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THINKING ABOUT ECONOMIC GROWTH:

CITIES, NETWORKS, CREATIVITY AND SUPPLY CHAINS FOR IDEAS

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Abstract Discussions of economic growth require an examination of the role of cities. It is widely claimed that cities exist because they facilitate economic growth and development. Spatial concentrations reduce transactions costs. There are additional benefits gained as positive spillover effects are realized. The latter is especially important for the exchange of ideas. Creativity comes from new arrangements of thoughts and ideas. The thoughts of others facilitate new combinations of ideas. It is argued here that propitious spatial arrangements make both sets of benefits possible. These arrangements involve choices from a very large combinatorial set. The choice problem is too complex to entrust to models or planning agencies. Rather, flexible land markets are required. This paper is based on the author's presidential address delivered at the February 2012 meetings of the Western Regional Science Association in Kauai, Hawaii.

Key words economic growth, creativity, urban form

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1. ECONOMIC GROWTH AND CITIES

Adam Smith famously asked: Why are some nations wealthier than others? Almost 250 years later, the discussion continues. Robert Lucas noted, “Once you start thinking about economic growth, it’s hard to think about anything else.” By all means. In this paper, I want to examine the contributions of cities. I will try to show that simply calling them the “engines of growth” or places where “creative people” go is not adequate. Cities exist because they facilitate the formation of supply chains, including the human supply chains that spawn ideas. But to do all this, cities must be allowed to form propitious spatial arrangements.

Economist Steven Landsburg (2007) framed the growth question this way:

> Modern humans first emerged about 100,000 years ago. For the next 99,800 years or so, nothing happened. Well, not quite nothing. There were wars, political intrigue, the invention or agriculture – but none of that stuff had much effect on the quality of people’s lives. Almost everyone lived on the modern equivalent of $400 to $600 a year, just above the subsistence level. True there were always aristocracies who lived far better, but numerically, they were quite insignificant …

And (in 2011):

> Just five generations ago, the average American worked 60 hours a week, took no vacations, and earned less than the modern-day equivalent of $6,000 a year, He or she rarely traveled more than a few miles from home, had no central heat or running water, and died at age 50.

How did all this happen? Do we have big answers to big questions? Sylvia Nasr (2011) rightly called the discussion *The Grand Pursuit*, a topic that has preoccupied many smart people for many years. Niall Ferguson (2011) recently boiled it down to his famous “six killer apps”. They are:

- Competition – political (between states) as well as economic
- Science – a way of studying and learning
- Property rights – the rule of law
- Medicine – the science that made health and life possible
- The consumer society – the source of demand
- The work ethic – a moral and cultural framework

Is anything missing? I will argue that it is the role of cities -- and how they become congenial to creativity and entrepreneurial discovery; how their evolving forms support networks that facilitate supply chains – including the less formal but essential and complex supply chains that prompt and nurture good ideas. It is important to emphasize “evolving” because where there are complex arrangements error-correction opportunities are essential.

2. ORGANIZATION AND CITIES

When Ronald Coase (1937) asked the seemingly naïve question "Why are there firms?" he launched quite a discussion – and earned a Nobel prize and launched the economic study of organizations. So it is not crazy to ask "Why are there cities?" And what does their spatial organization contribute to the discussion of growth?

A convenient summary of what economists know about economic growth is depicted in Figure 1 (from Deron Acemoglu, 2009). It shows that "institutions" (Douglass North's "rules of the game", usually meaning secure property rights) impact incentives. The factors of production respond to these – via "organization" – and produce technical knowledge, which gives us material wealth (GDP per capita) -- and much more.

But where and how in the diagram are human knowledge and human capital nurtured? And where is the essential entrepreneur? Is he/she part of "organization"? Note that "Organization" is at the center of the chart -- and has had a place in the discussion ever since Coase's 1937 paper. Most of us would add that spatial organization also matters a great deal.

Regional scientists and urban economists like to call cities "the engines of growth". Also cities are "the crucible of ideas". I think what is meant is that entrepreneurs in cities are the real engines of growth. People go to certain cities for "ingenuity-sparking collisions" (Paul Kedrosky, 2011).[1] They form "Chains of collaborative brilliance" (Edward Glaeser, 2011). And, even better: "I believe that at some point in human history, ideas began to meet and mate, to have sex with each other" (Matt Ridley, 2010, p. 270). These views are ever more important in the information age.

We know that creativity and human ingenuity ("technical knowledge") are tremendously significant -- but not well understood. How do we get to the "aha!" moments? I want to link the economic growth discussion to the following two thoughts: (1) It is all about combinations; and (2) Most of us do our best work with and among others.

Economic growth happens when we find ways to combine resources in new ways (Romer, 2007). But the "Aha!" moments also happen when we combine previously unconnected ideas from the various "shelves" of our brains; we are always looking for promising new combinations of old ideas. But much better if we can pick from and combine ideas from many brains – perhaps from varied and diverse fields. This is the largest combinatorial space of all. Raymond Tallis recently wrote: "…we belong to a boundless, infinitely elaborated community of minds that has been forged out of a trillion cognitive handshakes over hundreds of thousands of years."[2] Charlie Karlsson (2011, p. 85) cited Arthur Koestler and also Herbert Simon as stressing that, "exceptional creativity calls for an ability to bring together habitually incompatible ideas and combine them in a way that gives deep new insights." Combinatorial space is vast. In how many ways can people or ideas (or land uses in cities or anything else) be arranged? Here is Paul Romer:

[1] Not to be confused with "brainstorming", which gets mixed reviews (Kohn and Smith, 2011)
[2] Quoted at *Your Brain and You* http://yourbrainandyou.com/category/evolution/

> There have been 10**18 seconds since the Big Bang, and there are 10*88 particles in the known universe. Those are very large numbers … but they are dwarfed by the number of ways that things or ideas can be combined. Even something as simple as a deck of cards can be arranged in unimaginably numerous ways. There are 10**68 possible card decks, which means that any order you happen to shuffle has probably never appeared before.

This is not so different from Jane Jacobs' insight when she said of cities:

> "Their intricate order – a manifestation of the freedom of countless numbers of people to make and carry out countless plans – is in many ways a wonder." Jane Jacobs, *The Death and Life of Great American Cities*

"The naïve intuition that people have about limits to growth is profoundly wrong … There is a scarcity of physical objects but that's not the constraint on what we can do …" (Romer,1996) … which suggests that "The real constraint is not the number of objects, but the ways of combining objects or ideas – a number of possibilities that makes the number of atoms in the universe look close to zero in comparison. We are limited in a very real sense, only by our imagination and the time in which we have to exercise it" (Postrel, p.64).These Romer-Jacobs-Postrel observations suggest the incredible complexity that markets sort through to get to some fairly good outcomes. But this is not just how amazingly complex supply chains are formed. It is also about how creativity happens.

Econ 101 discussions of supply chains benefit from the wonderful illustration provided by Leonard Read's *I Pencil*'. I am a lead pencil … no one knows how to make one of me …" Yes, and how about a toaster? Thomas Thwaite (2011) recently tried and failed to build one by himself. How about an iPhone? How about an MRI machine or a 787 Dreamliner? Etc. "We couldn't live a day without depending on everybody." -Will Rogers.[3] There is surely specialization and exchange as Smith famously taught us, but these take form in an uncountable set of incredibly complex supply chains.

Each supply chain requires the cooperation of large numbers of strangers. Market price signals facilitate this coordination as nothing else can. In fact, many of the adjustments that market participants are involved in are adjustments to disequilibrium prices; these adjustments facilitate the never-ending nudging of prices in the equilibrium direction. The many price signals emerge as markets sort through a very large number of possible combinations to arrive at one that seemingly works for each of the large numbers of agents involved.

Likewise, think about the complex spatial arrangements that emerge to spawn creative thought and innovations in the same way. We get complex spatial arrangements – just as we get supply chains that yield products. We seemingly get what we could call the supply chains that yield productive ideas.

In trying to understand economic growth as well as cities as well as the creativity supply chain, I want to claim that we can understand each one by considering the other. This discussion suggests the idea of *The Adjacent Possible* – which also happens to be the punch-line in Diamandis and Koltler's recent book on *Abundance* (2012, last page, p. 239).Here is William Duggan (2010) on creativity:

[3] Cited in Sowell (2007), p. 11.

> Clausewitz gives us four steps for how strategic intuition works. First, you take in 'examples from history' throughout your life and put them on the shelves of your brain. Study can help, by putting more there. Second comes 'presence of mind' where you free your brain of all preconceptions about what problem you're solving and what solution might work. Third comes the flash if insight itself. Clausewitz called it coup d'oeil, which is French for 'glance'. In a flash, a new combination of examples from history fly off the shelves of your brain and combine. Fourth comes 'resolution,' or determination, where you not only say to yourself, 'I see', but also, 'I'll do it!'

And here is Steven Johnson (2010) on *The Adjacent Possible*:

> The adjacent possible is as much about limits as it us about openings. At every moment in the timeline of an expanding biosphere, there are doors that cannot be unlocked yet. In human culture, we like to think of breakthrough ideas as sudden accelerations on the timeline, where a genius jumps ahead fifty years and invents something that normal minds, trapped in the present moment, couldn't possibly have come up with. But the truth is that technological (and scientific) advances rarely break out of the adjacent possible; the history of cultural progress is, almost without exception, a story of one door leading to another door, exploring the palace one room at a time. But of course, human minds are not bound by the finite laws of molecule formation, and so every now and then an idea does occur to someone that teleports us forward a few rooms, skipping some exploratory steps in the adjacent possible. But those ideas almost always end up being short-term failures, precisely because they have skipped ahead. We have a phrase for those ideas: we call them 'ahead of their time.'

If cities are the places that connect people, we expect most creativity to occur in cities. The wrinkle is that we form many sorts of networks; there are many kinds of connectivity. These are the supply chains – that bring forth goods as well as ideas. The latter are ever more important in the information age.

Some interactions involve nearness and some do not. Sandy Ikeda and I refer to "Jacobs density," environments that allow us to create and maintain the networks that work best for us. Network density and population density are not the same; the latter may be a poor proxy for the former.[4]

Various investigators have pursued this idea and there are many studies that are seemingly content to look at the interaction of human capital and urban density as explanations of city productivity and success. But there are problems with this approach. First, most metropolitan areas are too large and too complex to be adequately described in terms of one overall average density measure. Second, this aggregate approach ignores what many of us claim matters (and which defines our field).What about location, location, location?

A recent paper by a prominent urban economist began this way:

> The spatial structure of an urban area is measured using average densities of population and employment. While there is no single measure that will fully capture the spatial structure of an urban area, the average density is one of the most useful and widely used.

[4] Gordon and Ikeda (2011)

Along with Sandy Ikeda, I recently (2011) examined twelve important papers on the predictive powers of density, all from respected researchers. We found that they all used average (usually population) densities for cities, counties metropolitan areas[5] -- and even one that used the state-wide average density. But these areas are too large. Densities vary considerably within each; the area-wide average includes significant noise.

In ongoing research, Cheng Yi Lin and I are examining U.S. migration data for sub-metropolitan areas in terms of the education and skill-level of migrants and where they go. We want to study smaller and easier to characterize destinations for which an average population density measure is more meaningful than for the much larger metropolitan areas; we use in-migration data for PUMS areas (PUMAs)[6] which make it possible to identify individuals belonging to Richard Florida's "super-creative core" (SCC) or his "bohemians" (BO).We looked at these as well as the BA+ and MA+ movers. We studied movers in three distinct age groups: 25-34, 35-44, and 45-54.The first two are most likely to seek places with suitable networking opportunities and we examined these. Table 1 summarizes some of the results. "All" migrants for the two age groups are shown to establish a reference.

First, just looking at the top fifty destination PUMAs (of the more than 2,000 metropolitan-area PUMAs in the U.S.) the various migrating groups shown are more responsive to destination densities than the reference groups ("All").Second, among the top fifteen destinations, there is a tremendous range of densities for all of the eight (non-reference) groups of in-migrants. Third, for all eight, among the top-fifty destinations, correlations between in-migrants and destination population densities are positive but low. Fourth, among the top-fifty destination PUMAs, the population density coefficients of variation are usually above 100, sometimes by quite a bit, indicating that the signal-to-noise ratio of the density variable is high. Local area population density is part of the story, but a small part.

Even at the small-area level, it is seemingly questionable whether we can ask population density to do all the "heavy lifting" (Ikeda, forthcoming). Density is widely used as a proxy for the various networks that each of us form and maintain in order to test and exchange ideas. Some of our interactions occur locally; others happen electronically; and we still get on airplanes and go to meetings and conferences. Each of our networks allows for serendipitous interactions, chance encounters, mixing and mingling. We create and monitor our networks as we try to position ourselves to be productive and even creative. We cooperate, but not randomly. We choose to go (or not to go) to specific meetings and venues that are promising for the development of our human capital. How do we arrange our work via these three sets of networks? To what extent are they complements or substitutes? And how do network choices affect the bids that locaters form for the various available sites?

Recent research on the composition of scientific teams that have published papers in top journals show that teams are becoming ever more geographically dispersed.[7] Do trade routes explain trade or does trade explain trade routes? We face a similar question when studying the evolution research networks.

[5] One exception published after our survey is by Kolenda and Liu (2012); they look at "creative industries" at the sub-metropolitan level, comparing central city vs. suburban locations.

[6] Employment densities are only available for a subset of PUMAs.But the correlation between population and employment density for 65 PUMAs among our top-fifty sets, was 0.83.

[7] See, for example, Cummnings and Kiesler (2005).

Looking at the locations of co-authors of jointly published *Journal of Regional Science* papers, there are some notable fifty-year trends (Appendix Table 1 and Figures A-D). The proportion of co-authored paper is up. Collaborations between authors at the same institution are down. The number of international collaborations is up most sharply.

HOW ARE WE DOING?

Are there market failures? Are there government failures? Yes and yes. We are inevitably in the world of second best. How are our cities performing in the world of second-best? Assessments are not simple, but here are four indications:

(1) Table 2 summarizes U.S. NHTS data for commuting (all modes) for 2001 and 2009 and shows that the metro area average had increased by just one minute, from 24 to 25 minutes. NHTS reports these data for residents of "urban", "suburban" and "second city" residents. The average for the first group had not changed (28 minutes in each year), neither had those living in suburban areas (24 minutes in each year); those living in "second city" addresses experienced average commutes of 21 and 22 minutes, respectively. We see remarkable stability over time -- as well as the advantages of worker-employer co-location outside the "urban" areas.

(2) The International Council of Shopping Centers reports that there are about 100,000 "shopping centers" (including many "Lifestyle Centers") which account for about 50 percent of all U.S. retail gross leasable area. Whereas some of the centers are Edge Cities which include many of the functions once associated with downtowns, many others are developed at low densities that are seemingly under the radar (as in "Edgeless Cities")[8]. Rather, than downtown and the 'burbs, it is an extremely complex arrangement. The NHTS (Table 3) also includes data for "non-work" travel, which includes shopping as well as other consumer services opportunities. It appears that the many "centers" (and smaller places) are spatially distributed so that the average shopping trip by central city vs. suburban residents in the U.S. were of similar duration, 14 minutes for central city residents and 16 minutes for residents of suburbs. In fact, the 2001 and 2009 surveys show that the *average* non-work trip distance in 2001 and 2009 was the same at 6.7 miles each way (not walkable, but not bad).In the intervening years, U.S. population had grown by 7.8 percent but shopping access had not gotten out of reach in spite of significant growth and development.

(3) Consider the stability of city-size rankings *at the top*. If we rank the top-ten largest U.S. cities for each of the census years, 1950-2000, we get just 7 (of 25 possible) *rank changes* among the (1950) top five; but we get 19 (of 25) if we look at the next five. But cities are not economies. The city-suburb distinction is out of date and not useful. Most people cross their boundaries without knowing it. If we perform the same analysis for the Urbanized Areas, we get slightly more stability: 3 changes for the top 5 (in 1950) and 17 changes for the next five. The advantages of size and dispersion dominate the disadvantages. The larger combinatorial

[8] Lee (2007).

problems (what to place where) are seemingly not a disadvantage. Could we say as much for the 1950 top-four corporations or the 1950 top-four richest Americans?

(4) Bumsoo Lee (2006) identified places of work in some detail and noted the commuting time differences. Tables 5a and 5b show some of Lee's data -- the various travel times and the workplace locations of the corresponding groups Looking at the drive-alone travel times, the two tables indicate that the more concentrated the workplaces, the longer the commutes; CBD workers have the longest trips while those working in dispersed locations enjoy the shortest trips. The "dispersed city" is a much more widespread phenomenon than many suppose. The respective average commuting times for the three groups were 35 minutes, 30 minutes and 26 minutes (also one-way and drive-alone only).What many people deride as "sprawl" looks pretty good. Note that many in the first group were commuters to Manhattan's two centers. Lee also found that when he plots commuting times vs. metro area size – and does this for the three groups of workers, the steepest slope was for CBD workers; the mildest slope was for "dispersed" workers. These findings are consistent with three plausible ideas: (1) where there are the most agglomeration economies, there are likely to be the highest wages which compensate commuters for the longer trips; (2) the co-location of workers and employers ("dispersed" column) favors the greatest number of workers; (3) the idea that the latter is a chaotic and wasteful "sprawl" does not stand up. For the fourteen largest (3-million and more in 2000) U.S. metropolitan areas, 18 percent of workers were employed in the main center, 15 percent were employed in various sub-centers and 68 percent were "dispersed", e.g., not working in a major center.

Does the cited evidence support the idea that in this world of second-best (many market failures and many policy failures) there are beneficial outcomes to complex problems?[9] The second-best spatial arrangements, the ones we get, are seemingly doing the job, accommodating productive lives -- making further growth possible. We get the spatial arrangements that are congenial to economic success (including inventive activity). When it comes to the spatial arrangements of activities within our cities, it is all about interactions, and therefore about combinations -- and the number of possible combinations is (again) very large. Suppose a large but medium-sized city with one-million population. There would be about 250,000 parcels and (counting density options) about 15 possible land uses (5 uses, each at high or medium or low density) of each parcel. That's as many as 2.5**20 possible land use combinations – in any one year. In a dynamic economy, problems like this have to be "solved" repeatedly. In this context, dreams of omniscient planners or ambitious optimization models are implausible.

In the face of uncountable combinations, what can modelers do? What can planners do? Perhaps it is useful to ask instead about how the institutions we have actually perform. No one can or ever did "solve" the problem of picking the "best" large-city land use pattern, but the indications are that we have not done too badly. Letting land markets allocate space does not cause "failure". How markets spawn order from voluntary exchange out of vast complexity also describes our cities -- which can be

[9] About twenty-five years ago, Jim Moore and I tried to describe what a first-best version might be. Gordon and Moore (1989).But this was a static approach that falls short of the complexity described here.

characterized as spontaneous orders (Gordon, forthcoming).[10] We seemingly get pretty good outcomes to a huge combinatorial problem. Not bad for our world of "urban sprawl" – and the many "market failures" and "policy failures".

3. FINAL THOUGHTS

Cities compete. Growth is a good metric of their success; judge outputs, not inputs. We cannot see or judge "good" vs. "bad" land use patterns. Photo spreads of aerial shots such as *The Atlantic's* "Landscape Absurdism: Las Vegas" http://www.theatlanticcities.com/design/2011/12/landscape-absurdism-las-vegas/711/ tell us very little. But cities that are stuck with land use patterns that are uncongenial to productive activity will falter in the race to attract labor and capital – and creative people. Ake Andersson (2011, p. 39) recently wrote: "The creative city as an informal and spontaneously evolving spatial organization has been the area for large-scale creative revolutions." Randall Holcombe (2011, p. 403) concluded: "The idea of planning a creative city misses the whole point of creativity."

We know that places grow because they remain vital by attracting and maintaining and facilitating the activities of many talented people. But talented people come in all sizes and shapes; they are not simply the selected occupations itemized in recent "creative class" writings. Many of these people want affordable homes with space for family; they end up in suburbs and that is where most of the urban growth has been. But is that simply more "sprawl" and traffic? Yes and no. Urban growth vitality would quickly disappear if only costly growth were possible. So what is the explanation?

It must be that land uses (users) find ways to arrange themselves such that positive agglomeration and networking economies remain available while the associated costs of agglomerating are kept in check. When discussing agglomeration economies (including externalities), we must recall that most of them attenuate with distance; transactions and transactions costs are simultaneously determined. Likewise, most externalities are *potential* externalities; they become *realized* externalities in light of specific spatial arrangements.[11]

Just as networks create opportunities, making locations and interactions endogenous, so realized externalities are endogenous. A successful (competitive) urban form is likely to be one in which the positive realized agglomeration economies dominate the negative realized agglomeration economies. We could not get competitive growth or advancement if we could not get spatial arrangements that are

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[10] Russ Roberts calls emergent orders "The Deepest Thing We Know." http://cafehayek.com/2012/02/the-deepest-thing-we-know.html

[11] Several sources of agglomeration economies (shared inputs, labor market pooling, and knowledge spillovers) were identified by Marshall (1890). Urbanization mitigates many direct transactions costs. Marshall also emphasized transactions costs that involve third parties (shared inputs and labor market pooling), as well as benefits (spillovers) that occurred without transactions. Knowledge spillovers are important part of Marshall's third category, but these do not necessarily involve transactions and are, therefore, not addressed by the New Economic Geography, which concerns itself with "pecuniary" externalities and which ignores land markets. Yet, the analysis presented here suggests how and why such spillovers can become pecuniary -- *and that this requires land markets*. Over time, there is also path dependency, which can be seen as an intertemporal agglomeration effect.

suitable or congenial. In all this light, city-sizes debates are meaningless; it is all about how places are laid out – and whether we allow them to find competitive spatial arrangements.

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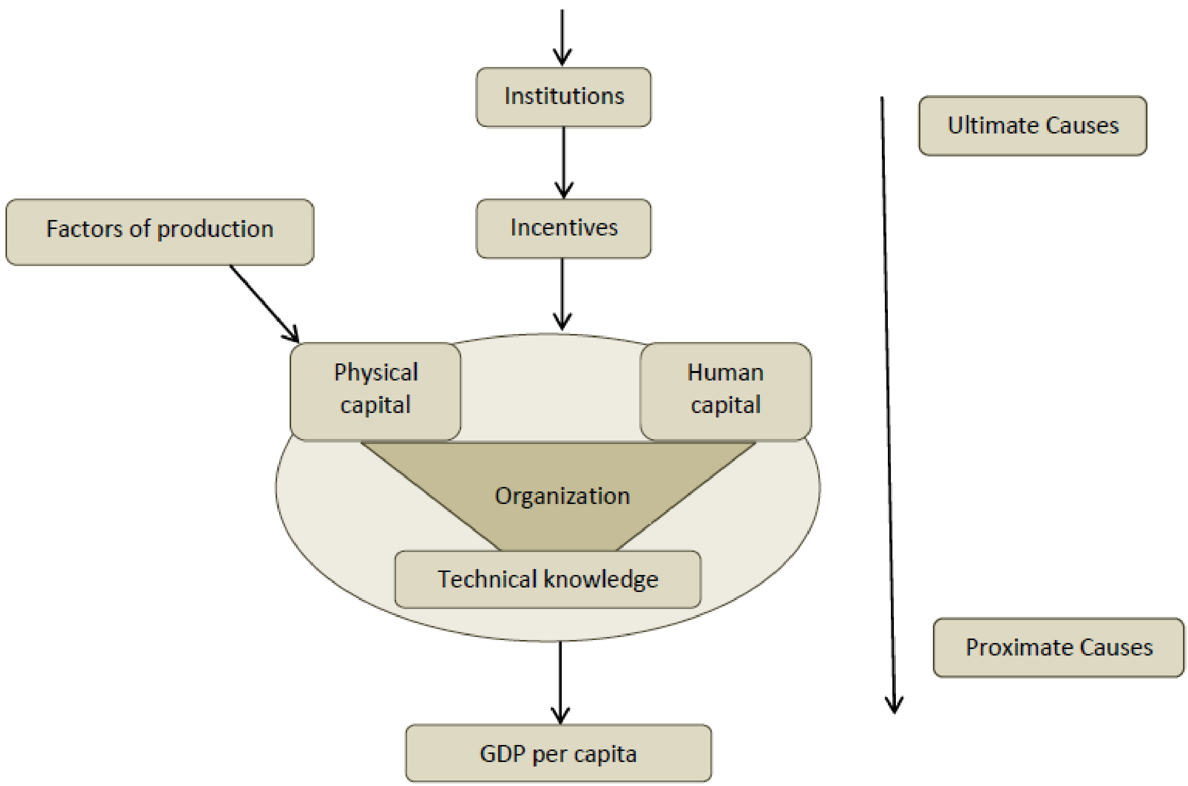
Figure 1: Economic Growth



Source: Cowen and Tabarrok(2011)

TABLE 1: Top destination PUMAs for selected in-migrant groups, 2009*

	Destination receiving largest number of in-migrants	Highest density destination (in top 15)	Lowest density destination (in top 15)	Correlations, density and # of arrivals (N= all MSA PUMAs)	Density coefficient of variation (top 50)
All (25-34)	24,086 to Lincoln Park, Chicago (10,243/sq km)	24,086 to Lincoln Park, Chicago (10,243/sq km)	16,932 to Exurban Maricopa County, AZ (25/sq km)	0.12	123.7
All (35-44)	12,481 to Exurban area of Maricopa County (25/sq km)	8,922 to Alexandria, Virginia (3,855/sq km)	9,275 to Suburban Las Vegas (13/sq km)	-0.01	343.6
BA+ (25-34)	21,427 to Lincoln Park, Chicago (10,243/sq km)	10,369 to Upper east-side, Manhattan (44,799/sq km)	11,607 to Northwest Austin (1,044/sq km)	0.29	137.4
BA+ (35-44)	6,901 to Upper east-side, Manhattan (44,799/sq km)	6,901 to Upper east-side, Manhattan (44,799/sq km)	5,083 to Exurban Virginia (105/sq km)	0.18	191.2
MA+(25-34)	7,684 to Lincoln Park, Chicago (10,243/sq km)	4,131 Upper east-side, Manhattan (44,799/sq km)	6,632 Silicon Valley (773/sq km)	0.29	136.8
MA+(35-44)	4,086 to Upper east-side, Manhattan (44,799/sq km)	4,086 to Upper east-side, Manhattan (44,799/sq km)	2,008 to Exurban Broward County, FL (70/sq km)	0.24	203
SCC (25-34)**	5,365 to Lincoln Park, Chicago (10,243/sq km)	3,772 to Greenwich Village, Financial District, Manhattan (17,193/sq km)	5,337 to Silicon Valley (773/sq km)	0.26	125
SCC (35-44)**	2,254 to Alexandria, Virginia (3,855/sq km)	1,569 to Upper east-side, Manhattan (44,799/sq km)	1,544 to Silicon Valley (773/sq km)	0.24	188.2
BOH (25-34)**	2,738 to Hollywood area of Los Angeles (3,392/sq km)	1,702 to Lower east-side/Chinatown, Manhattan (35,847/sq km)	1,309 to Santa Monica mountains/Hollywood hills (900/sq km)	0.37	113.3
BOH (34-45)**	960 to Upper west-side Manhattan (26,340/sq km)	896 to Upper east-side, Manhattan (44,799/sq km)	591 to Eastern rural North Dakota (2/sq km)	0.36	157.4

* Densities are population densities; workplace densities are only available for a subset of PUMAs

Population and workplace densities for the PUMAs studied were highly correlated (r=0.83)

** Lists of occupations based on Florida (2002)

Source: Cheng-Yi Lin (USC, forthcoming)

TABLE 2: Mean commute times (minutes, one-way, all modes), 2001 and 2009

	Urban	Suburban	Second City	Town & Country	All Metro
2001	**28**	**24**	**21**	**24**	**24**
Population*	39,757	61,105	43,140	60,757	204,050
Prop of US Pop	15.7%	24.1%	17.0%	24.0%	80.6%
2009	**28**	**24**	**22**	**25**	**25**
Population*	49,563	69,223	45,322	65,532	229,639
Prop of US Pop	17.5%	24.5%	16.0%	23.2%	81.1%

Source: 2001 and 2009 NHTS

Note: NPTS defines an "urban continuum" from "urban" to "suburban" to "second city" to "town and country"

* In thousands, excludes ages 0-4.

TABLE 3: Mean non-work travel times (minutes, one-way, all modes), 2001 and 2009

	Urban	Suburban	Second City	Town & Country	All Metro
2001	**19**	**17**	**17**	**18**	**18**
Population*	39,757	61,105	43,140	60,757	204,050
Prop of US Pop	15.7%	24.0%	17.0%	24.0%	80.6%
2009	**19**	**17**	**17**	**18**	**18**
Population*	49,563	69,223	45,322	65,532	229,639
Prop of US Pop	17.5%	24.5%	16.0%	23.2%	81.1%

Source: 2001 and 2009 NHTS

Note: NPTS defines an "urban continuum" from "urban" to "suburban" to "second city" to "town and country"

* In thousands, excludes ages 0-4.

TABLE 4a: Rankings of largest U.S. cities, six census years, 1950-2000

1950	1960	1970	1980	1990	2000	Changes
New York	New York	New York	New York	New York	New York	0
Chicago	Chicago	Chicago	Chicago	Los Angeles	Los Angeles	1
Philadelphia	Los Angeles	Los Angeles	Los Angeles	Chicago	Chicago	2
Los Angeles	Philadelphia	Philadelphia	Philadelphia	Houston	Houston	2
Detroit	Detroit	Detroit	Houston	Philadelphia	Philadelphia	2
Baltimore	Baltimore	Houston	Detroit	San Diego	Phoenix	4
Cleveland	Houston	Baltimore	Dallas	Detroit	Sand Diego	5
St. Louis	Cleveland	Dallas	San Diego	Dallas	Dallas	4
Wash DC	Wash DC	Wash DC	Phoenix	Phoenix	Detroit	2
Boston	St. Louis	Cleveland	Baltimore	Baltimore	San Jose	4

Source: author calculations

TABLE 4b: Rankings of largest U.S. urbanized areas, six census years, 1950-2000

1950	1960	1970	1980	1990	2000	Changes
New York	New York	New York	New York	New York	New York	0
Chicago	Los Angeles	Los Angeles	Los Angeles	Los Angeles	Los Angeles	1
Los Angeles	Chicago	Chicago	Chicago	Chicago	Chicago	1
Philadelphia	Philadelphia	Philadelphia	Philadelphia	Philadelphia	Philadelphia	0
Detroit	Detroit	Detroit	Detroit	Detroit	Miami	1
Boston	San Francisco	San Francisco	San Francisco	San Francisco	Dallas-Ft. Worth	2
San Francisco	Boston	Boston	Wash DC	Wash DC	Boston	3
Pittsburgh	Wash DC	Wash DC	Boston	Dallas-Ft. Worth	Wash DC	4
Knoxville	Pittsburgh	Cleveland	Dallas Ft. Worth	Houston	Detroit	5
St. Louis	Cleveland	St. Louis	Houston	Boston	Houston	5

Source: author calculations

TABLE 5a: Mean commute time by workplace type in largest metropolitan areas, 2000

MSA Name	Population	All modes				Drive alone mode				
		Metro	CBD	Sub-centers	Dispersed	Metro	CBD	Sub-centers	Dispersed	
New York	21,199,865	34.3	51.1	38.6	31.6	28.5	55.6	30.2	27.8	
Los Angeles	16,369,949	29.0	39.0	30.0	28.1	27.8	36.6	28.9	27.0	
Chicago	9,157,540	31.3	46.4	33.3	29.7	28.9	41.8	32.1	28.0	
Washington	7,608,070	32.1	42.0	32.2	31.2	30.3	40.2	30.2	29.8	
San Francisco	7,039,362	30.4	40.9	30.7	29.4	28.4	39.3	29.3	27.8	
Philadelphia	6,188,463	27.7	38.8	26.4	26.6	26.1	36.6	26.1	25.7	
Boston	5,828,672	28.3	42.3	26.5	27.2	27.1	41.6	25.9	26.7	
Detroit	5,456,428	26.6	32.0	27.7	25.9	26.2	31.0	27.7	25.4	
Dallas	5,221,801	28.1	33.3	28.5	27.6	27.4	31.5	28.0	27.1	
Houston	4,669,571	29.2	35.8	30.0	28.2	28.1	32.9	28.9	27.3	
Atlanta	4,112,198	31.9	37.8	32.4	31.3	30.9	36.0	31.4	30.3	
Miami	3,876,380	28.9	35.8	29.6	28.0	27.9	33.8	28.9	27.1	
Seattle	3,554,760	27.9	35.1	27.5	27.1	26.2	30.7	26.3	25.8	
Phoenix	3,251,876	26.2	32.2	25.6	25.7	25.4	31.1	24.7	25.0	
3 million and plus		29.4	38.8	29.9	28.4	27.8	37.1	28.5	27.2	
1 to 3 millions		24.8	28.0	23.9	24.4		24.1	26.9	23.4	23.8
half to 1 million		22.9	23.8	22.2	22.8		22.3	23.3	21.7	22.2

Source: Lee (2006)

TABLE 5b: Employment shares by location type in 2000

MSA Name	Employment	No. of Sub-centers	Employment CBD A	Sub-centers B	Dispersed C	Share of employment (%) All centers	CBD	Sub-Center	Dispersed
New York	9,418,124	33	937,055	1,057,297	7,423,772	21.2	9.9	11.2	78.8
Los Angeles	6,716,766	53	190,100	1,931,988	4,594,678	31.6	2.8	28.8	68.4
Chicago	4,248,475	17	297,755	504,732	3,445,988	18.9	7.0	11.9	81.1
Washington	3,815,240	16	283,341	449,488	3,082,411	19.2	7.4	11.8	80.8
San Francisco	3,512,570	22	205,553	849,021	2,457,996	30.0	5.9	24.2	70.0
Philadelphia	2,780,802	6	239,735	125,190	2,415,877	13.1	8.6	4.5	86.9
Boston	2,974,428	12	238,092	239,257	2,497,079	16.0	8.0	8.0	84.0
Detroit	2,508,594	22	129,845	557,776	1,820,973	27.4	5.2	22.2	72.6
Dallas	2,565,884	10	126,010	404,365	2,035,509	20.7	4.9	15.8	79.3
Houston	2,076,285	14	165,525	432,101	1,478,659	28.8	8.0	20.8	71.2
Atlanta	2,088,215	6	166,946	223,168	1,698,101	18.7	8.0	10.7	81.3
Miami	1,623,892	6	121,045	243,970	1,258,877	22.5	7.5	150.	77.5
Seattle	1,745,407	7	163,051	207,542	1,374,814	21.2	9.3	11.9	78.8
Phoenix	1,463,581	9	104,417	189,071	1,170,093	20.1	7.1	12.9	79.9
3 million and plus		17.0				22.1	7.1	15.0	77.9
1 to 3 million		2.6				17.8	10.8	7.0	82.2
half to 1 million		0.9				17.4	12.2	5.2	82.6

Source: Lee (2006)

Appendix Table A

Journal of Regional Science Author Locations, 1959-2011*

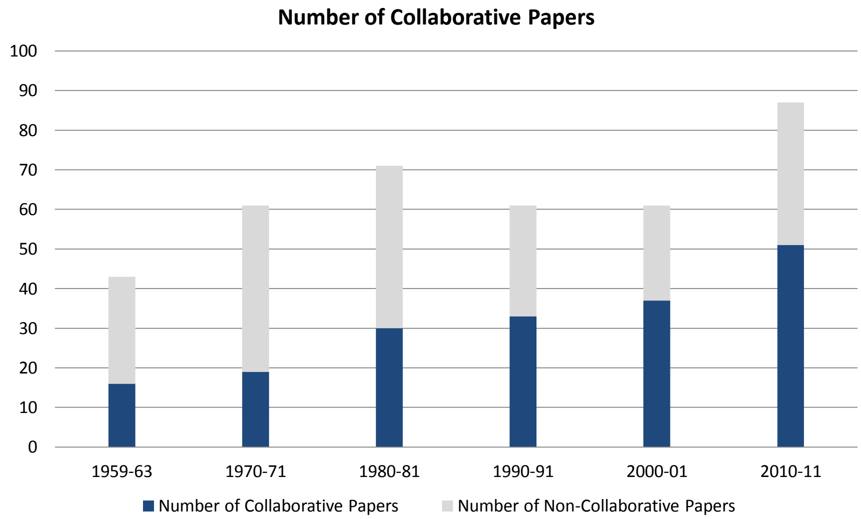
	1959	1960	1961	1962	1970	1971	1980	1981	1990	1991	2000	2001	2010	2011
Number of Papers	7	11	10	8	30	31	36	35	36	25	32	29	44	43
Number of Collaborative Papers	**2**	**4**	**2**	**7**	**11**	**8**	**14**	**16**	**16**	**17**	**19**	**18**	**19**	**32**
Same Institution, City, Country	1	4	2	5	5	3	6	7	8	7	7	5	5	5
Same City	1	0	0	0	0	2	1	0	0	1	0	0	1	2
Same Country	0	0	0	2	3	2	5	6	7	9	8	9	4	11
Different Countries	0	0	0	0	3	1	2	3	1	0	4	4	9	14

	1959-62	1970-71	1980-81	1990-91	2000-01	2010-11
Number of Papers	36	61	71	61	61	87
Number of Non-Collaborative Papers	21	42	41	28	24	36
Number of Collaborative Papers	**15**	**19**	**30**	**33**	**37**	**51**
Same Institution, City, Country	12	8	13	15	12	10
Same City (Different Institutions)	1	2	1	1	0	3
Same Country (Different Cities)	2	5	11	16	17	15
Different Countries	0	4	5	1	8	23
Percentage of Collaborative Papers	**41.7%**	**31.1%**	**42.3%**	**54.1%**	**60.7%**	**58.6%**
Same Institution, City, Country	80%	42.1%	43.3%	45.5%	32.4%	19.6%
Same City (Different Institutions)	7%	10.5%	3.3%	3.0%	0.0%	5.9%
Same Country (Different Cities)	13%	26.3%	36.7%	48.5%	45.9%	29.4%
Different Countries	0%	21.1%	16.7%	3.0%	21.6%	45.1%

*The affiliations of approximately ten authors were ambiguous.

Peter Gordon (February, 2012)

***Journal of Regional Science* Author Locations, 1959-2011**



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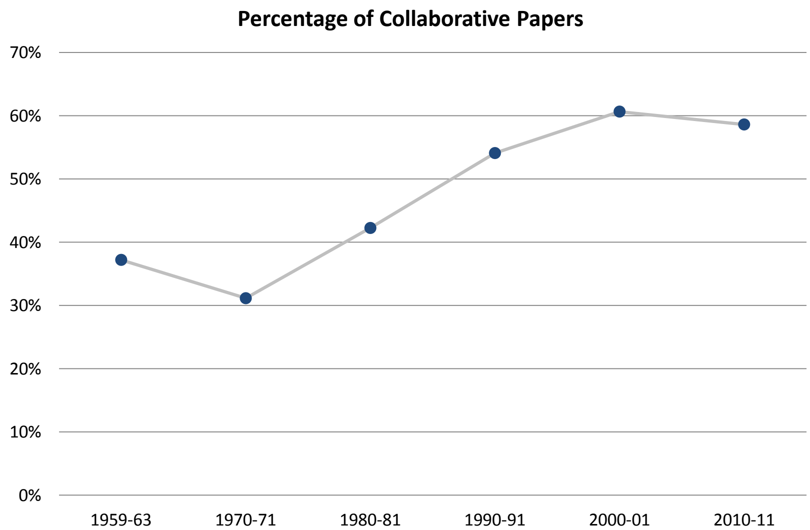
***Journal of Regional Science* Author Locations, 1959-2011**



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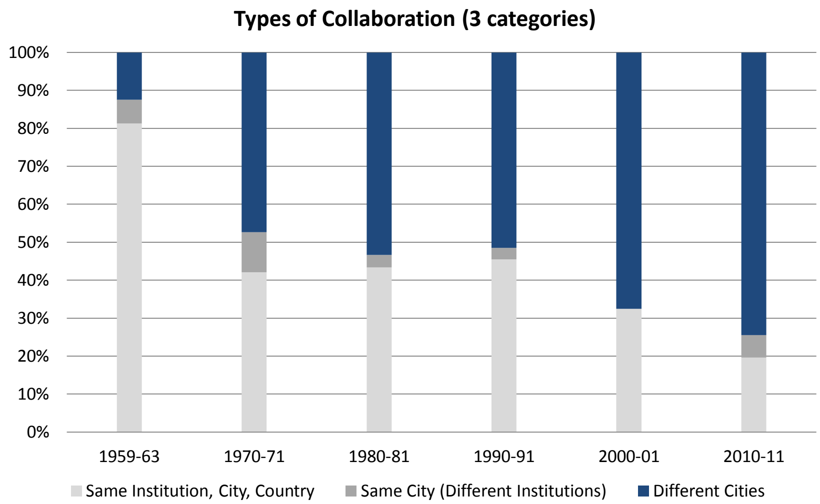
***Journal of Regional Science* Author Locations, 1959-2011**



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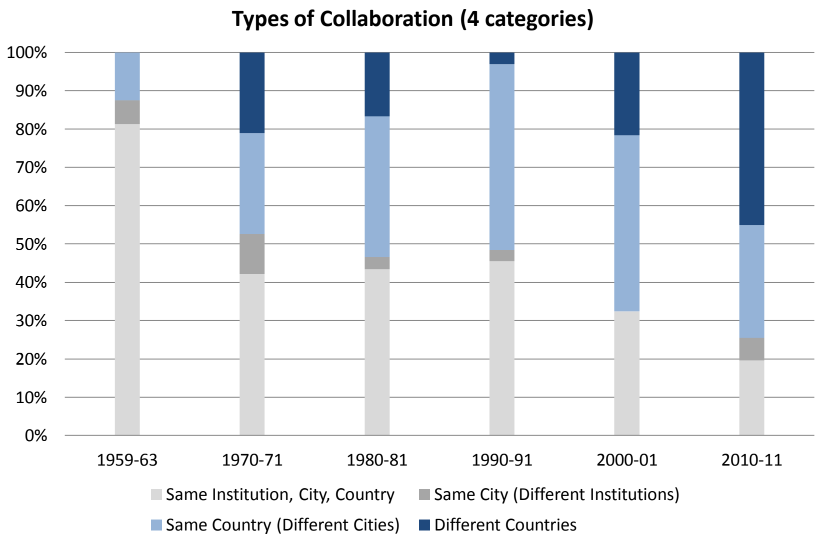
***Journal of Regional Science* Author Locations, 1959-2011**



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