PROCESSSES OF CHANGE IN URBAN SYSTEMS*

MICHAEL STORPER
Department of Geography and Environment, London School of Economics
Master of Public Affairs, Sciences Po, Paris and
School of Public Affairs, University of California Los Angeles

CHARLES VAN MARREWIJK
Utrecht University School of Economics

and

FRANK G. VAN OORT
Department of Economic Geography, Utrecht University and
Netherlands Environmental Assessment Agency, The Hague

Abstract
The rapid increase in world population is accommodated by a massive movement towards the city, leading to ever more complex urban systems. The social sciences use different methods to analyze urban dynamics and the associated economic, social, and spatial changes. The time horizon varies from long-run institutional changes to the short-run impact of recessions. We discuss a selection of these approaches and analyze the associated public policy implications, particularly regarding future implementation.
JEL codes: B40, H70, J11, O10, R00
Key words: urban systems, social methods, time horizons, public policy

* We are grateful to Utrecht University (Department of Economics and Faculty of Geosciences) and the Institute for Housing and Urban Development Studies (IHS) for organizing and financing the conference “Urban development : patterns, causes, foundations, and policy” on 13-14 December, 2010, which provided the basis for this special issue of the Journal of Regional Science with a selection of the articles presented on that occasion. We thank Steven Brakman for useful comments and suggestions.
1. Urban Development: Upward and Changing

Some 500 years ago about 438 million people lived on our planet. The most populated regions were East Asia with 27 per cent of the world population (including China with 23.5%), South-Central Asia with 26 per cent (including India with 25.1%), and Europe with 20 per cent. In the next 200 years the world population increased by about 0.16 per cent per year to 603 million in the year 1700, with only minor changes in the distribution across the planet. This was the beginning of a more rapid population increase, first in China and then more so in Europe, such that the world total reached more than one billion people in 1820 and 1.56 billion in 1900. Europe’s share of the total rose substantially to 27.4 per cent, while the share of South-Central India in particular fell to 18.4 per cent. At the same time large migration flows raised North America’s share to 5.2 per cent (from 0.5 per cent in 1500). The First and Second World War interrupted, but did not stop, the growth of global population, which subsequently increased to 2.5 billion in 1950. The second half of the twentieth century was characterized by higher growth rates, with a peak of 2.11 per cent in 1970. The threshold of three billion people was reached in 1960 and six billion in 1999. Currently (2011) there are about 6.9 billion people. The UN estimates the world total will reach 9.3 billion in 2050 and 10.1 billion in 2100. As illustrated in Figure 1, we are thus confronted with an enormous increase in world population in the period 1900-2100.

Figure 1 Development of world population (billion), 1500-2100

Data sources: Maddison (2010) and UN (2010), medium variant.

---

1 All historical population estimates are from Maddison (2010).
Associated with the population boom are major changes in the distribution of world population. Europe’s share has already declined from 27.4 per cent in 1900 to 10.7 per cent now and is expected to decline to less than 7 per cent by 2075. The share of South and Central America is expected to decline from 8.0 per cent now to about 6.4 per cent in 2100. Similarly, the share of South-East Asia is expected to decline from 8.6 to 6.9 per cent. The most substantial decline, however, is expected to occur in East Asia, from 22.8 per cent in 2010 to 11.1 per cent in 2100. It is mostly a reflection of the rapidly ageing Chinese and Japanese populations. The share of world population is fairly steady in North America (about 5 per cent) and South-Central Asia (about 24 per cent), while it is rising slightly in Western Asia (from 3.4 to 4.8 per cent). By far the most substantial increase is expected to occur in Africa, namely from 14.8 per cent of the world population in 2010 to around 35 per cent in 2100.

Figure 2 Urban population (% of total), 1950 – 2050

We are confronted with an enormous rise in total population in virtually all regions of the world, while the size of the planet has not increased. This raises the question of how such populations will be accommodated. The answer is found in Figure 2: we increasingly live in
In 1950 around 28.8 per cent of the world population lived in cities. In the period 1950–2010 the urban population share increased by about 0.36 percentage points per year to reach 50.5 per cent in 2010. Since 2009 there are, for the first time in history, more people living in cities than on the countryside. The urbanization process is expected to speed up in the period 2010–2050 to an increase of about 0.46 percentage points per year, reaching an urban population share of 68.7 per cent in 2050. As illustrated in Figure 2 North America, South & Central America, Europe, and West Asia are already highly urbanized (all above the world average), so the expected increase in the next 40 years is modest (around ten percentage points). In contrast, the developing regions in East Asia (mostly China), South-Central Asia (mostly India), South-East Asia, and Africa (all below the world urbanization average today) are expected to experience an enormous increase in urban population in the next 40 years (all more than 21 percentage points). Consequently, in all regions of the world the majority of the population will soon live in cities. The absolute level of the rural population is expected to start declining around 2020.

2. Understanding Urban Dynamics

At first glance, it seems easy to understand why cities are increasingly the preferred mode of human settlement. They save on infrastructure, reduce trade costs, and enhance interaction. In developing countries, there is nothing particularly new about urbanization as the expression of development. At second glance, however, cities impose many costs – land, pollution, other externalities. Moreover, since costs of communication and transport are coming down so rapidly, it is not entirely obvious why urbanization remains the settlement form of choice, especially in wealthy areas of the world. We once believed that suburbanization combined the primary advantages of urbanization with lower land costs and other externalities, but density is back in many parts of the world.

There are many other dimensions of urban growth that remain puzzling to researchers. For some, urban systems grow according to a regular pattern (such as a rank-size rule); for others, there are too many empirical exceptions to this rule, and little substantive theory behind it. Even among highly-developed areas of the world, such as the US and Europe, there are

---

2 Unless otherwise indicated all urbanization information is from the UN World Urbanization Prospects (2009).
3 Two centuries before this share must have been lower than ten per cent (the urban population share in Europe around that time), see Brakman, Garretsen, and van Marrewijk (2009, Ch. 1).
4 China represented 86 per cent of East Asia’s population in 2010 while India represented 72 per cent of South-Central Asia’s population in that same year.
substantial differences in urbanization patterns. Are these just “effects of history?” Should such effects be incorporated in models of change, and if so how?

Urban systems reflect ongoing geographical redeployment of capital and labor – firms, households, individuals. As such, analysis of large-scale urban change has an intimate analytical connection to theories of migration, location, trade, and economic geography, and involves the additional layers of housing and land economics. And then it has to engage with the forces that can cause changes in the choice of location, such as technology, preferences, infrastructure, the composition of the economic base, declining trade barriers, and so on. In other words, all these forces for change through time are spatially selective in their impact. The “where” of urban system dynamics is that there are different growth rates of population, income, output, and composition of output across places, leading to turbulence in the ranks of particular cities. This underlies overall restructuring of urban systems. Urban dynamics, as can be seen, are the ultimate noisy social science problem.

Urban dynamics are not just a social science problem; they are where economic development processes “hit the ground” and generate many challenges for public and private actors and individuals. The urban pattern of population and incomes leads to demands for changing infrastructure, schooling, public services, culture, architecture, housing. Urban dynamics are not just an expression of the economy, however; they also contribute to the trajectory of economic, social, and technological development by fostering interaction, innovation, segregation, mixing, and a host of other complex socio-economic dynamics. This circularity is extremely complex, made even more so by the relatively long time horizons under which it unfolds.

A variety of disciplines have struggled with how to deal with development and change in urban systems (a wide sample of such approaches can be found in the handbook edited by Henderson and Thisse, 2004). The many perspectives in the field are, as usual, shaped by the theoretical assumptions, methods, and time horizons that are chosen by the researchers that adhere to them. Some researchers are interested in the infinite incremental adjustments of people and population and how these cumulate into observable changes in patterns. Still other approaches introduce non-linear dynamics – such as tipping points in population or activity – based on substantive theories of monopolistic competition in space, so that rates of change over time may not be constant. These ideas are notoriously hard to implement, even with the fanciest econometric techniques, and often require simulations.

A different flavor to research comes from interest in spatial selection processes – whether it be population or economic activity. Conceptually, the starting point for this kind of research
is theories of trade, location, migration and household choice. The keystone of explanation is
determining what forces sort or filter different people and activities into different places.
Theories for capturing these processes usually involve partial equilibrium models that have
some set of structural determinants, and then solve for the allocation of people, jobs, and
incomes. Empirical work usually reverses this, with econometric methods used to identify the
structural determinants and specify their values.

Another way to investigate dynamics comes from more historically-minded approaches,
which is more comfortable for geographers and historians than economists. These approaches
rely on a wide variety of information on potential sources of change and then draw on lessons
from spatial economics, land economics, and migration economics to consider how they
interact to generate sequences of change. Thus, they cast a wide net in looking for major
changes in structural determinants of agent behavior, and then examine how such big
changes subsequently work themselves out incrementally. They combine external validation
with internal consistency of explanation.

At the Rotterdam conference from which the papers in this special issue are drawn, the
organizers had an open mind about how to explain dynamics of change in urban systems,
leading to presentations, discussions, and interactions with and between economists,
sociologists, regional scientists, geographers, urban economists, and physicists. We wanted to
see how leading researchers in the field were trying to capture change – with what kinds of
specific questions, theories, models, and empirical methods. We also wanted to see what
kinds of substantive questions they were asking about processes of change. This issue is
meant to reflect this non-dogmatic spirit and open contact among approaches, and we hope its
virtue is to stimulate the reader to consider the many ways our field needs to carry out its
work in order to deal with its noisy problem. Of course, each article in the issue also raises a
number of specific issues for its particular sub-field, and we touch on them below.

Consistent with its interest in processes of change, the special issue is organized according
to time horizons. Kim and Law work on the long run, on how institutional rules on the
creation of new urban authorities can shape the long-term evolution of urban systems in
durable ways. Brakman, Garretsen, van Marrewijk and Oumer work on the medium- to long-
run, the effects of EU integration on border populations. De Graaff, Van Oort, and Florax, as
well as Kemeny and Storper, examine medium-run dynamics of population, jobs and
incomes. Fingleton, Garretsen and Martin move to a shorter time horizon, by examining
recessions, which are relatively short-run events, but they are also interested in possible
longer-term impacts of adjustment to recessions. Finally, Barca, McCann, and Rodriguez-
Pose look to the future, on policy frameworks for the EU, where they argue that the time horizon of policy should be determined by its substantive commitment to territorial development rather than short-term allocation of activity or equity.

3. Institutions, Dynamics, and Resilience

Kim and Law (2012) provide a long-run institutional perspective on the forces underlying the changes in urban systems in the Americas. They argue that the diversity of European colonial history combined with local conditions led to the emergence of different political institutions that persistently affect local and urban development. They substantiate their analysis using data for the period 1900 – 2002. The Spanish and Portuguese colonial rule in Latin America combined with the unequal distribution of factor endowments led to centralized political power in non-democratic institutions. The British rule in North America, on the other hand, combined with more equally distributed factor endowments resulted in more democratic institutions and a federalist form of government with significant regional and local autonomy. Kim and Law argue that political centralization in South America leads to larger urban primacy and a distribution of city sizes skewed towards large cities. They also argue, using Canada and US data, that it leads to general purpose (e.g. cities) rather than special purpose (e.g. sewage districts) local governments and limits the number of local governments. Thus, while Figure 2 shows that there is virtually no difference in the overall degree of urbanization in North America versus South & Central America, the institutional differences lead to changes in the underlying urban systems. Extension of this work on the relationship between political centralization and urban economic performance or the extent of metropolitan sprawl seems warranted.

Brakman et al. (2012) investigate the impacts of a medium- to long-run political innovation – EU integration – on the urban systems in Europe, particularly along its internal borders. Based on the New Economic Geography literature they argue that a location’s attractiveness (and thus its ultimate relative size) is based on a combination of firm market access and consumer market access. Both forces are greatly affected by the location of international borders, making cities along this border less attractive. The EU integration process, which started in 1951, provides a unique natural experiment on the long-run implications of removing those barriers for the dynamics of change in the urban system. Using data for 2410 cities (and 1457 regions) they find that a country’s joining the EU affects population of the cities along both sides of the border positively, with a range of about 70 km and a duration of about 30 years. As a by-product of their approach they show that the increased population
Processes of Change in Urban Systems

density around the world as illustrated in Figure 1 is not space-neutral. Instead, there is a
tendency for the relative population density to decrease along national borders. The positive
EU integration effect discussed above is not strong enough to reverse this tendency. It only
mitigates it for a substantial time period. An open issue, now that the population of some
European countries is declining, is whether the above processes work symmetrically in
reverse, or not.

De Graaff et al. (2012) and Kemeny and Storper (2012) are all working on determinants of
medium-term changes in population, jobs and incomes and both papers take up the classic
question of “do jobs follow people or people follow jobs?” but do so in different ways. De
Graaff et al. look at interaction of agglomeration effects and migration with a sectoral model
for the Netherlands and a special focus on the impact of a large planned increase of the
population of Almere (close to Amsterdam). They find that population changes are largely
exogenous to employment changes, while employment in non-basic sectors follows
population changes more closely than employment in basic sectors. They also find that
intersectoral dynamics are even more important drivers of regional sectoral employment
changes than population changes, which is useful information for local politicians and
planners. Two important open questions in this line of research concern the impact of
different types of labor skills on mobility and the extent of dynamic interaction as well as the
impact of the tendency to liberalize the currently rather strict spatial regulations.

Kemeny and Storper use American evidence to argue that major branching points in
patterns of urban development cannot be set off by people moving in search of amenities and
cheap housing; the sequences have to be set off by the movement of firms. Using data in 1980
and 2000 they examine the three main components of worker utility: wages, rents, and
amenities. They question the general spatial equilibrium hypothesis in which the urban system
moves to equalize worker utility across cities, since they find that similar workers earn higher
wages net of housing costs in large cities where they also have access to better amenities. In
discussing the implications of this finding they focus on the role of amenities (requiring more
detail in the analysis), price formation across space (for housing and certain types of labor
skills), and sequences of change in jobs and people. They argue that institutional change in
the South (with lower unionization) enticed firms to relocate more routine work (at the mature
end of the product cycle) to these locations. This started a migration process where people
follow jobs despite the persistence in real wage differences. The contrast in their finding
relative to the De Graaff et al. paper may be based on the different scale of analysis
(municipalities in the Netherlands versus all of the US) or on differences in the historical and

8
institutional setting (high mobility in the US versus low mobility in the Netherlands; Kemeny and Storper note, however, that most mobility in the US occurs within counties or metropolitan areas).

Fingleton et al. (2012) move to a slightly shorter time horizon by examining recessions, but also consider whether there are durable effects thereof. Analyzing the resilience of UK regions to employment shocks, their paper finds that UK regions substantially differ in their resilience. Two basic notions of resilience are distinguished: engineering resilience, in which there is an underlying stable growth path to which a regional economy rebounds following a shock, and ecological resilience, where shocks can permanently affect the growth path of a regional economy. The paper tests for the relevance of (engineering) resilience of UK regional (NUTS1) employment to the four recessionary shocks in the sample concerning employment dynamics in the period 1971-2010. It turns out that the regional differences found mainly concern the initial resistance to shocks and not so much the recovery stage. To allow for shocks to have permanent effects and for time differentiated shock spillovers between the 12 regions, an alternative model specification is introduced. They find that employment shocks typically have permanent effects when it concerns the own region. Permanent effects can also be found for the impact on other regions, but the inter-regional effects are typically only significant for nearby regions. This suggests that local and place-based policies are more relevant than generic polices.

4. Policy implications
As stated before, urban system dynamics can be seen as the background to a host of important policy problems. Taken together, changes in the spatial distribution of population and income levels are the urban version of the problem of development, and ultimately public policy is in the service of development. All the papers in this special issue shed light on policy, although some more explicitly so than others. The papers in this issue start their arguments from changes in population and income levels in relation to urban system development, and relate this to policy initiatives at various levels. Although economists’ interest in the location of economic activity has waxed and waned over the last two centuries, policy makers’ interest in the subject has never wavered. Policies aimed at shaping overall spatial patterns of development, as well as those aimed at helping specific places are of central interest to all the disciplines dealing with spatial economic development, such as Regional Science, Urban Economics, and Economic Geography. Before the seminal contribution of Baldwin et al. (2003), the New Economic Geography literature paid little attention to policy. In later
contributions, it became clear that the New Economic Geography is particularly suitable for policy analysis, as dynamic spatial processes are at the heart of these models, making them well-equipped to analyze the effect of changes in the environment and regional context, such as changes in infrastructure.

All approaches – in general and in this issue – stress the importance of spatially determined externalities for explaining regional growth differences (Baldwin et al., 2003). The economic processes at work differ with the level of spatial aggregation, resulting in different models and policy focus for various spatial problems. In general, spatial modeling traditions differ in their attempt to examine both the effects of nationwide economic growth on various regions (distributive effects) and the effects of regional economic growth on the national economy (generative effects). The papers in this issue treat these two effects in a variety of ways. Fingleton et al. focus on distributive effects (of economic shocks and recession) while Barca et al. (see below) conceptually compare distributive effects versus generative effects (from generic sector policies and place-based policies, respectively). This leads to an interesting blend of policy analysis throughout the issue, ranging from urban planning policies to trade, tax, and regional development policies. As the papers focus on spatial dynamics in urban systems – defined as a set of regionally, nationally or globally linked and interdependent urban areas (Pred 1977) – it is obvious that the empirical issues of the direction of causality (De Graaff et al. and Kemeny & Storper) and the multilevel character of policy initiatives (Barca et al.) are of prime importance when interpreting policy recommendations. We can conclude from the contributions collected in this issue that future research should – inter alia – focus on these issues further, as the set of papers does not resolve all controversies and conceptualities in this.

In the final contribution Barca et al. (2012) are working on policy for the (near) future. They argue that policy – in their specific case EU cohesion policy, but also touching on other applications – needs to be explicitly developmentalist (“generative effect of policy”), and that this is different from being “allocational” (“distributive effect of policy”). They draw on many of the concepts about dynamics that are used in other papers in this issue, and argue for an approach based on dynamic spatial economics, but explicitly recognizing local institutional and contextual variation in dynamic economic processes. The paper argues that, despite the major recent transformation in theory and empirical analysis, via the introduction of endogenous growth theory, the New Economic Geography and the institutional turn in economics, there was one area where little progress had taken place: that of policy implementation. Development intervention at the national and regional level had remained
firmly anchored in rather old regional development thinking, paying little attention, and often no more than lip service, to the recent transformations in the theories of development and growth. This is likely to change as a result of the publication in 2009 and 2010 of a series of highly influential reports about regional development policy intervention (by the World Bank, the European Commission, and the OECD). All these reports are inspired by different sources, adopt different philosophies and arrive at what seem to be different policy conclusions. It demonstrates that the debate regarding the case for regional policies is both alive and complex. Barca et al (2012) argue that recent theoretical progress calls for policies that are not place-neutral, because they refocus our attention on generative effects, requiring integration of insights about forces that transform the overall shape of urban systems with the processes that that come from the ground up, inside places within those systems. The debate is thus far from being settled and requires further consideration of a range of fundamental and interrelated issues on place-based development – not only in the European Union, but also in North-American urban regions and in developing countries.

5. Conclusion
This issue will obviously not resolve the controversies emerging from the papers collected: not on empirical choices on scale, measurement and specification, not on theoretical approaches of urban systems, nor on the suggested generic or place-based development policies. What is important is to draw attention to the dynamic and changing nature of population, employment, and income distributions over space. The papers here are mostly dealing with mature, developed economies. Processes of change and development are, of course, much more dramatic in emerging economies, and are more linked to primary urbanization and industrialization. But across all economies, there is a dynamic of “churn,” in the fates of places – moving up and down the ranks of growth in terms of population, employment and income. The field needs to get better at dealing with such change processes, across different time horizons and spatial scales, since this is where it can provide meaningful help to policymakers, citizens, entrepreneurs, and others.
References


