The economics of urban growth

Hans Koster
Associate professor
Many cities around the world face strong population increase
- More than 50% of the world's population lives and works in cities


2019
1. Introduction

- The largest metropolises can now be found in emerging economies and developing countries

<table>
<thead>
<tr>
<th>Year</th>
<th>City, Country</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>Tokyo, Japan</td>
<td>16.5</td>
</tr>
<tr>
<td></td>
<td>New York, United States</td>
<td>16.2</td>
</tr>
<tr>
<td></td>
<td>Shanghai, China</td>
<td>11.2</td>
</tr>
<tr>
<td></td>
<td>Osaka, Japan</td>
<td>9.4</td>
</tr>
<tr>
<td></td>
<td>Mexico City, Mexico</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>London, England</td>
<td>8.6</td>
</tr>
<tr>
<td></td>
<td>Paris, France</td>
<td>8.5</td>
</tr>
<tr>
<td></td>
<td>Buenos Aires, Argentina</td>
<td>8.4</td>
</tr>
<tr>
<td></td>
<td>Los Angeles, United States</td>
<td>8.4</td>
</tr>
<tr>
<td></td>
<td>Beijing, China</td>
<td>8.1</td>
</tr>
<tr>
<td>2015</td>
<td>Tokyo, Japan</td>
<td>37.1</td>
</tr>
<tr>
<td></td>
<td>Jakarta, Indonesia</td>
<td>26.1</td>
</tr>
<tr>
<td></td>
<td>Seoul, South Korea</td>
<td>22.5</td>
</tr>
<tr>
<td></td>
<td>Delhi, India</td>
<td>22.2</td>
</tr>
<tr>
<td></td>
<td>Shanghai, China</td>
<td>20.9</td>
</tr>
<tr>
<td></td>
<td>Manila, Philippines</td>
<td>20.8</td>
</tr>
<tr>
<td></td>
<td>Karachi, Pakistan</td>
<td>20.7</td>
</tr>
<tr>
<td></td>
<td>New York, United States</td>
<td>20.5</td>
</tr>
<tr>
<td></td>
<td>Sao Paulo, Brazil</td>
<td>20.2</td>
</tr>
<tr>
<td></td>
<td>Mexico City, Mexico</td>
<td>19.5</td>
</tr>
</tbody>
</table>
Many cities around the world face strong population increase
• Bogotá is no exception
I will discuss the economic consequences of urban growth for:
• City size and urban sprawl
• Densities
• Land prices
• Commuting costs

Market forces are key in understanding and predicting what happens
• I will outline the most important forces using a very simple model
I then consider arguably the main cost of urban growth
• Traffic congestion
• (Pollution is very much related to this)

I also consider a benefit of urban growth
• Agglomeration economies

How to deal with urban challenges?
• Recommendations
• A regional perspective...
Let us try to understand the key economic forces that come into play when urban areas grow

We use the simplest model possible
Let us consider a very simple city with most employment located in the centre

- People have to commute to the centre
- Prices are therefore higher in the centre

\[ \text{Price per m}^2 \]

\[ x \] denotes the distance to the city centre
\[ p^A \] denotes productivity of agricultural land
2. Urban growth

- Bogotá
  - Guzman and Bocarejo (2017)
2. Urban growth

- If population grows
  - Land prices will go up
  - The city becomes larger

\[ x \text{ denotes the distance to the city centre} \]
2. Urban growth

- Land prices are higher closer to the centre
  - Buildings are generally taller
  - ... substitution of land for capital

- New developments at the city’s border are usually of lower density
  - Urban sprawl?

- Hence: both urban sprawl and compact development are a result of market forces
New developments at the city’s border are usually of lower density?
• Not for Bogotá?...
• Informal developments?
Hence, urban sprawl is not necessarily ‘bad’ and compact development is not necessarily ‘good’.

- Brueckner (2000)

In what cases is urban sprawl ‘excessive’?
3. Excessive urban sprawl

- Excessive urban sprawl
  1. When benefits of open space are ignored
  2. When there are strong density restrictions
  3. Excess commuting
1. Benefits of open space are ignored
   - The city should be smaller...
1. Benefits of open space are ignored

- Many cities around the world therefore protect open spaces around their city
  - England’s greenbelts
  - The Dutch Green Heart
1. Introduction
2. Urban growth
3. Excessive urban sprawl
4. Traffic congestion
5. Agglomeration economies
6. Recommendations
7. Summary
1. Introduction
2. Urban growth
3. Excessive urban sprawl
4. Traffic congestion
5. Agglomeration economies
6. Recommendations
7. Summary
1. **Benefits of open space are ignored**

- Protection makes sense if open space generates amenities or is necessary for water supply

- I indeed find evidence for substantial, but very local, amenity effects of open space in England
  - However, this amenity effect does not warrant the strong protection of open space
  - ... Reduced supply of housing increases prices for everyone!

- What are benefits of open space in Bogotá?
2. When there are strong density restrictions
   • Cities are forced to grow bigger if density is restricted
2. **When there are strong density restrictions**

- **Many examples of Floor-Area Restrictions (FARs)**
  - Many cities around the world (India, China, England) impose density restrictions

- **For India:**
  
  > “In controlling FAR, the goal of the Indian planners has been to [...] limit both job and population densities. It is believed that “excessive” density results in a loss of environmental quality and increased traffic congestion” [Brueckner and Bertaud, 2005]
2. When there are strong density restrictions

- The main reason would be to protect cultural heritage
  - But these areas are often small and FARs should only apply to a few areas
  - *e.g.* in La Candelaria

- Cultural heritage generates substantial benefits to the society
  - But again... very local!
2. When there are strong density restrictions

- However, it is often unclear what the benefits of FARs are
  - By contrast, compact development reduces commutes and improves overall environmental quality
    → ... but more people may be exposed to higher levels of pollution
  - Sprawled cities have higher shares of car use
3. Excessive commuting

- People do not take into account the negative effect on others when using the road
  - ‘Externality’
  - People travel longer than if there would be no traffic
4. Traffic congestion

- **Costs of urban growth – traffic congestion!**

- **Akbar and Duranton (2017)**
  - What are the social costs of traffic congestion for Bogotá?
  - → ... Externality

<table>
<thead>
<tr>
<th>Table</th>
<th>Descriptive statistics from the Bogotá Travel Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Trips within Bogotá (36,309 well-defined trips)</td>
<td></td>
</tr>
<tr>
<td>Trip duration (all modes)</td>
<td>37.93</td>
</tr>
<tr>
<td>Trip duration (motorised trips)</td>
<td>53.21</td>
</tr>
<tr>
<td>No. of trips per person</td>
<td>2.04</td>
</tr>
<tr>
<td>No. of motorised trips per person</td>
<td>0.91</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mode</th>
<th>Walk</th>
<th>Private vehicle</th>
<th>Taxi</th>
<th>Transit</th>
<th>Transmilenio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of trips</td>
<td>0.448</td>
<td>0.154</td>
<td>0.044</td>
<td>0.245</td>
<td>0.082</td>
</tr>
<tr>
<td>Share of trips longer than 15 min</td>
<td>0.286</td>
<td>0.185</td>
<td>0.055</td>
<td>0.334</td>
<td>0.113</td>
</tr>
</tbody>
</table>

*Notes: Statistics above are computed on all trip instances but are not weighted by sampling expansion factors. Trip durations are in minutes.*
4. Traffic congestion

- Akbar and Duranton (2017)
  - What are the social costs of traffic congestion for Bogotá?
  - Externality costs appear to be small (less than 1% of the daily wage)
4. Traffic congestion

- Travel is still very costly in Bogotá due to congestion

- Paradoxically: high travel costs lead to a more compact city
  - Baum-Snow et al. show that cities grow bigger when new highways are built
  - Ostermeijer et al. show that cities become larger when car ownership increases
4. Traffic congestion

- Policies that may help in reducing congestion
  1. Road pricing
  2. Better traffic management
  3. Improve on public transport system
4. Traffic congestion

- Are driving restrictions based on number plates a solution?
  1. *Davis (2008)* do not find any evidence for a reduction in congestion in Mexico City
  2. *Viard and Fu (2015)* find some evidence that driving restrictions reduce pollution in Beijing, at the expense of labour supply
Should we build many more roads to combat congestion?
- “Fundamental law of road congestion”
- If travel time of cars reduces, it becomes more efficient to take the car

**Duranton and Turner (2011)**
- Highways: 10% more roads $\Rightarrow$ 10% more traffic
- Urban roads: 10% more roads $\Rightarrow$ 8% more traffic

So adding more roads is unlikely to alleviate congestion
- Still, solving some bottlenecks may be effective
5. Agglomeration economies

- A large literature shows that agglomeration economies are important
  - Combes et al (2010) for France
  - Ahlfeldt et al (2015) for Berlin
  - Dericks and Koster (2019) for London
  - [...] 

- Agglomeration economies
  - Firms are more productive in dense areas
  - Hence, firms benefit from other firms in the vicinity

- Particularly holds for business services and shops
However, firms do not take into account the benefits they may have on others
  • Think of isolated shops or manufacturing plants

Policies that nudge firms to cluster more are likely to be effective
  • But only if the benefits of clustering offset the costs (... more congestion)
  • Whether this holds for Bogotá remains to be seen
Urban sprawl is not necessarily ‘bad’ and compact development is not necessarily ‘good’

1. Consider what the benefits of open space are when limiting urban sprawl
Planning restrictions imposing low(er) densities throughout the city may encourage sprawl

2. Be clear on what the benefits of restrictions are

Benefits of restrictions

- Cultural heritage protection
- Inner-city open space protection
- […]

Congestion usually is not combatted by building new roads or by imposing driving restrictions.

3. Consider alternatives: road pricing; better traffic management; investments in public transport.
6. Recommendations

- Agglomeration economies make firms more productive in dense areas

4. Cluster employment *if* the benefits of clustering offset the costs of clustering

- Research is needed to measure the magnitude of traffic congestion costs and agglomeration benefits in Bogotá
6. Recommendations

- Urban challenges do not stop at municipal boundaries
  - A regional perspective is required!

- Benefits:
  - Scale economies in provision of infrastructure
  - No competition between local governments
  - Integrated plans for the region

5. Increase collaboration between local authorities
To test effectiveness, good urban data is required:
- Traffic flows
- Firm locations
- Household locations (both formal and informal)
- Land prices (!)
- Wages
- [...]

6. Gather data to analyse magnitude of urban problems and test effectiveness of policies

- ODUR!
Market forces shape cities

Compact city development and urban sprawl can be both a result
• Compact development in the city centre
• Low-density developments at the urban fringe
• .... as a result of bidding for land
7. Summary

- When is urban sprawl excessive?
  1. When benefits of open space are ignored
  2. When there are strong density restrictions
  3. Excess commuting
How to combat congestion?
- ... not easy!
1. Road pricing
2. Better traffic management
3. Improve on public transport system

What usually does not work
1. Driving restrictions (based on number plates)
2. Just building more roads
Agglomeration economies
• Firms are more productive in dense urban areas

Fostering dense developments could be efficiency improving
• If agglomeration benefits are higher than the additional congestion costs
• ... open question for Bogotá
The economics of urban growth

Hans Koster
Associate professor