prepared for

**Building, Connecting and Sharing Knowledge: A Dialogue on
Linkages Between Communities**

March 3, 2005

Mario Polèse

INRS Urbanisation, Culture et Société
Université du Québec
Montréal, QC, H2X 2C6

mario.polese@ucs.inrs.ca

Linkages, Infrastructure, and the Future of Canadian Communities, Large and Small: A Framework for Analysis

Introduction

The purpose of this paper is to propose a framework for analyzing linkages between Canadian communities, building on two papers (Reimer 2005, Simmons 2005) presented at the Structured Dialogue on “Building Connecting and Sharing Knowledge: A Dialogue on Linkages Between Communities”, organized by Infrastructure Canada in conjunction with the Canadian Policy Research Network (CPRN), Ottawa, March 3rd 2005.

Although starting from different perspectives, Reimer (2005) and Simmons (2005) come, on the whole, to similar conclusions. The Canadian economy, population, and the linkages that accompany them, are continuing to polarize around the largest urban centres, with the concomitant risk that small distant communities will be increasingly marginalized. To quote Simmons (2005: 3) “...the structure of contacts is shifting up the urban hierarchy”. Understandably, Reimer (2005: 8) is concerned about the observed trends; his is in part an advocacy approach in support of rural areas: “...we need a framework that does not marginalize rural and remote communities...”.

An abundant literature exists, confirming the trends observed by Reimer and Simmons (Bourne 2000, Bourne and Simmons 2003, 2004, Coffey 2004, Polèse and Shearmur 2002, Slack *et al* 2003). Analogous trends are observable in other nations with geographies similar to Canada’s (Ausstat 2000, Forth 2000, Hanell *et al* 2002). There can be little doubt that these are deep-rooted trends with strong structural foundations. Spatial concentration has accelerated in Canada in recent years. In this paper, I shall attempt to explain why, drawing often on the concepts and theories of regional economics, which will in turn allow me to suggest the outlines of an analytic framework for thinking about linkages and communities. Regional economics stresses the role of space (distance /proximity) in human relations. Reimer (2005: 8) concludes, “...*density and distance still matter...*” (his italics). I agree, but rewrite this to read that *density and distance matter more*. Why I make this statement will, hopefully, become clearer as I proceed.

Before I do so, a disclaimer is in order. This paper deals only with linkages between spatially separated communities. Linkages within urban areas, between neighbourhoods for example, are not considered. That is not to say that such linkages are not important. They are. However, they raise an entirely separate set of issues related, for example, to urban planning, public transit, environmental impacts, and the social cohesion of cities. As such, they draw on a different literature and on different theoretical foundations. That being said, I now return to the subject of this paper.

An Economy Increasingly Reliant on Face-to-Face Linkages

Figure 1 illustrates structural shifts in the Canadian economy over three decades¹. As in other industrialized nations, the most rapid growth has been in services, specifically in scientific and technical services, professional services, and entertainment and leisure related services. Growth has been especially fast in the first class, an almost tenfold increase in employment. What do these sectors have in common? They rely heavily on face-to-face contacts and direct human interaction. Why the need for face-to-face linkages? Simply, because these are often ‘creative’ activities (to use a currently fashionable term) with a high knowledge content, where spontaneity, imagination, and informal contact play a major role in determining productivity. At another level, the need to establish and reinforce trust, especially for the most information sensitive activities (R&D, investment...), also fuels the demand for face-to-face linkages.

The obvious question is: why has IT not reduced the demand for face-to-face linkages? Should not e-mail (an electronic linkage) reduce the need to meet? The impact of IT is, it seems, quite the opposite. IT, it would appear, *increases* the demand for face-to-face linkages. Gasper and Glaeser (1998) argue that electronic and face-to-face linkages are complements, not substitutes. People who regularly communicate via e-mail will, eventually, have to meet. In other words, IT has fuelled a new demand for face-to-face linkages. The same thing happened, Gasper and Glaeser point out, a century ago with the introduction of the telephone. The evidence appears to bear them out. Never has the demand for business air travel (9/11 notwithstanding) risen so fast as in the last few decades. This also sheds light on an apparent contradiction. While linkages increasingly occur over greater distances (a point noted by Simmons), suggesting a weakening of distance, the locations via which such linkages occur are increasingly polarized, suggesting a strengthening of distance. IT linkages have become largely ubiquitous (at least outside the poorest nations and regions) generating *distance-insensitive* electronic linkages, but which need to be complemented by *distance-sensitive* face-to-face contacts.

The most rapidly growing sectors of the economy are generally producer services; that is, intermediary inputs into the production process. This is certainly the case for most scientific and technical services. In other words, the production of goods (manufacturing) is increasingly linked to a set of services that rely on face-to-face linkages (see also section 4). This change in the structure of production will continue as the knowledge content of manufactured goods grows. The growth of marketing and of direct investments over large distances (financial linkages) has a similar impact. Managing a plant at a distance is facilitated by IT, but must be backed up by meetings between management, technical and marketing people at both ends.

In sum, electronic linkages, production linkages, trade and investment linkages, and face-to-face linkages are often interdependent. Growth in one will fuel the other. In an economy where the knowledge and the creative content of products (goods and services) are growing, often marketed over great distances, we should expect the demand for face-to-face linkages to grow.

¹ A word on data. The figures in this paper draw on a data bank housed at INRS in Montreal, based on special Statistics Canada tabulations, developed initially with William J. Coffey (Université de Montréal) and more recently with Richard Shearmur (INRS). Industrial classifications are standardized over time, compatible with NAICS codes. All geographies (boundaries) are also standardized over time.

Face-to-Face Linkages Generate Cities

Cities exist, in large part, to facilitate face-to-face linkages. As the American urban economist R. Lucas (1988; 39) famously wrote: “What can people be paying Manhattan or downtown Chicago rents for, if it is not for being near other people?”. Why indeed would a firm choose to pay the high rents and wages of a location in Toronto, Montreal or Vancouver if it could avoid it? As figure 2 demonstrates, the propensity of scientific and technical service establishments (as measured by employment) to locate in the largest Canadian cities has not changed significantly over the last three decades². The reason, simply, is the continued reliance on face-to-face contacts.

The non-standardized nature of advanced services, with constantly changing demand, reinforces their need to be in large cities. One of the advantages of large cities is the diversity of potential contacts. Where else but in New York (perhaps Toronto or Montreal) is one likely to find a Portuguese-speaking accountant, versant in international trade regulations, qualified to practice in Brazil? For a consultancy wishing to bid on a World Bank contract, rapid access to such a person can be crucial. An advertising agency may need an opera singer one day, a symphony orchestra the next, and a whiz in computer graphics the following day. A research laboratory may need to bring in a variety of scientists on short notice. The entertainment industry relies on a broad range of face-to-face linkages: actors, screenwriters, musicians, technicians, producers, etc... coming together in ever changing combinations.

The relationship between cities and face-to-face linkages also operates at a second level. Thus far, we have referred to the range of face-to-face linkages between people living in the same city. It is easy to see that larger cities hold a clear advantage³. This advantage is compounded by the superior access that large cities also provide for distant face-to-face linkages. The polarisation of air travel-dependant face-to-face linkages is largely driven by the economics of air transportation, sensitive to scale economies. Only large markets with high volume can provide frequent cost-efficient service. Flights between Montreal and New York are far more frequent (and generally less costly) than between Montreal and, say, Rimouski. At the other end, the businessperson in Rimouski has no access to a direct face-to-face air-linkage with New York. He or she must spend more time and more money (probably flying over Montreal) to develop an active relationship with associates in New York. Little wonder, given the choice, that a Québécois establishment with close linkages with New York will prefer Montreal. For our friend in Rimouski, if the need for face-to-face meetings with New York associates grows beyond a certain point, the pressure to move Montreal may become irresistible.

The results on figure 2 for small peripheral communities (10,000 to 25,000 inhabitants) provide a useful demonstration of the continued pull of large cities. The location quotient for these

² The methodology behind figures 2 and 3 is explained in Polèse and Shearmur (2002, 2004). Simply put, central observations encompass all Canadian CMAs with populations over 500,000, plus all locations within an hour's drive. Peripheral observations cover all the rest. The vertical (Y) axis gives the location quotient for each group of observations, a measure of its relative strength in the given industry..

³ On this, let me quote from in a recent survey of New York in *The Economist* (2005: 6, 10): “Discourse and intercourse in the broad sense of that word- are the essence and the comparative advantage of New York” and (4 pages later) : ”...a design or a report can be e-mailed from anywhere; but a handshake, a lunch and look in the eye remain popular as foreplay”

communities drops sharply between 1971 (dotted line) and 2001 (column). This is a reflection of the end of the resource exploration boom (mainly petrol and mining) of the 1970's, largely concentrated in Northern Alberta and Québec. These industries employed a large number of engineers, geologists, etc..., but who left after the boom ended. Once the pull of resources subsided, the spatial distribution of scientific and technical services resumed its "normal" pattern, reflected in the systematic positive relationship (in 2001) between location quotients and city size⁴.

Linkages and Location

The concentration of producer services in large cities affects the location of other sectors, precisely because the consumption of these services depends on face-to-face linkages. Figure 3 is analogous to figure 2, but for medium value-added manufacturing, which includes electronics, machines, furniture, and transportation equipment (excluding aerospace). I chose this industrial class because it should be more 'footloose', while resource-based industries (paper mills, aluminium smelting...) will logically be drawn to resource locations and high tech industries more naturally drawn to large urban centres.

Figure 3 tells us that medium value-added manufacturing is, in relative terms, concentrated in small and medium-sized cities. The economic explanation for this has been admirably presented by Henderson (1997). Simply put, since such industries are important consumers of space and do not generally require a highly skilled labour force, they will seek out locations with lower land costs and lower wages. But figure 3 also tells us that these industries, given the choice, prefer to locate *close to (but not in)* a metropolitan area; this pattern, again, has not changed significantly over time. Once one moves outside the metropolitan realm, distance is a much more powerful predictor of industrial location than city size. The reason, in large part, is face-to-face linkages. Plants need to be in frequent contact with providers of producer services, generating a constant flow of face-to-face linkages between the plant and the nearby metropolis for technical, financial, marketing or other services. By locating within an hour's drive (more or less), the plant is, so to speak, "borrowing" the linkage advantages of the large city, but without actually locating in it. Compared to our friend in Rimouski, this provides a considerable advantage. Not only does the plant manager close to, say, Montreal have the freedom of driving there when he or she pleases (at fairly low cost and time lost), but he or she also has the use of the linkage infrastructures of Montreal. The economies of scale of the airline industry do not penalize him (or her).

In sum, distance matters, as we have argued elsewhere (Polèse and Shearmur 2002, 2004). I shall thus not belabour the point. However, this suggests that communities, although of similar size, live in different planets in terms of linkages, depending on where they are located. Communities close to a metropolis will have a different matrix of linkages than those far away. St-Hyacinthe (about 45 minutes from Montreal) may be about the same size as Rimouski, but its relations with the rest of the world are not the same. The crux, again, is the ease with which information-rich face-to-face linkages can be sustained. The same logic holds for other linkages sensitive to distance and the movement of people. It is no accident that a case of institutional collaboration

⁴ The slightly higher values, for the same city size, of peripheral cities over "central" cities (close to metro areas), reflect the central place role of the former.

between city and countryside, cited by Reimer (2005: 7), involves New York City and the nearby Catskills. By the same token, most successful large-scale tourist developments are within easy reach of a metropolis: Mont-Tremblant, Mont Ste-Anne, Whistler, Banff... Agriculture is no exception. The knowledge and marketing content of modern agriculture has also grown, favouring farms closer to large cities. It would be interesting to ask a farmer, within easy reach of Montreal or Toronto, how often he travels to the city, and to compare his (or her) linkage matrix with that of a farmer in rural Saskatchewan.

The Competition Effect of Improved Linkages

A basic tenant of regional economics holds that a fall in communications or transport costs (linkage costs, in other words) will generate competition between the locations connected, and will in turn foster the concentration of production (in one of the locations) if: a) production is subject to scale and/or agglomeration economies; b) one of the two locations holds an initial advantage. This economic “law”, when combined with the rise of face-to-face linkages as a production input, largely explains the trend to spatial concentration noted by Reimer and Simmons.

Geographic concentration is maximized when transport costs are nil or negligible and when the product in question (good or service) is very sensitive to scale and/or agglomeration economies. The entertainment industry, alluded to earlier, is a prime example. It is very sensitive to agglomeration economies, largely defined by its reliance on a diverse web of face-to-face linkages. But, this was also largely true in the past. What has changed is the cost of transporting the final product (sound, images...), which can now literally be transported free of charge over the air waves or by other electronic media. Video clips or CDs can be mailed at little expense. The result has been the decline of entertainment-related employment in small and middle-sized communities. One simply needs to turn on a Radio, TV or computer, where before one might have gone to a local cinema, show, or concert. The national news we watch on TV is produced in Toronto (if English) or Montreal (if French), where the jobs are located.

There are countervailing forces working against spatial concentration, among which high linkage costs. Resources still need to be exploited where they are found. The cost of transporting goods and people (precisely) remains high. Information linkages (verbal, written...) are sensitive to cultural and linguistic differences, which has hampered the (total) concentration of entrainment and broadcasting-related jobs in Toronto, as we have shown elsewhere (Polèse and Shearmur 2004a). To the extent that people want local news, it must be produced locally. Congestion costs are obstacles to concentration: traffic; housing costs; pollution; crime... However, in the Canadian case, we should not be too optimistic about the decentralising impact of congestion costs. Our largest metropolis (Toronto) is fairly unremarkable by world standards, barely a sixth the size of greater Tokyo and barely fourth that of greater New York. In sum, if linkage costs fall in the future, we can expect further concentration in and around large urban centres.

Improved linkages can, in sum, produce conflicting results. They bring communities closer, but they also increase competition. The rise of the automobile and of paved roads was largely responsible for the demise of small towns in rural Saskatchewan. Where before, residents shopped locally, they now prefer the nearest larger town, accessible by car. In more recent times,

IT and other innovations (i.e. bar codes, ATMs...) have accelerated the spatial concentration of jobs in finance, distribution, and marketing. Warehouses, outlets, and plants can now be more easily managed from the centre. The information highway goes both ways. It opens up big city markets to small distant producers, but it also allows big city producers to penetrate distant markets. E-commerce has had a devastating effect on many small town wholesalers. We cannot assume that improving linkages will necessarily have a universally positive effect. And, if I may be allowed a detour into sociology, closer proximity and new linkages may create better understanding, but they can also be a source of conflict, as anyone who remembers the Oka crisis and the more recent merger/de-merger debate in Montreal.

An analytic framework for thinking about linkages needs to address such conflicting impacts⁵. This will not be easy because the analytical tools are not necessarily available. From a policy perspective, this means choices for which there are no clear answers. Surely, more linkages are good, but then again...., which is why political boundaries exist, and why Canada is a federation and not a unitary state. As the saying goes, good fences make good neighbours. For some Canadian communities, already overpowered by a multitude of linkages, what may be needed are better fences.

Beyond the Rural-Urban Divide

Before concluding, let us see how all this plays out over Canadian space. On figures 4, 5, and 6, Canada is divided into four groupings of communities: Urban Central; Rural Central; Urban Peripheral; Rural Peripheral. The results show an ever-increasing divide between the fortunes of central and peripheral communities; that is, between those located close to and those far from a major metropolis. The divide starts to widen in the 1980's (note the difference between figures 4 and 5), basically marking the end of employment growth in resource-based industries.

The divide cuts across rural areas. It is not the urban/ rural divide that matters but where the community is. Rural areas close to large urban areas are prospering, for all the reasons explained in section 4, while those that are far are not. Stated differently, it is the relative facility of linkages with a metropolitan area that makes the difference. The discriminating factor is not IT (now fairly ubiquitous, as Reimer notes), but physical access to people. Central rural communities live in environments where not only can produce be brought to market more rapidly, but which also open up other options: a) year-round tourist developments; b) weekend homes and weekend tourism; c) new residents connected to the metropolis via telecommuting; (d) institutional service arrangements with the metropolis, such as those mentioned by Reimer (landfills, water...). Such options are far less available to rural communities located at some distance from a major metropolis. The first (lucky) group has, in essence, become an extension of the metropolis, connected to it by a multitude of linkages. One may well ask whether the farmer from Ste-Madeleine, Qc, who comes into the city every week to sell his produce and goes to suburban shopping malls is less urban than his Montreal counterpart.

Towards a Framework for Thinking about Linkages

⁵ Telemedicine, a godsend for many remote communities, provides another example of the conflicting impacts of new electronic linkages. As telemedicine expands, the need for doctors in remote locations will surely decline, fostering an ever-greater concentration of medical talent in the largest centres.

Building on the above, I suggest, as a first step, a template (figure 7) that positions communities along two axes: distance and size. Outside of the metropolitan core (about half the Canadian population), the four quadrants on figure 7 account for comparable population shares (given in %). The mix of linkages, priorities, and infrastructure investment concerns will be different for communities in each quadrant.

From a policy perspective, this way of looking at linkages allows us, for example, to identify areas of common interest; what we might call Functional Economic Areas (FEAs)⁶. Thus, communities in quadrant A and C, rural and urban, share many linkages, and might be viewed as a whole for the purposes of infrastructure planning. Communities in quadrant C (rural and urban), linked to A via land linkages, will benefit from infrastructure improvements in A in air-travel, ports, and distribution facilities. I have used a 500,000-population threshold to identify the urban cores of FEAs. However, depending on the policy objectives, the threshold could be lowered to 250,000 or even 100,000 (to include urban areas such as Saskatoon, Moncton, and Halifax). The challenge remains the ‘open spaces’, too far from any major urban area. If, indeed, face-to-face linkages are the basic organising principle of the knowledge economy, then how can we help communities in quadrant D to improve their access to such linkages?

Figure 7, though useful, is simply a guide for positioning communities. It tells us little about the dynamics of change. The driving force remains economic and technological change, which in turn, I have suggested, drives a constantly evolving pattern of linkages, where each linkage (face-to-face, electronic, trade...) imposes its spatial logic. Face-to-face linkages foster proximity (cities) and concentration, while electronic linkages should foster dispersion, but are intimately tied to face-to-face linkages. The relationships are complex, with myriad feedback effects. Whether an all-encompassing framework is possible remains an open question. It is not surprising that Infrastructure Canada (2005: 8) concludes: “There is no prevailing analytical framework for understanding these linkages”⁷. Perhaps we are chasing after a Holy Grail, but should this stop us from trying?

That being said, I have attempted to demonstrate that a perspective which looks at the role of space (proximity / distance) in human behaviour, especially as it affects economic relationships, can provide useful insights. The framework, at a minimum, should allow us to ask the right questions; that is, questions which are “researchable” (not all questions are) and policy relevant. A policy-relevant framework should, ideally, prompt us to think intelligently about some of the following:

1. The interdependencies between linkages. Do, for example, improvements in one affect the demand for another? I have argued that the introduction of IT linkages has increased the demand for face-to-face linkages, and thus also for (urban) concentration and for air travel.

⁶ My thanks to Rose Olfert, a participant at the March 3rd Dialogue, for sparking this idea.

⁷ And, recalling my earlier disclaimer, please note that this paper only addresses half of the issue, leaving aside relations between communities within cities. Those interested in some of my thoughts on the subject, please see Polèse and Stren (2000), especially the first and last chapters.

2. The relationship between current trends in specific linkages (say, distribution) and the future of communities. If scale economies (volume) are of increasing importance for some linkages, what does this imply for communities located in the extreme southeast quadrant on figure 7, and what are the policy implications?
3. The relationship between the economics of specific linkages (say, air travel) and the future of communities. This is a corollary of the previous point. If, as I have argued, face-to-face linkages (thus, air travel) are a growing factor in urban competitiveness, should this not affect the way we think about federal aviation policy?
4. The conflicting impacts of linkages on communities, what I have called the competition effect. The issue is not only economic, but also social and cultural. Federal rules on broadcasting (permits, ownership...) implicitly recognize that some linkages are not desirable.
5. The social value of maintaining "unprofitable" linkages. The answers to points 2 and 3, when added to population decline for communities in quadrant D, mean that a growing number of linkages will in the future fall below the "profitability" threshold. Rail links have been dismantled. What yardstick do we use to justify subsidies?
6. As a corollary to the previous point, can we (should we) develop base-line standards for public services in communities across Canada? Can (should) criteria of distance and size be applied uniformly across the land? Is 'no village is too small' a realistic perspective? Dare we add 'no village is too far'?
7. The impact of economic, technological and social change on linkages. I have argued that people linkages (face-to-face, especially) are becoming increasingly crucial. How might other foreseeable changes alter linkages and impact communities? The impacts will be different for communities in different quadrants on figure 7.

References

Ausstat (2000) *Australian Social Trends - Population Distributions: Regional populations, growth and decline*, Australian Bureau of Statistics, online at: <http://www.abs.gov.au/ausstats/abs%40.nsf/ausstatshome?OpenView>

Bourne, L.S. (2000) "Living on the Edge: Conditions of Marginality in the Canadian Urban System" in Y. Gradus and H. Lithwick, eds. *Developing Frontier Cities-Global Perspectives*. Amsterdam: Kluwer: 79-97.

Bourne, L. S. and J. Simmons (2003) "New Fault Lines: Recent Trends in the Canadian Urban System and Their Implications for Planning and Public Policy," *Canadian Journal of Urban Research/ Plan Canada*, Special joint issue 12 (1): 1-27.

Bourne, L. S. and J. Simmons (2004) *Urban Growth and Decline in Canada, 1971-2001, Explanations and Implications*, Research Paper 201, Centre for Urban and Community Studies, University of Toronto.

Coffey, W.J. (2004) "Canadian Cities and the Shifting Fortunes of Economic Development" in Bunting T. and P. Fillion, eds. *Canadian Cities in Transition* (2nd Edition), Toronto University Press.

Forth, G. (2000) "What is the future for Australia's declining country towns" Paper presented to the "Future of Australia's Country Towns" Conference, La Trobe University, Bendigo, Australia.

Gaspar, J. and E. Glaeser (1998) "Information Technology and the Future of Cities," *Journal of Urban Economics*, 43 (1): 136-156.

Hanell, T., H. Aalbu and J. Neubauer (2002) *Regional Development in the Nordic Countries*, Nordregio Report 2002:2, Nordregio, Stockholm.

Henderson, J. V. (1997) "Medium-Sized Cities," *Regional Science and Urban Economics*, 27: 583-612. I

Infrastructure Canada (2005) *An Overview of the Literature on Linkages between Communities*, Paper Prepared for the Infrastructure Canada / CPRN Structured Dialogue on Linkages, Ottawa, March 2005.

Lucas, R. (1988) "On the Mechanics of Economic Development, " *Journal of Monetary Economics*, 22: 3-42.

Polèse, M., and R. Shearmur (2002) *The Periphery in the Knowledge-Based Economy: The Spatial Dynamics of the Canadian Economy and the Future of Non-Metropolitan Regions in Quebec and the Atlantic Provinces*, INRS-UCS, Montreal / Canadian Institute for Research on Regional Development, Moncton. On-line at : www.inrs-ucs.uquebec.ca

Polèse, M., and R. Shearmur (2004) “Is Distance Really Dead: Comparing Industrial Location Patterns over Time in Canada,” *International Regional Science Review*, 27 (4): 1-27.

Polèse, M., and R. Shearmur (2004a) “Culture, Language and the Location of High-Order Service Functions: the Case of Montreal and Toronto” *Economic Geography*, 80 (4): 329-350. .

Polèse M. and R. Stren (2000), eds, *The Social Sustainability of Cities: Diversity and the Management of Change*, University of Toronto Press, Toronto.

Reimer, R. (2005) *A Rural Perspective on Linkages among Communities*, Paper Prepared for the Infrastructure Canada / CPRN Structured Dialogue on Linkages, Ottawa, March 2005.

Simmons, J. (2005) *The Urban System and Linkages*, Paper Prepared for the Infrastructure Canada / CPRN Structured Dialogue on Linkages, Ottawa, March 2005.

Slack, E. L.S. Bourne and M. Gertler (2003) *Small, Rural, and Remote Communities: The Anatomy of Risk*, Research Paper Series, RP (18), Panel on the Role of Government, Government of Ontario, Toronto.

The Economist (2005) “The town of talk. A survey of New York” *The Economist*, February 19th 2005.