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CITIES AS LABOR MARKETS

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ABSTRACT

A city's welfare depends on its labor market. As long as a labor market does not fragment into adjacent, smaller ones as it grows, the larger the market, the more innovative and productive the city will be. Maintaining mobility is therefore essential to the economic viability of cities.

Maintaining mobility has two implications: first, managing a transport system that allows an efficient movement of labor and goods across metropolitan areas, and second, insuring that regulations or inadequate land supply do not prevent firms and households from settling in the area that will maximize their welfare. This also implies that transaction costs should be low enough to allow firms and households to change location when their circumstances change. Considering cities primarily as labor markets has important operational implications for their management, particularly in the way transport systems are developed and in the way land markets are allowed to operate.

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THE EFFICIENCY OF LARGE LABOR MARKETS IS THE MAIN CAUSE OF EVER-GROWING CITIES

CITIES ARE PRIMARILY LABOR MARKETS

Cities are primarily labor markets. This claim may seem terribly reductionist to the many among us who love cities. Certainly the attractions offered by the amenities of a large city cannot be reduced such that the whole is seen merely as a place where firms are looking for labor and people are looking for jobs.

During the French "cultural revolution" of May 1968 students were deriding a life reduced to only three activities: "Metro, boulot, dodo", which could be roughly translated by "commuting, working, sleeping." This became one of the most ubiquitous tags on Paris' walls. The students were revolting against what I, more pedantically, call an urban labor market, and they had a strong point; I have seen such reduced forms of urban life in many malfunctioning cities. However, I believe that improving the way labor markets function through better land use and transport allow for the indispensable values of urban life: a commute short enough that one has time for elective activities; an open job market that allows one to change jobs until an interesting and/or materially rewarding professional activity has been secured; a residence from which access to social life or nature is quick and easy. All this is possible only in the presence of a well-functioning labor market. Urban life reduced to "Metro, boulot, dodo" is precisely the expression of a dysfunctional labor market.

I am not implying that a city's only purpose is as a labor marketplace, but I am arguing that without a functioning labor market there is no city. Try thinking of an alternative explanation for the existence of very large cities. A city nucleus might have been created originally as a commercial port, a trading post, an administrative center, a military stronghold, or a center of religious pilgrimage, but over the years, the growth of a diversified labor force would be the only possible cause for the expansion of the original urban nucleus. While most cities offer a lot more than job opportunities, it is important to recognize that the expansion of job markets makes everything else possible. A well-functioning labor market brings together people with varied, but complementary, knowledge and skills-- the preconditions for innovation. A well-functioning labor market makes possible every other urban attraction—symphonic orchestra, museums, art galleries, public libraries, well-designed public spaces, and great restaurants, among many others. In turn, these typically urban amenities require additional specialized jobs and attract an even more diverse population, which become the source of future innovations and a more interesting urban life.

Usually when a city's population is growing, it means that its labor market is growing. Still, there is a segment of any urban population (usually between 35 and 50 percent) that does not participate directly in the labor market. Statisticians rightly call the non-active segment the "dependent" population. Its members—retired people, infants, students, prison inmates, etc.—are not part of the labor market and participate in the urban economy only as consumers.

People migrating from other cities once they have reached retirement age may be the cause of the growth of a few cities whose growth is more driven by consumer markets than by labor markets. These types of cities might become more common in the twenty first century with the projected aging of the world population. The retiree population of these cities would be expected to consume a lot of services in health care facilities, restaurants, and entertainment venues. The growth of these "retiree" cities would then be caused by the dual effect of not only the retirees' migration, but also the migration of additional workers to staff the services required by the retirees. These retiree cities would not require spatial concentration and are unlikely to create much economic dynamism. The eventual growth of retiree cities is the only exception to growth created by the efficiency of large labor markets. And, of course, the retirement income of retirees will have to have been generated by efficiently working labor markets in other large cities.

LARGE LABOR MARKETS ARE MORE PRODUCTIVE THAN SMALLER ONES

Economists have convincingly demonstrated the productivity advantage of larger cities over smaller ones. Large cities generate scale economies that allow enterprises to reduce their costs by increasing output, thereby reducing costs per unit. Scale economies are only possible in cities with a large labor market. When many related activities are located in close proximity, they generate what economists call "knowledge spillovers." New ways of doing things in one firm are soon imitated by other firms and

eventually by other sectors as a result of the proximity and close contact between workers of different firms and sectors within the urban economy. For instance, the first users of electronic spreadsheets in the early eighties were mostly accountants and financial analysts. The use of spreadsheets soon became common in all sectors of the economy, but the spillover occurred first in large cities. Knowledge spillovers are responsible for agglomeration economies, i.e. increase in productivity due to the rapid dissemination of new ideas in areas where large numbers of workers are in close contact.[1] Agglomeration economies also result from a lowering of transaction costs in larger cities because of the proximity of competing suppliers and consumers.

Economic literature linking the wealth of cities to spatial concentration is quite abundant and is no longer controversial in academic circles. National accounts show that the output share of large cities is always much higher than their share of the national population. The 2009 World Bank Development Report "Reshaping Economic Geography," and the report of the Commission on Growth and Development, "Urbanization and Growth" published the same year, exhaustively summarize and document the theoretical and empirical arguments justifying the economic advantage provided by the spatial concentration of economic activities in large cities.

But if larger cities are more productive than smaller ones, why are large cities not growing faster than small ones? And why do many households and firms choose to remain in or even move to smaller cities when they could instead settle in the more productive environment provided by larger cities?

THE PROPORTION OF SMALLER CITIES TO LARGER ONES STAYS CONSTANT OVER TIME; ON AVERAGE, ALL GROW AT ABOUT THE SAME RATE

Data on city size distribution by country or by region show that the proportion of small to medium and large cities stays about constant over time. When households decide to migrate and firms decide to select a location for a new enterprise, they are as likely to choose a small city as a larger one.

The American economist Vernon Henderson, who pioneered work on the growth rate and size distribution of cities in various countries, shows the regularities found in the distribution of city size across countries, with the exception of anomalies in the former Soviet Union and China. In his book Planet of Cities (2012), Shlomo Angel summarizes previous studies on the subject and addresses the issue of worldwide city size distribution. Angel based his analysis on a reliable worldwide database. His conclusions confirm previous, less exhaustive studies:

- The size distribution of cities by continent follows Zipf's law, which states that the size of a city's population is inversely proportional to its statistical rank, such that if cities are ranked by decreasing size, the second largest city is half the size of the largest, the third largest city a third the size of the largest, etc.

- On average, large cities, as a group, are growing at about the same rate as medium and small cities in the same countries or regions. It seems that cities' growth rates follow Gibrat's law of proportionate effect, which says that the size of a city is not an indicator of its future growth rate—that is, cities' growth rates are random, with the same average expected growth rate and same variance. This is why Zipf's law is preserved over time.

In any given region, the distribution of cities of various sizes therefore remains stable. Larger cities keep growing, but on average, so do smaller cities. This seems paradoxical given that larger cities are more productive than smaller ones. However, larger cities do not play the same economic role as smaller cities. They complement each other's activities. The increased productivity of larger cities is therefore linked to the existence and growth of smaller cities. In turn, smaller cities' economic growth is dependent on larger cities' innovations and inventions.

SOME CITIES KEEP GROWING WHILE OTHERS DON'T

Small cities do not always grow into larger cities. The rate of population growth is determined by economic opportunity, which in turn is largely determined by the comparative advantage given by a city's location and its population's capacity for innovation. But the economic advantage provided by location

1 The internet is certainly able to spread knowledge quickly without requiring spatial concentration. However, the impact of the internet in disseminating knowledge might be similar to books: it makes knowledge available quickly and cheaply but it doesn't replace the serendipity of a random meeting of people with similar interests.

is not necessarily permanent; it may increase, decrease, or even vanish with technological change. Being close to an obsidian mine might have been a decisive advantage for the early Middle Eastern cities described by Jane Jacobs, but that advantage disappeared when obsidian ceased to be the preferred material for tools and weapons. The Anatolian cities, whose economies had not been able to diversify into activities other than obsidian's craft and trade, inevitably shrunk and eventually disappeared. The dominance of New York as the United States' main eastern seaport was made possible by the comparative advantage provided by the Erie Canal. By the time railways made waterway transport obsolete, New York's population had accumulated such a high level of diversified, specialized skills that it continued to thrive without having to rely on the advantage conferred by proximity to the canal.

The history of the world's cities is full of examples of large cities dominating their regions for a time and then shrinking back to a smaller size or even into oblivion. In 1050, Cordoba, in the south of Spain, was the largest city in Europe with 450,000 inhabitants, followed by Palermo, Sicily, with a population of 350,000. By the middle of the fourteenth century, the population of both cities had shrunk to 60,000 and 50,000, respectively. In the eleventh century, Kaifeng in China was probably the largest city in the world, with 700,000 people, while Shenzhen was not even on the map. Today, Shenzhen has 10 million people, and over the past ten centuries, Kaifeng's population has barely increased to 800,000 people.

WHY DON'T HOUSEHOLDS AND FIRMS MIGRATE TO LARGER CITIES WHERE PRODUCTIVITY AND SALARIES ARE HIGHER?

In spite of the higher productivity to be gained, only some types of firms can benefit from moving to a larger city. Firms established in larger cities require higher capital and higher operation and maintenance costs than those located in smaller cities. Land and rents are more expensive in larger cities than in smaller ones. Distances traveled are longer, and the "congestion tax" is higher. In addition, not every enterprise can benefit from economy of scale or agglomeration economies.

Moving to a smaller city where land is cheaper and salaries are lower makes economic sense for firms whose activities require a lot of land and labor that is not particularly specialized. For instance, activities like furniture-making require a lot of land and easy truck access to transport the bulky materials necessary for the finished product. They require skilled, but not particularly specialized, labor. Furniture manufacturers, therefore, have no reason to relocate to a large city, where land and labor would be expensive and where moving bulky raw materials and finished products in and out of the factory would be inefficient and costly. These types of firms would tend to locate their manufacturing activities in smaller cities. However, furniture makers may require innovative designers who may not be found in smaller cities. In such cases, they may need to subcontract the design of furniture to a firm located in a large city, where talented designers are more likely to be found and where agglomeration economies and idea spillover, both important for a design firm, are also more likely to occur. Firms such as furniture makers can carry out their highly specialized and innovative activities—design and marketing, for instance—in large cities. Their repetitive and land intensive activities (manufacturing) can be carried out in smaller cities. In this way, they can enjoy the advantages of both a large city (innovation, specialized labor) and a smaller city (low land and labor costs).

Speedier and cheaper communication over the past twenty years, including the expansive adoption of the Internet, has contributed to the splitting up of large firms into various departments located in cities of different sizes. Specialized tasks (design, marketing, export promotion) can take place in larger cities, where the requisite innovators and specialized labor force are more likely to be found, while more routine manufacturing can take place in smaller cities. In addition, large firms increasingly subcontract tasks to smaller firms often located in different areas. The same factors have likely led to the growth of both large and small cities, allowing them to specialize in what they do best. Similar rationale could be applied by workers who prefer either to remain in large cities or to migrate to smaller cities: the latter have lower salaries but also lower rents, lower commuting costs and, often, a better natural environment.

Some services are likely to thrive in both large and small cities and are thus not dependent upon the advantage provided by location. Fast food restaurants, barber shops, and laundry services, for instance, follow the labor force of more specialized firms wherever they locate, contributing to the even growth rate

of small and larger cities.

THE PLANNER'S ANTI-BIG-CITY BIAS AND THEIR ATTEMPTS TO "BALANCE GROWTH"

Cities grow when their labor markets expand. This economic expansion is usually the result of a comparative advantage gained from location or an unusual concentration of skilled workers. The rate of a city's population growth cannot be attributed to advance planning; rather, it is due to a combination of exogenous and endogenous circumstances. To the chagrin of urban planners, a city's growth rate over the mid or long term is largely unpredictable, and it is futile to pretend it is the result of careful planning.

Planners and city managers have traditionally been concerned about the unplanned growth of large cities because of the complexity involved in managing them, the difficulty integrating poor migrants from rural areas into city life, and an instinctive aversion to anything that seems "undesigned." Planners have even described the growth of large, dominant cities like Paris or Mexico City as "cancerous."

The aversion to unplanned or to "asymmetrical" spatial patterns is quite apparent in most urban planners' approach. Some planners look at a country's map and observe that some regions contain many cities while others have only a few. They incorrectly conclude that this "imbalance" represents an inequity due to parasitic urban activities or to other market failures. In their view, it then becomes the responsibility of the government to modify the imbalance and to remove this regional inequity through national spatial planning, with the declared objective of restoring a regional symmetry in the spatial distribution of cities. However, the assumption that national spatial planning can modify the distribution of urban populations in order to reach a new, planner-designed spatial equilibrium is false.

Cities that have a decisive comparative advantage, either because of their location or because of their large specialized and innovative labor pool, are likely to grow. People migrate toward cities where economic and social opportunities are best, from their point of view. The idea that a city's economic and demographic growth rate is due to parasitic activities occurring to the detriment of other cities is fanciful—unless, of course, piracy, smuggling, or other unlawful, predatory activities are its main cause.

The assumption that the preparation of national or regional plans would result in a predictable urban growth rate for each individual city in a region is also demonstrably false. Unfortunately, in many countries this common planning conceit has resulted in misallocated public investments and regulatory impediments that have decreased cities' productivity. In reality, planners have very little influence on city size distribution and city growth rates, unless they take active, targeted measures to destroy the urban economies of the cities that have grown "too large." The Khmer Rouge's urban policy applied to Cambodia in the late seventies was an extreme and brutal example of planners' temporarily successful attempt to manage city size.

As a consequence of the planners' hubris about the necessity of managing city size, many regional plans designed in the second half of the twentieth century have promoted regulatory limits on the growth of large cities. These were combined with planned infrastructure investment aimed at stimulating the growth of smaller cities, which were deemed more manageable. A seminal and influential paper published in 1947, calling for a national plan for the spatial development of France, was titled "Paris and the French Desert," implying that the growth of Paris had occurred at the expense of the French provincial towns. Anyone familiar with French provincial towns would recognize their comparison to a barren desert as a slightly comical but gross exaggeration. While it is possible that the centralization tendency of successive governments since the French revolution of 1789 contributed to Paris' rapid growth, the problem, if it exists, lays with the political system. Preventing investments in the capital while directing large resources towards provincial towns is unlikely to change a city size hierarchy caused by an idiosyncratic political system whose reforms fail to allow for more decentralized decisions.

In 1956, the Indian government adopted a policy dictating that new industries should locate in "backward areas." At the same time, it prevented further development of manufacturing in large cities.[2] Through this policy, the government committed

2 Industrial Policy Resolution of the Government of India adopted in 1956 under the provisions of the Industrial Development and Regulation Act, 1951.

itself to correcting regional imbalance and to preventing further industrial growth in cities of more than 500,000. In 1988, the negative impact of the policy was compounded by an interdiction that new industries locate less than 50 kilometers from cities with a population of more than 2.5 million and within 30 kilometers of cities with a population between 1.5 million and 2.5 million. As one can easily imagine, the latter policy didn't prevent the growth of industries in successful cities like Mumbai or Bangalore with a population significantly bigger than 2.5 million; it just made it more expensive for these industries to expand there. More tragically, it diverted scarce government infrastructure resources to regions with weak potential while starving large metropolitan areas of desperately needed investment, even though this was where most people were migrating. The current poor performance of public infrastructure – roads, transport, sewer, drainage, and power – in major Indian cities is in part the result of misguided national spatial policy conducted over the last 50 years.

If planners are unable to control the growth rate of cities, how do I explain the successful growth of entirely planned cities like St Petersburg, Brasilia or Shenzhen, created ex nihilo by powerful rulers as diverse as Peter the Great, Juscelino Kubitschek and Deng Xiao Ping? These planned cities became large and successful as the result of two main factors. First, each city's location was selected because of a geopolitical necessity[3] and not because of an abstract planning concept. Second, each city had the strong political and financial support of a powerful ruler of a very large country. This support allowed these cities to sink large amounts of money in infrastructure investment without having to borrow and tax their own initially fledgling economies. These political and financial conditions are not typically met in the regional plans routinely prepared by technocrats. Politicians created new capital cities like Washington (USA), Canberra (Australia), Islamabad (Pakistan), Abuja (Nigeria), and Naypyidaw (Myanmar). All are capitals of large countries and were initially without economic base beyond the national government bureaucracy. The "cost is no object" concept presided over their construction and insured their initial survival as they were financed by taxes paid by the rest of the country. Eventually, a more diversified labor market grafted itself onto the government activities.

During the 70 years of the Soviet Union, planners had the opportunity to decide which cities were going to grow and which were not. No city could grow without supporting resources allocated from the Gosplan,[4] a specialized ministry in Moscow. The government had the means to enforce the movement of people, and migrations toward selected locations within the Soviet Union's vast hinterland were often involuntary. Many new cities were created for various political or perceived economic reasons, but none of these cities was the result of voluntary migration of firms and people toward areas that represented better opportunities.

In 2010, traveling to Moscow as a consultant, I was asked by the ministry of construction to provide advice on how to proceed for the "closing" of 60 cities that the Russian government had identified as no longer viable. The government could not continue to support social services and infrastructure in cities that had been abandoned by the large monopolistic industries that were originally their raison d'être. The labor market had disappeared, but the laborers were still there; "closing" the cities would entail another forced migration of several million people. Apartments that had recently privatized represented most people's only asset; however, because the apartments had become worthless, their owners were unable to move. The closing of cities in Russia is an extreme illustration of the danger of creating cities based on "planning" criteria without economic base and of using forced migrations or heavy subsidies to promote urban growth.

WHY PLANNERS SHOULD NOT TRY TO ALTER THE DISTRIBUTION OF CITY SIZES

There is a "natural" equilibrium reached, within countries and regions, between the size of the population and the firms choosing to settle in small, medium, and large cities. This equilibrium is created by the accumulated decisions of firms and households to "vote with their feet," thereby selecting to move to

3 St. Petersburg was created by Peter the Great to open a port toward Western Europe in order to gain new technology through trade and cultural contact. Brasilia, created by president Juscelino Kubitschek of Brazil, was part of an effort to develop the center of the country and to make the capital more politically independent from the large cities of the coast. Deng Xiao Ping's main objective in creating Shenzhen was to graft and test within a limited perimeter some of the market institutions and technical know-how used across the border by his Chinese compatriots in Hong Kong.

4 In Russian: "Gosudarstvennaya Planovaya Comissiya" State Planning Committee, in charge of the Soviet economy.

the cities that will grow and to leave the cities or villages that have less potential. The spontaneous spatial equilibrium created by the sum of uncoordinated, individual decisions illustrates what I call the principle of "order without design."

With the exception of the few geopolitical examples mentioned above, planners have no credible rationale for intervening directly in the location and growth rate of cities. Planners should no more "encourage"—a favorite word in the planning literature—the growth of large cities at the expense of smaller cities than they should discourage their growth, as they have done in the past. History has shown that these types of planner initiatives are bound to fail or, worse, to create serious diseconomies, making a country poorer. The size of a city does not make it automatically more productive—large, dense refugee camps are less productive than small towns, although they may provide shelter to several hundred thousand inhabitants. A city only becomes more productive when its growth is generated by the aggregated decisions of many firms and households to migrate toward it and when those firms and households have the freedom to either stay put or to migrate elsewhere. These decisions should not be altered either by coercive regulations or by government investment incentives. Because households and firms have the most invested in the successful outcomes of their moves, we have to trust that the majority of them have enough information to justify their migration choices. Planners, in contrast, lack the information about the economy of individual firms and households that would be necessary to make informed decisions about the advantages and disadvantages of locating in a small, medium, or large city.

We will see below that planners' "optimum design" hubris is not limited to the size and location of cities. Within cities, too, they attempt to regulate both where households and firms should locate and the quantity of land and floor space they should consume. As we will also see, planners do have a crucial role to play in the development of cities, in particular with the development of their infrastructure. However, it must be clear that allocating land and floor space in specific locations is not their role.

THE CITY'S PRODUCTIVITY DEPENDS ON ITS ABILITY TO MAINTAIN MOBILITY AS ITS BUILT-UP AREA IS GROWING

> *Mobility, which I would argue is the centerpiece of our national productivity, is neither highly valued nor understood among public officials.*
>
> --Alan Pisarski, 2006

> *Good management can therefore increase indefinitely the «optimal» size of a city.*
>
> --Rémy Prud'homme & Chang-Woon Lee, 1998 , "Size, Sprawl, Speed And The Efficiency Of Cities"

Larger labor markets are made possible by an increase in the mobility of people and goods. Advancements in urban transport technology have improved the mobility of people and goods, which in turn, has contributed to the growth of large cities during the last 150 years. Improvements to transport technology have also made possible the spatial concentration of both people and fixed capital. Economists describe fixed capital as factories, office buildings, houses, apartment buildings, community facilities, and infrastructure. In the last fifty years, an increasing return to scale and agglomeration economies as a result of this spatial concentration has led to the emergence of mega-cities.

The potential economic advantages of large cities are reaped only if workers, consumers, and suppliers are able to exchange labor, goods, and ideas with minimum friction and to multiply face-to-face contacts with minimum time commitments and cost. The productivity of a city with a growing population can increase only if travel between residential areas and firms and among firms' locations remains fast and cheap. As a city grows, it is therefore important to monitor mobility by comparing how average travel times and transport costs vary over time.

THE DAILY HUMAN TIDE: THE CHALLENGE OF MOVING PEOPLE AND GOODS

The necessity of managing urban growth rather than to trying to slow it down is finally being understood by mayors, city managers, and urban planners. An increase in city size is not the only condition necessary to increase productivity. Productivity increases with city size only if the transportation network is able

to connect workers with firms and providers of goods and services with consumers. This connectivity is difficult to achieve in large cities; it requires consistency among a number of factors: land use and investments for transport networks, pricing decisions for road use, parking, and transit fares, and collection of local taxes and user fees. In their 2009 book, aptly titled "Mobility First," Sam Staley and Adrian Moore describe in detail the cross-disciplinary reforms in road and urban transport design and in road pricing, among other things, that would be required to maintain mobility in cities in the twenty first century.

Failure to manage urban transportation in a manner that maintains mobility results in congestion. Congestion decreases labor mobility and productivity and is in fact avoidable in large cities. Its presence represents a failure on the part of city managers. Congestion has a double-negative effect; it acts as a tax on productivity by tying down people and goods, and it degrades the environment and increases greenhouse gas emissions. It is conceivable that in the future some mismanaged large cities may reach a level of congestion and pollution the combined negative effects of which could offset the economic advantage of spatial concentration. These cities would then stop growing, and the economic advantage of spatial concentration would be taxed away by congestion and an unsafe environment.

Given this potential scenario, the positive economic effect of agglomeration must be very powerful in cities like Bangkok and Jakarta where urban productivity continues to offset the price of chronic congestion. It is difficult to assess a city's productivity just by visiting, but traffic congestion is clearly apparent on even a short visit to either city. But, even the spectacular and semi-permanent traffic congestion in these economic powerhouses, as well as in Beijing, does not cancel the productivity advantage of their large, human spatial concentrations.

Maintaining mobility while a city's built-up area and its population are growing is not easy. During centuries of urban development, walking was an adequate means of urban transportation. At the beginning of the industrial era, one could walk from the periphery to the center of each of the largest European and American cities in less than an hour. In the 1830s, the area occupied by each of the three largest cities in the Western world—Moscow, London, and Paris—was less than 60 square kilometers. Today, by contrast, the built-up area of the largest cities covers several thousand square kilometers each. In large modern cities, mobility can be maintained only with an elaborate system of transport, usually combining private and public modes of travel. The frequency of face-to-face contact among the millions of people living in large cities depends entirely on the efficiency of a motorized urban transport system.

THE SPATIAL PATTERN OF LABOR MOBILITY

Every day in urban areas, the millions of people who constitute the active population leave their homes to travel to their places of work, usually located in parts of the metropolitan area other than the ones in which they live. Every evening these same people come back home. In between, they may drop their children at school, stop to buy groceries, or meet friends at a coffee shop. These daily trips originate and terminate at people's homes but also include their workplaces and any number of amenities—restaurants, museums, supermarkets, cinemas, etc. The commute constitutes a daily tide moving back and forth in a predictable manner, with peak hours and ebb times, from home to workplace and amenities and back.

In addition to trips originated in residential areas by commuters and consumers, economic activities generate freight trips between firms' locations and increasingly, with the growth of e-commerce, from firms directly to their consumers in residential locations. Firms in large cities need to be constantly supplied both with merchandise to be sold in shops and with the materials and parts to be used in manufacturing. These freight trips do not follow the same patterns as commuting trips and are often ignored by planners. In a typical city in an OECD[5] country, freight trips may represent 10 to 15 percent of the total vehicle kilometers traveled (VKT). When roads are congested, the tax on productivity affects both labor and freight mobility.

A city's economy is therefore dependent on the repetitive flow of commuting and freight trips. If by chance a snowstorm, a flood, or a public transport strike forces these trips to be canceled, the city's economy freezes immediately and remains frozen until the daily commuting tide resumes.

5 The OECD (Organization for Economic Co-operation and Development) is a club of 34 rich countries with high human development index committed to market economy and democracy

COMMUTING TIME AND COMMUTING COST LIMIT THE SIZE OF LABOR MARKETS

Obviously, there are limits to the money and time that workers are willing to spend on commuting. These limits impose a constraint on the commuting distance, and as a consequence, on the size of the urban labor market. For very low-income workers—whose income is nearly entirely devoted to food and shelter—the cost of commuting is a more binding constraint than the time spent commuting. As a household's disposable income increases, the cost of transport becomes a smaller fraction of income—typically less than 15 percent, and the time spent commuting becomes the major constraint for workers, limiting the size of the labor market. Because the time spent on commuting is a dead loss for both individuals and employers, the size and efficiency of a labor market depends on how short, cheap, and comfortable the commute is. The maximum cost in time and cash that workers are willing to spend commuting will therefore dictate the size of the labor market and, by extension, the productivity of a city. Urban commuting surveys indicate that the median travel time across cities and countries is, and for a long time has been, remarkably stable, with an approximate mean of 30 minutes each way. Only a small percentage of commuters in large cities have a total commuting time of more than one hour per day. In 2009, the mean travel time in US metropolitan areas was 26 minutes; however, in New York, the largest US metropolitan area, with 19 million people, it was 35 minutes. Figure 1 compares the distribution of commuting travel time (one way) between an average of US metropolitan areas and Gauteng, the South African metropolitan area that includes Johannesburg and Pretoria (12.3 million people in 2011). In spite of the difference in their economies, urban structures, cultures, and topographies, the majority of commuters, approximately a third in both Gauteng and US cities, spend 15-29 minutes of travel time. The percentage of commuters who spend less than 15 minutes of travel time is significantly higher in the US cities, and the percentage who spend either 30-59 minutes or more than 60 minutes is significantly higher in Gauteng.

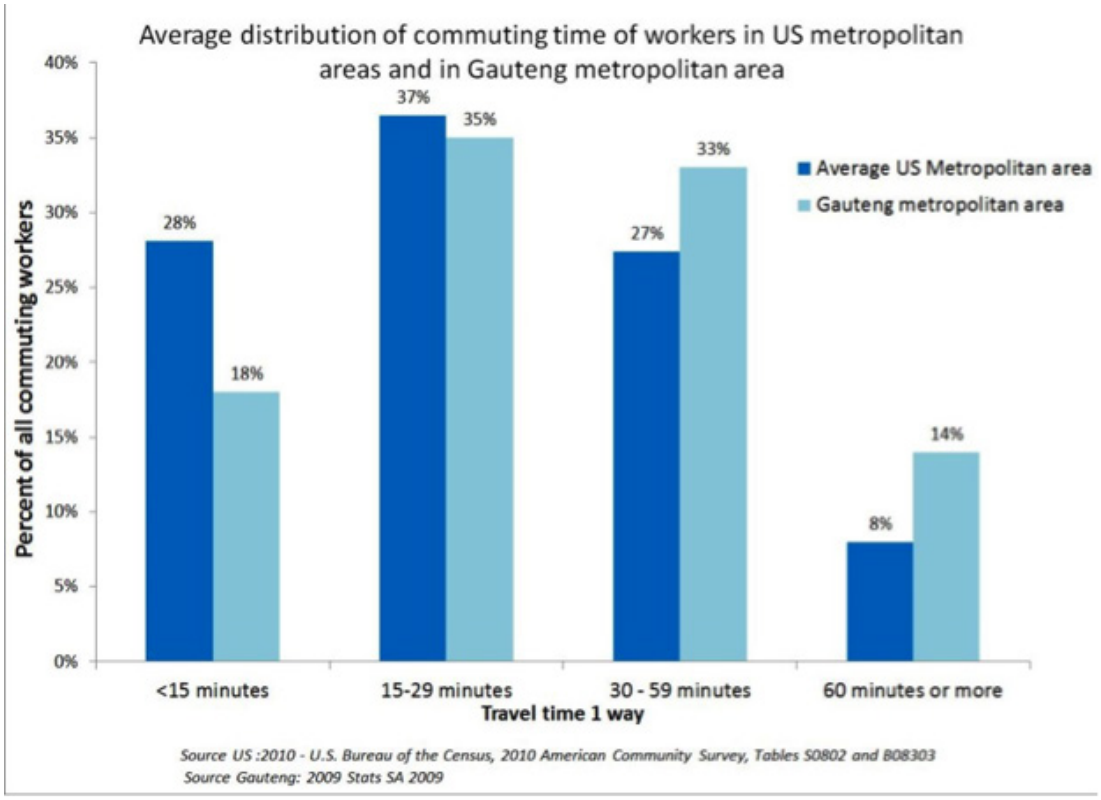


Figure 1: Distribution of commuting travel time in US cities and in Gauteng (South Africa)

I consider an hour's commute (one way) to be the absolute limit when defining the spatial extent of a labor market. For a worker, the number of jobs that can be reached within a travel time of less than one hour defines the size of his labor market.

One could argue that the number of jobs for which a particular worker would be qualified or in which he would be interested would be much smaller than the total number of jobs accessible within an hour of his home. This is true, but increasingly specialized jobs have led to a greater dependence on the physical proximity of people with other specialties and skills. In the service industry in particular, which constitutes a large portion of the jobs in large cities, large arrays of skills are needed in close proximity. For instance, a lawyer who specializes in European agriculture regulations would not be very productive if she were surrounded only by people with the same skills. To be effective, she will have to be in close contact with other specialists in taxation and import tariffs, and she will need to engage the services of workers who will fix her computer, clean her office, deliver coffee to the board room and prepare and serve the food that she will eat at lunch. In the same way, an unskilled industrial worker is likely to work in a factory requiring a large array of workers specialized in electronics, mechanics, labor law, insurance and so on.

The idea that a lawyer needs to access only the area where lawyers are likely to work while an industrial worker needs to access only industrial areas no longer corresponds to the reality of job distribution in a large modern city. Our European agriculture regulations specialist may only be interested in a few jobs, and these few jobs are likely to be randomly distributed among many other jobs. For this reason, the larger the total number of jobs, the greater the chances that a few very specialized jobs will be among them. In addition, the larger the number of jobs accessible within an hour's commute, the better the ability to change jobs when desired. This type of labor mobility – the ability to change jobs within different economic sectors – benefits both individual workers and the city economy by redistributing labor where it will provide the most benefits.

THE EFFECTIVE SIZE OF THE LABOR MARKET DEPENDS ON TRAVEL SPEED AND THE SPATIAL DISTRIBUTION OF JOBS

The impact of travel speed, size of labor markets and jobs' spatial distribution on urban productivity has been convincingly demonstrated for European and Korean cities by Prud'homme and Lee[6] and for US cities by Melo, Graham, Levinston and Aarabi.[7] Prudhomme and Lee's paper titled "Size, Sprawl, Speed and the Efficiency of Cities" shows that productivity per worker is closely correlated to the average number of jobs per worker that are reachable in less than 60 minutes. In Korean cities, a 10% increase in the number of jobs accessible per worker corresponds to a 2.4% increase in workers' productivity. Additionally, for 25 French cities, a 10% increase in average commuting speed, all other things remaining constant, increases the size of the labor market by 15 to 18%. In the US, Melo et al. show that the productivity effect of accessibility, measured by an increase in wages, is correlated to the number of jobs per worker accessible within a 60-minute commuting range. The maximum impact on wages is obtained when the number of jobs accessible within 20 minutes increases; within this travel time, a doubling in the number of jobs results in an increase in real wages of 6.5%. Beyond 20 minutes of travel time, worker productivity still increases, but its rate decays and practically disappears beyond 60 minutes.

Both papers demonstrate that workers' mobility – their ability to reach a large number of potential jobs in as short a travel time as possible, is a key factor in increasing the productivity of large cities and the welfare of their workers. Large agglomerations of workers do not insure a high productivity in the absence of worker mobility. The time spent commuting should, therefore, be a key indicator in assessing the way large cities are managed.

As Prud'homme writes in his paper: "[...] the benefits associated with city size are only potential, they are contingent upon the quality of management. City size would therefore define an efficiency frontier, with effective efficiency often significantly below this frontier." The "quality of management" as defined by Prud'homme is in a large part the ability of the local government to adapt the transport system to the spatial structure so that workers can access a maximum number of jobs in less than 60 minutes of travel time.

The effective size of a city's labor market is, therefore, not necessarily equal to the number of jobs available within a metropolitan area but to the average number of jobs per worker

6 Prud'homme and Lee, 1998, "Size, Sprawl, Speed and the Efficiency of Cities". L'OEIL, Observatoire de l'Économie et des Institutions Locales, IUP — Université de Paris XII

7 Patricia Melo, Graham, Levinson and Aarabi, 2013, "Agglomeration, Accessibility, and Productivity: Evidence for Urbanized Areas in the US" paper submitted to the Transportation Research Board, Washington DC.

accessible within a one hour commute. Depending on the speed of the transport system, the effective size of the labor market could be equal to the total number of jobs available in a city or to only a fraction of it. The location of workers' residences relative to their jobs and the speed of transport will determine the effective size of a labor market and, therefore, the additional productivity that could be gained by the scale and agglomeration economies described earlier.

I will illustrate the relationship between speed of transport, effective size of labor market and spatial distribution of jobs by using a schematic representation of a city as shown on Figure 2 Imagine a linear city where workers' residences are spread evenly between a and e. Jobs are concentrated in only three locations b, c and d. Each location contains 1/3 of all jobs. The speed of transport is uniform within the city and is represented by the arrows showing travel time between different points. It takes two hours to travel from a to e, on opposite outer edges of the hypothetical city.

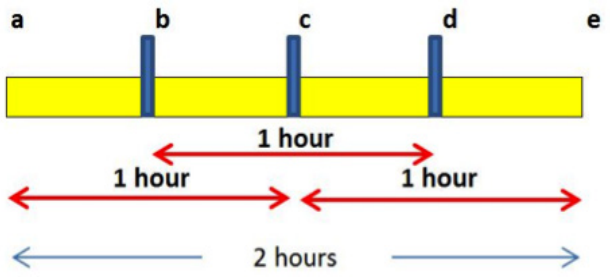


Figure 2: Distribution of workers residence and job location in a hypothetical linear city

Workers living between b and d can reach 100% of the jobs in less than one hour, but workers living between a and b can reach only the jobs located in b and c in less than one hour; jobs located in d are out of reach for workers living between a and b. Similarly, workers living between d and e can reach only the jobs located in c and d; the jobs located in b are out of reach. As a consequence, 50% of the workers (those living between b and d) have access to 100% of the jobs in less than 1 hour of travel time while the other 50% (those between a and b and between d and e) only have access to 2/3 of all the jobs. Therefore, the effective size of the labor market represented in Figure 2 is only 83% of all the jobs available in the city: 50% of 3/3 + 50% of 2/3 = 83.3%. If the speed of transport could be increased so that one could travel from a to d and from e to b within one hour, rather than the 90 minutes each trip currently takes, then the effective size of the job market would be 100% of all jobs available (100% of 3/3 = 100%).

In a less schematic city, the effective size of labor markets can be calculated as follows: Let us assume that the city is divided into polygons identified by their number *i*; then, the effective size of its labor market can be expressed by:

$J = \Sigma(w_i j_i)/\Sigma n_i$

where:

J is an indicator of the effective size of the labor market expressed as the average % of total jobs accessible in less than one hour per worker;

w_i is the number of workers living in location *i*;

j_i is the number of jobs accessible within one hour travel time of location *i*;

n_i is the number of jobs in location *i*;

This type of calculation would have been prohibitively labor intensive before the availability of GIS technology, but it is now quite feasible to update this indicator regularly. Different transport modes and networks could be tested for their potential impact on the effective size of the labor market.

The effective size of a labor market depends on commuting travel speeds and the relative location of workers' residences to their jobs. This dependence may be illustrated in a less abstract way by representing a city as a two dimensional object, rather than the one dimensional, linear representation of Figure 2, and by showing alternative arrangements for travel speeds and job locations.

Figure 3 shows a schematic representation of an urban built-up area, represented by a circle. Within this circle, smaller red circles represent job locations. Horizontally, I have shown three types of spatial distribution for jobs: monocentric, where all jobs are concentrated in a central business district (CBD); polycentric,

where jobs are concentrated within three clusters; and dispersed, where jobs are uniformly distributed within the built-up area. For each pattern of job distribution, an arrow shows the maximum travel distance that a worker can cover in one hour from the outer edge of the urban area. The different arrows' lengths correspond to different travel speed.

We will see how different commuting speeds have an impact on the effective size of the labor market depending on the spatial distribution of jobs.

access to all jobs within the built-up area, but workers living on the periphery have access to only a fraction of the total jobs available in the city. In this case, then, the implied productivity of a large labor market is not fully realized. A decrease in commuting travel speed fragments large labor markets into smaller ones and results in a decrease in urban productivity. Increasing travel speed decreases the difference between the effective labor market (the number of jobs accessible within an hour commute) and the nominal labor market (the total number of jobs in a metropolitan area.)

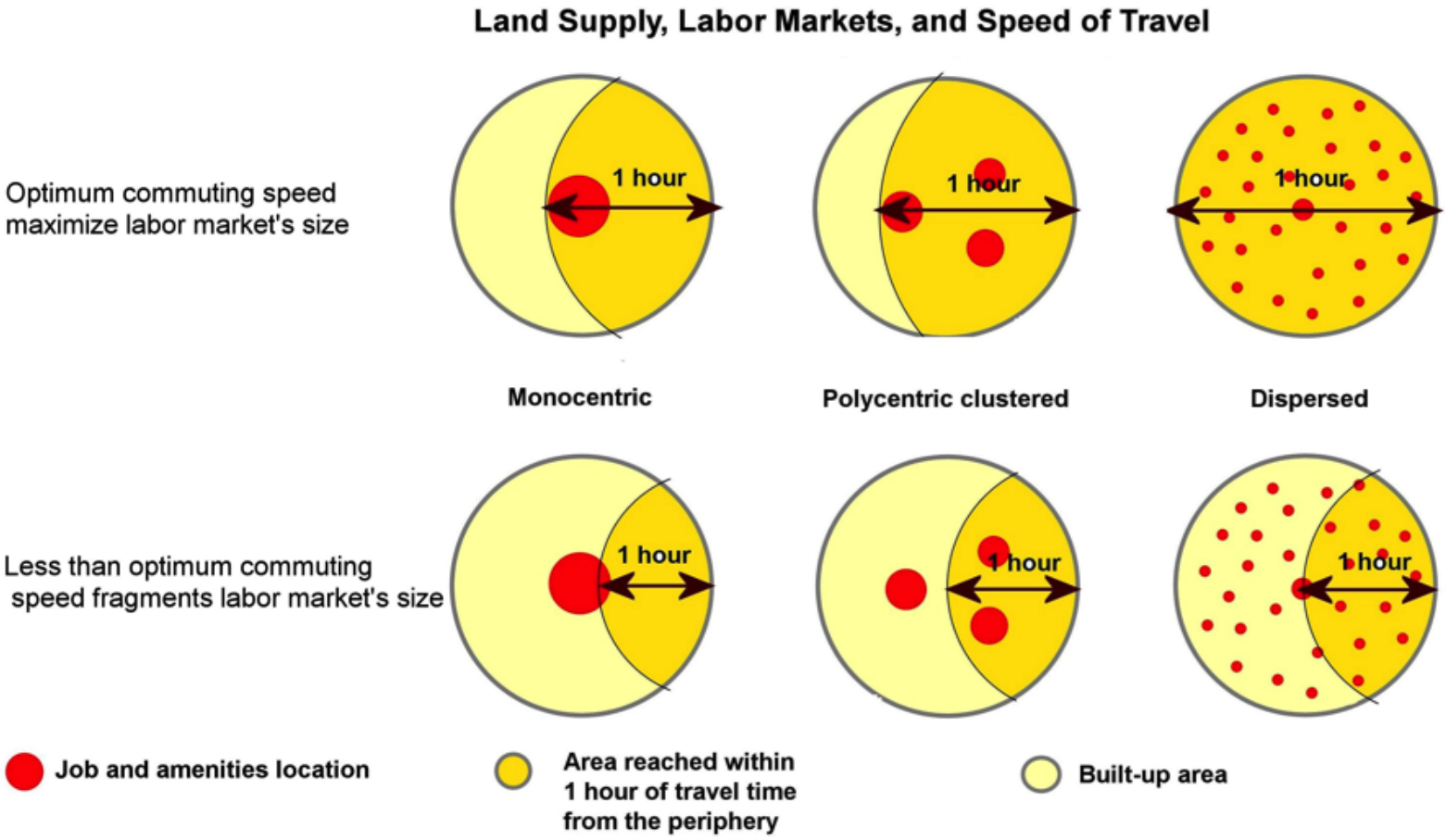


Figure 3: Labor markets, speed, and job location

In the three graphs on the top row of Figure 3, I have adjusted the speed of travel to allow for accessibility to all jobs in less than one hour. On the bottom row, at a lower travel speed, the workers residing on the periphery can access only a fraction of the jobs in less than one hour. The labor market in this case is fragmented and is therefore less efficient than the unified one represented in the top row. Workers who live in a more central area may have

For a given built-up area, the pattern of job distribution is important in defining access to the labor market. When jobs are clustered in a CBD, the distance from all jobs to all residential locations is much shorter than it is when jobs are randomly distributed within the built-up area. This does not necessarily demonstrate that the CBD model is the most efficient pattern or

that it will ensure full access to the labor market for everyone. It is true that a centrally located CBD[8], containing one hundred percent of all jobs, would decrease the distance from one's residence to one's job for everyone. However, the size of labor markets is limited not only by distance but also by travel time. Therefore, speed of transport (distance/time) is the key parameter in allowing access to the maximum number of jobs.

The convergence of all commuting routes[9] toward a CBD usually creates congestion and slows the speed of travel. In contrast, when jobs are dispersed in suburban locations, there is no convergence of routes, and transport speed is usually faster. The average surface transport speed in the center of Paris (within 5km of City Hall) is about 12 km/h; rush-hour speeds in the suburbs (20 km from City Hall) are about 50 km/h. Thanks to improvement in GPS technology, we are now able to check variations in rush hour speeds on the internet in real time for many cities in the world.

In areas where the major road network was originally designed for a monocentric city, commuting routes from suburb to suburb may be less direct than they should be; this is the case in Paris, Atlanta and Shanghai. Initially, suburb to suburb commuting routes may have to follow minor roads and may include awkward major road crossings. There is usually a long time lag before a municipality is able to adjust the design of a major road network from monocentric to a grid-like pattern that will better serve new, emerging routes among suburbs.

It is outside the scope of this paper to further discuss the influence of different transport modes – cars, public buses, or subways – on transport costs and travel time for various types of urban spatial structures in which population and job densities are distributed differently within the built-up area. The schematic representation of spatial structure in Figure 3 is very crude, but it clearly demonstrates the impact of speed of travel and job location on the effective size of a labor market.

8 Not all CBDs are located at the center of the built-up area. Mumbai's CBD, for instance is located at the Southern tip of a peninsula while the centroid of the built up area is located more than 15 km to the north. This situation is relatively rare, as market forces tend to "re-center" the CBD toward the center of gravity of a city's population.

9 The term "commuting routes" defines an itinerary from one place to another, which may have to follow minor roads in the absence of major roads linking the point of origin to the desired destination. Commuting routes are therefore independent from the existing design of major roads which may often converge toward a central point.

In cities where job accessibility has been measured, the number of jobs accessible by commuting time shows large variations. For instance, Prud'homme noted that in Seoul, "in 1998 the average worker has in 60 minutes access to only 51% of all the jobs offered by the city; and the average enterprise has 56% of all the workers at less than 60 minutes." The additional subway lines built since that date must have increased the effective size of the labor market in Seoul. A comparison of car commuting across US cities in 2010 calculated by David Livingston[10] shows amazing differences in accessibility between US cities (Figure 4). Within a 30 minute drive, 2.4 million jobs can be accessed in Los Angeles compared with 0.6 million in Atlanta. However, 4 of the 5 cities represented in figure 4, allow access to all jobs within 60 minutes.

THE LABOR MARKET SHAPES THE PATTERN OF COMMUTING TRIPS

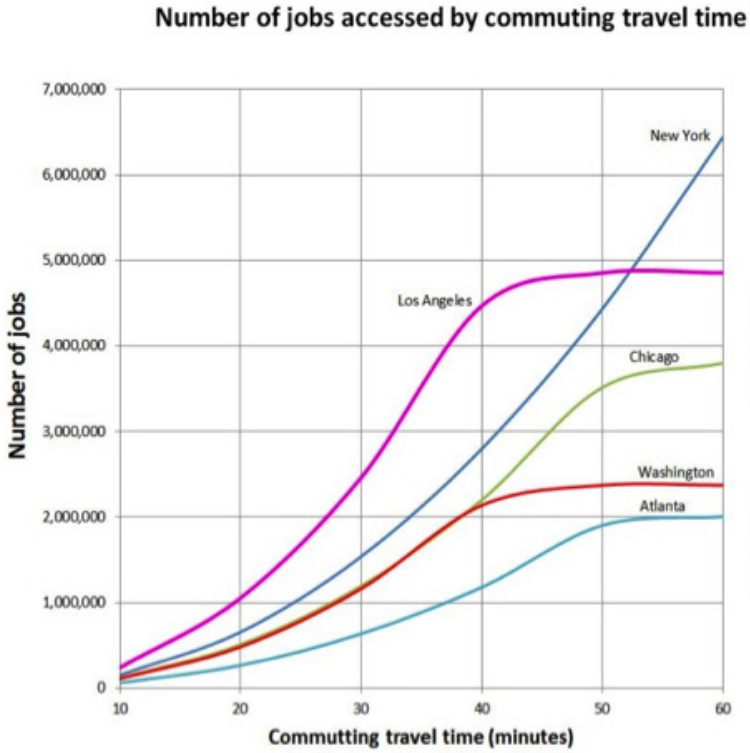
As we have seen in Figure 3, a majority of jobs may be concentrated in a central business district or be clustered in several centers or be completely dispersed across a metropolitan area. Next, we will look only at the possible trip patterns that would allow the labor market to function within each of the following spatial distributions of jobs.

Figure 5 illustrates in a schematic manner the most usual trip patterns in metropolitan areas depending on the concentration or dispersion of jobs. There are three observed models of commuting route patterns, labeled from A to C on Figure 5:

A. The monocentric model– most jobs are concentrated in a dense Central Business District (CBD); trip routes follow radial roads and converge toward the CBD. Of course, no real city is ever strictly monocentric; a number of jobs are necessarily found inside residential areas, for instance in schools, dispensaries, gas stations and grocery stores.

   Monocentricity is really measured by degree rather than in absolute terms. A city where more than 50% of the jobs are located in the CBD is dominantly monocentric. To my knowledge, no metropolitan area with a population above 5 million meets this

10 David Levinson, "Access Across America," 2013, Center for transportation studies, University of Minnesota



Sources: David Levinson, "Access Across America", 2013, Center for transportation studies, University of Minnesota

Number of jobs reached by minutes commute

	10	20	30	40	50	60
New York	150,849	654,932	1,537,458	2,795,655	4,432,204	6,438,456
Los Angeles	237,203	1,052,716	2,458,111	4,467,004	4,852,354	4,852,354
Chicago	115,890	509,755	1,194,136	2,197,286	3,514,244	3,797,772
Washington	108,988	481,675	1,160,713	2,135,912	2,370,531	2,370,531
Atlanta	59,477	264,942	635,155	1,178,230	1,902,208	2,003,047

Percent of total number of jobs in the metropolitan area

	10	20	30	40	50	60
New York	2%	9%	21%	38%	61%	89%
Los Angeles	5%	22%	51%	92%	100%	100%
Chicago	3%	13%	31%	58%	93%	100%
Washington	5%	20%	49%	90%	100%	100%
Atlanta	3%	13%	32%	59%	95%	100%

Figure 4: Average number of jobs accessible by workers in various US cities

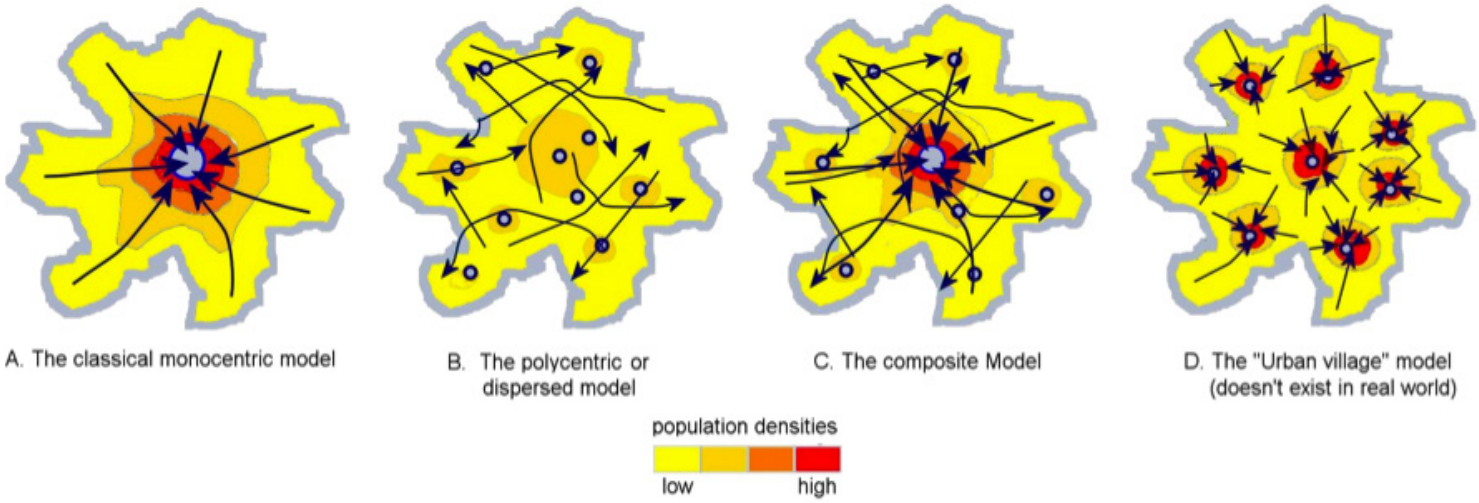


Figure 5: Possible trip patterns in metropolitan areas

criterion.

B. The polycentric or dispersed model – most jobs are concentrated in small clusters or completely dispersed among residential areas; trip routes are randomly distributed within the built-up area. If speed of transport allows it, some workers will commute from one edge of the metropolitan area to its opposite edge. As in the monocentric model, workers residing closer to the centroid of the built-up area are closer to all the jobs than are workers residing at the edge. Firms located closer to the built-up area centroid are also closer to all workers. However, because commuting speeds are usually not the same near the centroid and at the periphery, firms located close to the periphery might be accessible in shorter time by more workers than firms located close to the centroid. In part, this explains why firms do not cluster close to the centroid even though doing so would put them at a shorter distance from all their potential workers.

C. The composite model – a significant fraction of all jobs are concentrated (say, 30% for instance) in a dense CBD, but the majority of jobs are randomly distributed in the rest of the built-up area. Trip routes toward the CBD follow radial roads while trip routes toward dispersed jobs are randomly distributed but usually avoid the congestion of the CBD. This is the most usual pattern of trips in large cities in Asia and Europe.

There is also a fourth model of trips that doesn't exist in the real world but is very often presented in master plans as being a desirable alternative to the three trips' patterns described above. Because of the prevalence of this conceit in many urban master plans, this utopian alternative trip pattern, labeled D in Figure 5, needs to be discussed:

D. The so-called "Urban Village Model" – jobs are concentrated in many small clusters. In this model, there are many centers, but commuters travel only to the center that is closest to their residence. The trips toward each job cluster follow radial routes centered on each cluster and behave as if each cluster were an isolated, monocentric city. According to this model, a large city can be made up of a number of self-sufficient, small monocentric cities.

Unfortunately, the urban village model exists only in the mind of urban planners. Otherwise, it would be a very attractive model, which is why urban planners favor it, as it would not require significant investment in transportation or roads. Furthermore, it would dramatically reduce vehicle kilometers travelled (VKT) and, as a result, greenhouse gas (GHG) emissions. According to the proponents of this model, everybody could walk or bicycle to work, even in a very large metropolis. To allow a city to grow, it would only be necessary to add more clusters. The assumption behind this model is either that urban planners would be able to perfectly match work places and residences, or that workers and employers would spontaneously organize themselves into the appropriate clusters.

This model does not exist in the real world because it contradicts the economic justification of large cities: the efficiency of large labor markets. Employers do not select their employees based on their places of residence; neither do specialized workers select their jobs based on proximity from their residences. However, as I have postulated above, employees may be reluctant to accept a job located beyond a one-hour commuting time. This commuting time limit would not allow the creation of urban villages.

The "urban village model" implies a systematic fragmentation of labor markets within a large metropolis and does not make economic sense in the real world. A firm that would be satisfied to restrict the selection of its employees to the vicinity of its factory or office would not need to locate in a large metropolis where rents and salaries are higher. This firm could locate in a small town where the unspecialized workers it seeks could be recruited for a lower salary. In the same way, a worker living in a large city and looking for a new job would try to maximize job satisfaction, measured in part through salary, level of interest in the work and its compatibility with skillset, attractiveness of the work environment, etc. The time spent commuting

might certainly be a consideration in seeking a job, but if the commuting time were less than one hour, it would likely not be a determining one.

The five satellite towns built around Seoul are an example of an attempt to implement the urban village concept. The government built the new towns under the assumptions that they would be self-contained and that most inhabitants would work and live within their own towns. To achieve this objective, planners carefully balanced the number of projected jobs in each town with the number of projected inhabitants. However, subsequent surveys showed that most people living in the new, satellite towns commuted to work in the Seoul metropolitan area, and most of the jobs in the satellite towns were filled by people living outside of them. The trip pattern found in satellite towns is consistent with the hypothesis made at the beginning of this paper: a large unified labor market is the justification for large cities. It's likely that some households initially decided to move to Seoul's satellite towns because apartments were cheaper than in Seoul's core city or because the environment was better and newer. It is also probable that when these households moved, the heads of household were already employed somewhere in Seoul. After all, had they not been employed, they likely would not have been able to buy a new apartment. Furthermore, after moving to a satellite town, it is unlikely that they would quit their current jobs to find equivalent, vacant jobs within the town. The same reasoning could be made for firms moving to a satellite town. A firm might move from the central city to find cheaper rents or more space, but many of its employees would likely decide to keep their jobs and commute from the core city to the satellite town.

HOW COMMON ARE EACH OF THE THREE SPATIAL DISTRIBUTION MODELS?

The spatial distribution of jobs, and as a consequence commuting trip patterns, evolve as cities become larger and more affluent. The monocentric model is a simple, primitive city model that inevitably evolves over time into a more complex form, more closely resembling the composite model. Once jobs have dispersed into a pattern similar to the dispersed/polycentric model, it is unlikely that they will eventually concentrate again into a dense, central CBD.

This path dependency[11] rule, common to all evolving shapes, is a reality that should seriously limit the freedom of planners to dream up new urban forms. Planners should take into account the path dependency of city shape when designing for new transport systems.

None of the three models discussed above are immutable. Future urban labor markets, for instance, might not require as many face-to-face interactions between employees, customers and suppliers as they have in the past. New models of trip patterns might emerge in the future reflecting the new requirements of an evolving labor market. For instance, the recent emergence of telecommuting has put into question not only the pattern of commuting trips but also the very need for commuting. As such, we should remain agnostic regarding the patterns of commuting trips twenty years from now. However, we can look at the trend in trip patterns over the last decades to inform our understanding going forward. This trend reflects path dependency, mentioned above.

What effect could a large increase in telecommuting have on current trip patterns? So far, the effect has been modest. In fact, there is a hint that this modest trend may reverse itself among high tech companies that were the first to initiate it. In 2013, Yahoo's new CEO announced a reversal of its telecommuting policy, which confirmed what we already knew: that serendipitous face-to-face contact between professionals is necessary for innovation.

However, the question remains: how often should those face-to-face interactions occur? Once a week? Every other day? How large should the groups needing face-to-face interaction be? How much serendipity is required to generate innovation? Whatever the answer, telecommuting will certainly decrease daily commuting flow and change traffic flow, but it will not completely eliminate a worker's need for spatial proximity to his/her employer or to other workers with complementary skills. It is quite possible that telecommuting will decrease in firms requiring innovation and increase in firms engaged in routine

11 Path dependency refers to situations in which options taken in the past limit the number of options available in the future. The concept is commonly used in history, evolutionary biology and economics but is obviously applicable to urban development. For instance, in evolutionary biology a group of primitive living cells could possibly evolve in into a mammal or into a fish. But once the cells have evolved into a fish, they cannot possibly evolve into a mammal and vice-versa.

data processing. One lesson is clear, we cannot plan for it, but we must monitor carefully the spatial implication of this trend and support it with adequate transport infrastructure.

Although the large metropolises of the world show a great variety of histories, cultures and incomes, the trends, when the data exist to measure them, seem to converge toward a more spatial dispersion of jobs. This trend seems counterintuitive, particularly as the CBDs in an increasing number of cities compete for the distinction of world's tallest skyscraper. But we must realize that a prime office skyscraper contains fewer workers per hectare than the five-story sweatshop that it likely replaced.

Because of the very low built-up densities of US cities, their spatial trend might not be representative of most world cities. However, the US trend has the advantage of being well documented and may still provide some insights into the way changes in labor markets impact urban land use. In 1995 and 2005, Alan Pisarski conducted the most comprehensive nationwide study of commuting in the US. The trends he measured over a ten-year interval are clear: the ratio between jobs and resident workers is decreasing in central cities and increasing in suburban areas. Pisarski's studies clearly show that, on average, US metropolitan areas are slowly evolving from a composite model (Figure 5, pattern C), to a more dispersed model (pattern B). Furthermore, Pisarski's studies indicated that the job concentration in the traditional CBD is constantly decreasing not in absolute terms but as a proportion of the total number of metropolitan jobs.

Pisarski's reports show that in smaller US metropolitan areas, those below 100,000 people, commuting trips[12] to the CBD represent about 50% of all trips – a good approximation of the monocentric model. However, for larger metropolitan areas, those with population above two million people, the trips to the CBD drop to about or below 24%. This is also observed in very large metropolises with a well-marked, dominant CBD such as Seoul, New York or Paris. For instance, in the New York metropolitan area, 24.3% of trips are from the suburbs to Manhattan or within Manhattan; 2.1 % of trips are from Manhattan to the suburbs, and the large majority, 73.6%, are from suburb to suburb. The pattern of trips in metropolitan New York illustrates what I have called the composite model (Figure 5, pattern C).

Outside the US, the trends of large metropolitan areas also seem to move toward the composite model, even in cities like Paris, with a historically dominant and prestigious center and a radio-concentric transit system providing excellent access to the center. In Paris' metropolitan area (defined as the Ile de France region), trips within and to the Paris municipality (historical Paris) represent 30% of the total commuting trips, and 70% of trips are from suburb to suburb (Figure 6).

Large metropolitan areas of Asia, although much denser than US or European cities, are showing the same trends toward the suburbanization of jobs and people. Seoul's metropolitan area, with a population of 24.7 million in 2010, is representative of the trend in prosperous East Asian cities that have seen a significant increase in population and household income in the last 30 years. In Seoul, between 2000 and 2010, the population decreased by 0.5% in the central city[13], and it increased by 92% in outer suburbs located more than 20 km from the city center (Table 1). During that same ten year period, the spatial distribution of jobs has been less dispersed, with 16% of the new jobs being added to the CBD, while 59% were added to outer suburbs more than 20 km from the CBD. Seoul, however, still remains more monocentric than Paris or New York, with 31% of the total metropolitan jobs concentrated in the central city.

As we can see from the historical trend the monocentric model tends to break down when a city becomes larger. However, empirical evidence does not show an obvious population size threshold beyond which cities cease to thrive as dominantly monocentric. Sometimes, topography – rivers or mountains – prevents direct communication from suburb to suburb and therefore maintain monocentricity in spite of a large population. An original network of primary radial roads would reinforce a high degree of monocentricity as a city expands by making it easier to go to the CBD than to peripheral locations. This type

12 Commuting trips include only trips between a residence and a work place. Other trips, for shopping, social life or leisure, are counted separately. Commuting trips are often a fraction of all trips, but they are the most important for proper functioning of the labor market. In addition, most commuting trips take place at rush hour and therefore test the capacity limit of the transport system.

13 In this case, I defined Seoul central city as the area within a circle of 10 km radius centered on Seoul City Hall. This area includes three distinct CBD-like areas with an intense spatial concentration of jobs.

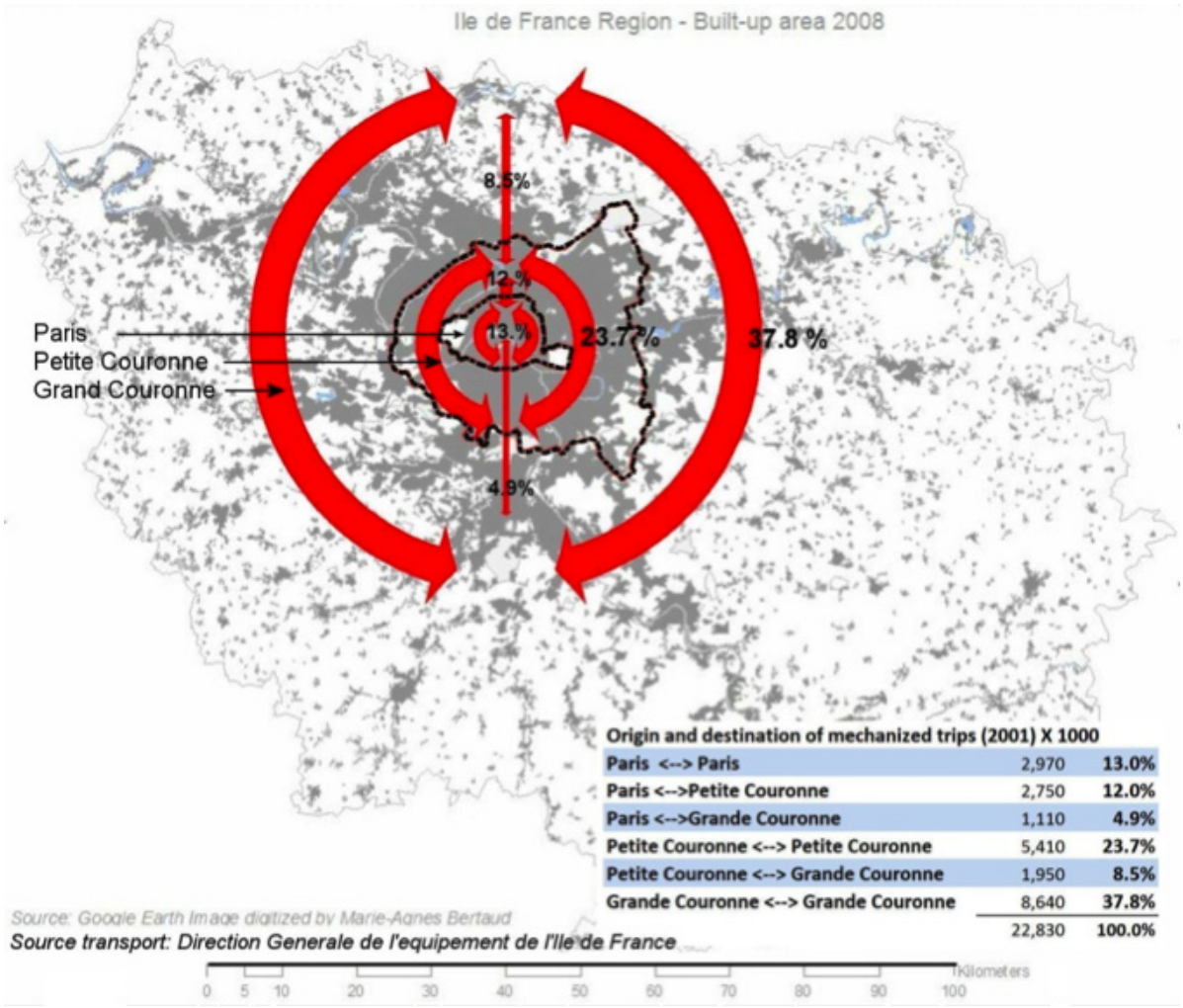


Figure 6: Trip Patterns in Metropolitan Paris

of radial network can be seen in European cities like Berlin, Copenhagen or Paris. By contrast, a primary grid network would rapidly encourage the creation of sub centers with good overall accessibility as a city develops. This has been the case for Los Angeles, Houston, and Omaha. The grids in these cities sometimes become irregular, but the availability of wide roads, perpendicular to the radial roads at the fringe of urbanization, stimulates the creation of sub-centers, and perhaps even of job dispersion, because wide roads allow for higher driving speeds and, therefore, for faster accessibility to areas farther away from the radial roads. A grid network of roads, therefore, encourages an early shift toward polycentricity.

THE AFFORDABILITY OF LAND AND FLOOR SPACE ALLOWS ALL INCOME GROUPS TO PARTICIPATE IN THE LABOR MARKET

THE EFFICIENT OPERATION OF LABOR MARKETS REQUIRES MOBILITY

Mobility should be understood in two ways: first, it is the ability to move quickly and easily between locations within a metropolitan area; second, it's the ability to locate one's house or one's firm in any location within a metropolitan area. Mobility is, therefore, not only the ability to move rapidly between origin and destination but also the ability to change the origin and destination of commuting trips as circumstances dictate.

The ability of households and firms to choose where they locate depends upon the availability of land and floor space in the areas of the city they deem to have the most favorable benefits— for households, the proximity to jobs and amenities, and for firms, the proximity to clients, employees and suppliers. Theoretically, the lowest-income household or the least well-capitalized firm should be able to locate anywhere in a city, even where land

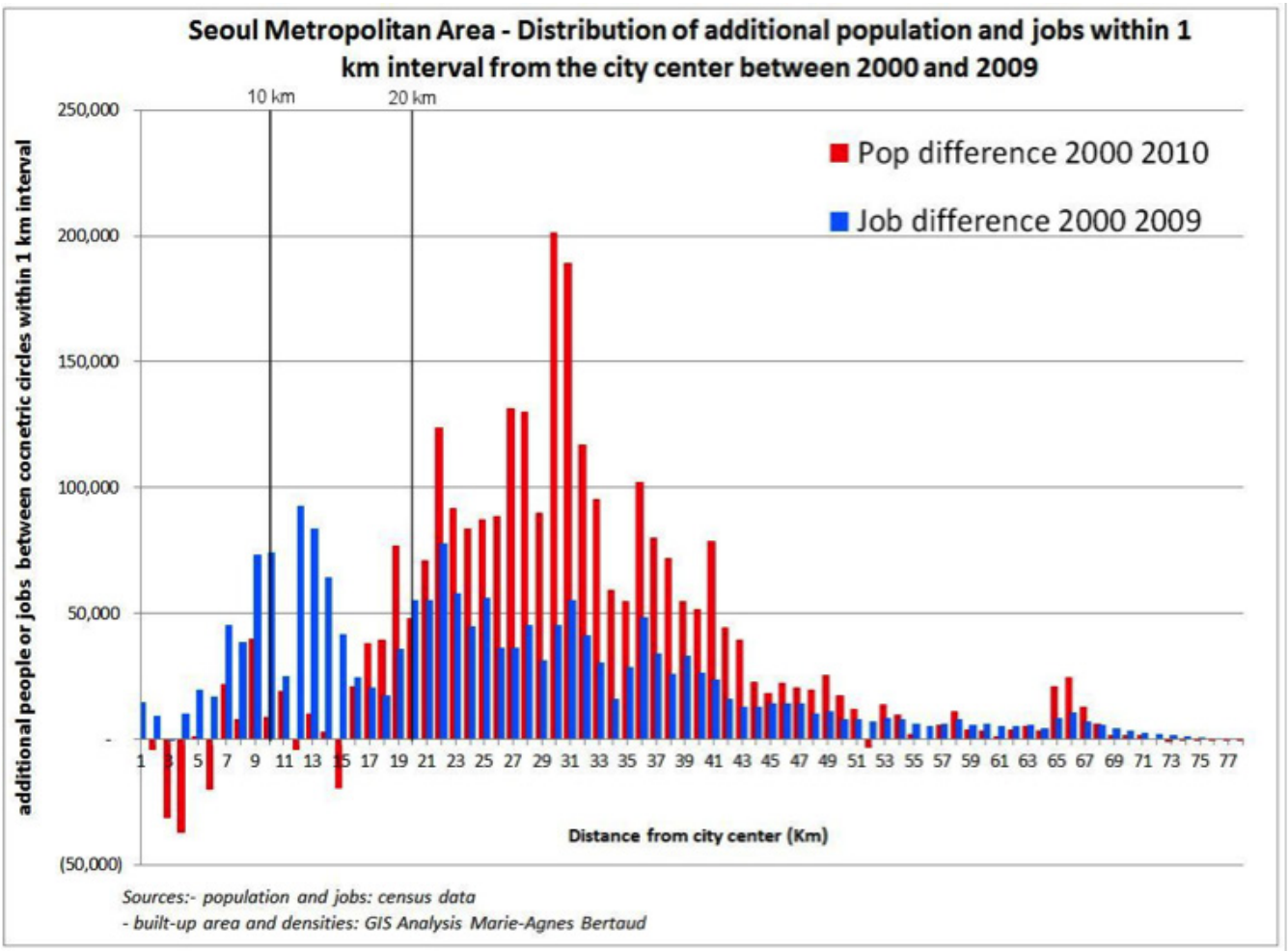


Figure 7: Seoul - Changes in population and job distribution between 2000 and 2010

Seoul - change in the spatial distribution of population and jobs between 2000 and 2010

	distance from city center	Census 2010				Increase between 2000 and 2010			
		Population	%	Jobs	%	Population	%	Jobs	%
Central city	0 to 10 km	5,409,428	22%	2,676,391	31%	(12,593)	**-0.5%**	302,558	**16.2%**
Inner suburbs	10 to 20 km	7,644,893	31%	2,219,956	26%	231,709	**8.8%**	460,789	**24.7%**
Outer suburbs	20 to 78km	11,654,883	47%	3,624,400	43%	2,423,859	**91.7%**	1,102,002	**59.1%**
		24,709,203	100%	8,520,747	100%	2,642,975	100.0%	1,865,349	100.0%

Table 1: Seoul - Spatial changes in the distribution of population and jobs 2000-2010

is the most expensive, if they are allowed to consume as little land as they require. The food carts of Manhattan and the tiny paanwalas[14] stalls of Mumbai demonstrate this point. These small businesses sell cheap products but thrive in their expensive locations by consuming only two or three square meters of land, as opposed to the several hundred square meters occupied by most shops in the same area. Farmers' markets and flea markets are other examples of the trade-off between location and land consumption allowing low-margin businesses to thrive in expensive locations.

Equivalent examples exist for housing; for instance, Paris' chambres de bonne[15] are located in the city's most expensive neighborhoods. Typically as small as nine square meters, they allow students or low-income workers to afford housing in a very favorable location. The residential plots in Indonesia's kampongs[16] are another example of the demand for centrally located residences with low land and floor consumption. The availability of these residences allows the poor to decide about the trade-offs they want to make regarding location and land consumption. If water, sanitation, and refuse management are adequate, a small, inner city location might be a desirable trade-off compared to a suburban one far from jobs, amenities, and social services. Whether "Chambres de bonnes" or "Kampongs," the neighborhoods in which such dwellings are located are by no means slums, in spite of the very small size of their dwellings.

Unfortunately, well-intentioned regulations often prevent the poor from making these trade-offs between floor space consumption and location. Urban regulations typically require a "generous" minimum floor space standard for housing. These well-intentioned regulations exclude the poor because the high price of floor area makes it too expensive for them to afford the minimum standard. Chambres de bonne exist only in housing built before 1930; they are prohibited in apartment buildings that are more recent. These unfortunate regulations reduce the mobility of the poor. As a consequence, their participation in the full labor market is also restricted.

In South Africa, the government housing program for the poor illustrates how well-intentioned planners may limit residents' mobility, reduce their participation in the labor market, and increase their travel time. Starting in 1995, the government embarked on a massive housing program to improve the living conditions of the victims of apartheid. The program aimed to provide subsidized housing to about 80 percent of the poorest South Africans. By 2012, it had already delivered 3.5 million urban dwelling units, a unique quantitative achievement for a government housing program. The standards are generous: 400 square meters per lot, 65 square meters of floor space per house, wide vehicular access roads, and schools equipped with large sports grounds and within walking distance, etc. The space standards are fixed and similar all over urban South Africa. The subsidy is also fixed, amounting to about 150,000 rand (US $16,000) per dwelling in 2012. The only dependent variable is the price of land. Land for this massive program must be very cheap to allow beneficiaries to enjoy the high space standards prescribed by the program. As a result, the new subsidized housing projects are all located in the far periphery of cities, in settlements that are too dispersed to be easily serviced by public transport. Because of the remote location, the beneficiaries of these projects have a hard time finding employment. Those who are employed pay as much as 50 percent of their income on transport, even when sharing taxis with other commuters. This dramatic example illustrates why planners should not make trade-off decisions involving location and land consumption for households and firms.

In the case of South Africa, the outcome is indeed comfortable housing for poor people, but the large subsidy attached to a house in a distant location prevents the beneficiaries from participating in the labor market. High-standard housing provided to poor people in a remote location becomes a poverty trap. The subsidies are not to blame here. The error is not only tying the subsidy to a specific location but also deciding on the location verse land consumption trade-off without having solicited input from the beneficiaries. A portable subsidy—that is, a lump sum

14 Paanwalas sell paan, a mixture of betel leaf, areca nuts, and tobacco. They are small, informal, thriving retail businesses in the streets of Indian cities.

15 "Chambres de bonnes" or maids' rooms were independent rooms of about 10 to 12 square meters built under the roofs of opulent buildings in Paris and provincial towns, usually with common bathroom facilities on the same floor. When the households in these buildings could not afford maids anymore, the rooms became the cheapest rental rooms on the market. Their low cost has been maintained over the years in spite of their excellent location because they are located on the 5th or 6th floors of buildings without elevators.

16 A Kampong, which means village in Bahasa Indonesian, is an informal but legal residential neighborhood in Indonesian cities. The lot sizes vary by income with the smallest being around 10 m2. Streets in a Kampong are usually 2 or 3 meters wide; some passages between houses not wider than one-half meter.

given to poor households to use for shelter anywhere in the metropolitan area—is significantly preferable.

Because planners lack information to make informed decisions about the difficult trade-offs between location and land consumption, they shouldn't have the authority to make these types of decisions. Only a free market allows households and firms to choose the trades- offs that best allow them to maximize their comfort and their participation in the labor market. To benefit fully from a large labor market, households and firms must have ease of mobility. As such, there must be sufficient, affordable options that allow them to make the trade-off decisions between location and land consumption that best suit their needs.

CITIES VIEWED AS LABOR MARKETS: OPERATIONAL IMPLICATIONS

Looking at cities as unified labor markets should change the generally negative views that urban planners hold regarding mobility. Planners believe that one of their most important tasks is to decrease nuisances created by urbanization and particularly by vehicular traffic. They are right; decreasing congestion and pollution is one of the most pressing challenges brought on by urbanization. However, planners, in their enthusiasm to reduce nuisances, often fail to understand the differences between the objective of increasing mobility and the constraint of decreasing the nuisances it creates.

One of the main objectives of urban planning is maintaining mobility – preventing an increase in commuting time as the size of the labor market increases. In other words, the main objective of planning should be to increase the speed of urban transport as a city's size increases. Decreasing the level of nuisances due to transport is a constraint that may increase the cost of achieving the objective. But this cost is fully justified if the marginal cost of reducing nuisance is lower than the marginal increase in productivity due to the expansion of the labor market. For instance, charging vehicles in proportion to the pollution they create, or imposing tolls on highways to reduce congestion would increase the cost of transport, but at the same time would also increase its efficiency, allow for higher speeds and improve environmental quality.

However, too often planners substitute the constraint for the objective. For instance, advocates of "smart growth" imply that the reduction of congestion and pollution is the main objective of urban planning. They soon realize that nothing would reduce congestion and pollution more certainly than a decrease in mobility. Reducing mobility is then considered a desirable outcome and is the logical consequence of the confusion between objectives and constraints. For this reason, planners design "urban village" spatial arrangements (Figure 5, pattern D), which implicitly reduce mobility.

Matching employment location with residence in large metropolitan areas has become the Holy Grail of urban planners. This recurrent conceit, motivating many master plans and many land use regulations[17], can only be explained by ignorance of the economic efficiency of large labor markets and the mobility that large labor markets require in order to function. The choice of spatial location is best left to households and firms themselves.

The functioning of labor markets is my guiding principle in evaluating alternative spatial arrangements. "Mobility" is the ability to reach any area of a metropolitan area in as short a travel time as possible, and "affordability" is the ability of households and firms to locate in whichever area they deem will maximize their welfare. Increasing mobility and affordability are the two main objectives of urban planning. These two objectives are directly related to the overall goal of maximizing the size of a city's labor market, and therefore, its economic prosperity.

17 For instance, Stockholm urban regulations require a job housing balance in each neighborhood, in spite of statistics showing that when this balance is achieved it doesn't decrease trip length. Allowing mixed land use where firms and housing can be found in the same location is an excellent thing but mandating it is illusory and only slow down the development process. In addition, the number of jobs per commercial structure could vary a lot in time.