

Agglomeration and cross-border infrastructure

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- Focus: Effects on agglomeration of cross-border infrastructure.
- Cross-border infrastructure: infrastructure that crosses the administrative boundaries of regions or countries, and serves mostly to facilitate movement of goods and people across regions rather than within regions.
- 2 main topics:
 - Agglomeration, cross-border infrastructure, and regional inequalities.
 - Infrastructure improvements and growing urban interdependence.

Agglomeration, cross-border infrastructure, and regional inequalities

- A recent literature on agglomeration and trade tries to explain broad patterns of agglomeration extending across substantial parts of a region or crossing regional boundaries.
- Strong emphasis on transport costs and how they affect regional inequalities in production, employment, and income.
- It builds on two basic elements:
 - Large markets are disproportionately attractive for firms producing differentiated products under scale economies.
 - Large markets are large partly because many firms and consumers choose to locate in them.
- The combination of market access and mobility creates a ‘snowball’ effect.

The home market effect

- The 'home market' effect (Krugman, 1980): Large markets attract a disproportionate share of production subject to increasing returns.
- In the benchmark theoretical model with only two regions,
 - defining the relevant size of demand in a market is straightforward,
 - the home market effect holds not only in static but also in dynamic terms (Head, Mayer, and Ries, 2002).
- More complex with many regions. The attractiveness of a region for firms is then a combination of three elements (Behrens, Lamorgese, Ottaviano, and Tabuchi, 2004):
 - market size (attracting firms towards high-expenditure countries),
 - accessibility (attracting firms towards countries that are centrally located or have good transport connections),
 - and competition (driving firms away from markets easily served by many competitors).

The role of transport for the home market effect

- High-quality transport connections and a central geographic position are a crucial part of what makes demand for firms located in a particular region large (Davis and Weinstein, 1996, vs. Davis and Weinstein, 2003)
- Despite this, a larger market and better accessibility do not always translate into more production.
 - Fiercer competition can be the dominant effect from increased accessibility.
 - Possible ‘hub shadow’ (regions with intermediate accessibility may do worst).

Mobility

- The new economic geography combines 2 types of mobility with home market effects to explain agglomeration:
 - Worker migration towards markets with more firms (due to higher wages and wider range of locally-produced goods), which amplifies the home market effect and attracts even more firms (Krugman, 1991).
 - Firm relocation towards markets with more firms (due to greater demand and availability of intermediates), which amplifies the home market effect and attracts even more firms (Krugman and Venables, 1995).

Transport and the evolution of regional inequalities

- One must not forget that roads and rail lines have lanes and tracks going both ways (Puga, 2002):
 - cross-border infrastructure projects connecting lagging regions with key markets make it easier for firms in lagging regions to reach new customers,
 - but also make firms in lagging regions subject to stronger competition from firms in more developed areas.
- Improvements in transport infrastructure connecting regions are more likely to increase than to decrease regional inequalities (Puga, 1999)
 - when there is strong labour mobility (as in the United States),
 - when there is weak mobility and limited wage differentials across regions within each country (as in Europe).
- Despite this they have an important role in facilitating increased efficiency and growth and wider gains from trade.

European regional inequalities

- Income convergence across European regions came to a halt in the late 1970s. In recent years, if anything, regional income inequalities have increased, specially inequalities within individual countries (Esteban, 1999, Rodríguez-Pose, 1999, Rodríguez-Pose and Fratesi, 2004).
- Regions that have benefitted from greater investments in infrastructure have not fared better in terms of income growth and convergence (Rodríguez-Pose and Fratesi, 2004).

- Contributing factors:
 - Natural tendency of transport improvements to amplify spatial inequalities (Puga, 2002).
 - Trans-European networks have improved access everywhere, but have widened the gap in relative accessibility (Gutiérrez and Urbano, 1996, Vickerman, Spiekermann, and Wegener, 1999).
 - The bulk of the change in transport costs is driven by other considerations common to all connections. According to Combes and Lafourcade (2005),
 - * 38.5% reduction in transport costs in France 1978–1998,
 - * improvements in infrastructure only lead to a 3.2% cost reduction,
 - * the bulk of the change was due to lower tyre and truck maintenance costs, improved fuel economy, efficiency gains from logistics, and deregulation in the transport industry.
 - Large investments in infrastructure not accompanied by other policies (e.g., skill formation).

Cross-border vs. local projects

- The defining characteristic of cross-border communication infrastructure projects, as opposed to local projects,
 - is not that investment is split among several regions,
 - but that it mainly affects the costs of moving goods and people across regions rather than within regions (e.g., Venables and Gasiorek, 1999, on the completion of the M-40 ring road around Madrid).

Border effects, agglomeration, and national network designs

- National transport and communication networks were often designed with a view to facilitating trade within a country (e.g., Toulouse to Bordeaux 2 hours by road or train, Toulouse to Barcelona 4 hours by road and 6 by train).
- A large literature documents significant border effects — discontinuities in trade as one crosses the border (McCallum, 1995, Anderson and van Wincoop, 2003, Chen, 2004).
- Agglomeration and national network designs contribute to border effects (Hillberry and Hummels, 2003, using data on us shipment distances).
 - Firms respond to national network designs by agglomerating within countries in clusters that rarely extend close to national borders.
 - Even if trade barriers are eliminated and transport networks adapted to facilitate international shipments, an important border effect will remain as long as earlier patterns of agglomeration persist.

Infrastructure across political boundaries

- *Since cross-border infrastructure crosses political boundaries:*
 - *There is a natural tendency for individual governments to under-invest in cross-border infrastructure because of cross-border spillovers.*
 - *It is prone to coordination problems; a connection built or improved by one government up to the border will be of little use if the project does not continue on the other side — aggravated if the project has particularly asymmetric effects.*

The role for supra-national institutions

- Recall:
 - Small effects on firm location and regional convergence from the vast improvements in infrastructure in Europe.
 - Cross-border spillovers lead to under-investment.
 - Cross-border infrastructure is prone to coordination failures.
 - Networks designed for the national market are becoming inadequate.
- Thus, it may be best for supra-national institutions to place emphasis on cross-border infrastructure, where they have a distinct role.
- Regarding spillovers and coordination failures, particularly important role when the distribution of the investment differs substantially from the distribution of expected benefits.
- Regarding the adaptation of transport networks to cross-border trade, this will be most effective when there are clusters with potential input-output linkages across the border (Hanson, 1996, on Mexico-US).

Infrastructure improvements and growing urban interdependence

- We now turn to agglomerations at smaller geographical levels than regions and countries, particularly at the level of cities.
- Firms and workers are much more productive in large cities than in other locations: a doubling of city size increases productivity by between 3 and 8 percent for a large range of city sizes (Rosenthal and Strange, 2004).
- 3 types of explanations (Duranton and Puga, 2004):
 - A larger market allows for a more efficient sharing of indivisible facilities (e.g., local infrastructure), a variety of intermediate input suppliers, or a pool of workers with similar skills.
 - A larger market also allows for a better matching between employers and employees, buyers and suppliers, or business partners.
 - A larger market can also facilitate learning (e.g., promoting the development and widespread adoption of new technologies and business practices).

Long-distance infrastructure and urban agglomeration economies

- Most of these agglomeration mechanisms operate over very small distances and are not particularly sensitive to long-distance transport infrastructure (Rosenthal and Strange, 2001, Henderson, 2003a).
- An important exception is agglomeration in order to share a variety of intermediate suppliers.
 - Spending a large fraction of costs on intermediate inputs alone does not make a sector more likely to agglomerate.
 - Firms agglomerate to share a variety of intermediate suppliers only if the suppliers of a sector's key intermediates are themselves agglomerated (Overman and Puga, 2008).
 - In this case final producers tend to cluster within reasonable distance of their intermediate suppliers.
 - Long-distance infrastructure allows the benefits of such an agglomeration to be reaped further away.

The urban trade-off

- Larger cities have productivity advantages but also more expensive residential and commercial land and involve lengthier average commutes.
- Following Henderson (1974), models of systems of cities characterize city size as the result of a trade-off between agglomeration economies and congestion costs.
- The relationship between city size and the net urban benefits is typically concave, with net benefits first increasing and then decreasing with city size.

Policies affecting the urban trade-off

- From a policy perspective, there is a tendency to focus on promoting the benefits, in particular through cluster policies.
- However, the case for such cluster policies is weak (see Duranton, 2008, for a thorough discussion).
- Addressing urban congestion costs, while also complex is plagued by fewer problems and can also be more effective.
- There are also greater public checks on such policies, since bad transport or housing policies are more easily perceived by a city's population.
- This points to transport infrastructure for commuting as a way to improve the trade-off between agglomeration and congestion costs delivered by cities.

Highways and cities

- However, inter-regional transport infrastructure also plays an important role (the first 15 or 20 km at either end of a highway connecting two cities is often used mostly for local commuting).
 - Highways, by facilitating commuting, affect the housing choices of people living in a city.
 - * An additional highway crossing an average US city doubles the number of people relocating from the central city to the suburbs (Baum-Snow, 2007).
 - Highways, by reducing commuting costs, also make a city more attractive relative to other locations and lead to population and employment growth.
 - * Duranton and Turner (2008) address the issue of reverse causation — faster growth possibly leading to more roads — by instrumenting US roads with the 1947 interstate plan.

- * A 10 percent increase in roads increases a city's population and employment by an extra 2 percent over the following 20 years.
- * Addressing the reverse causality problem increases the estimated effect of roads on city growth by a factor of five.
- * This indicates that road building is endogenous to urban growth, but because more roads are built in cities with slow growth rather than in cities with fast growth.
- * These new roads built in response to a local downturn tend to have much smaller effects on urban growth than the average new road.

Transport, trade, and urban primacy

- Many countries are characterized by an excessive urban primacy — concentration of urban population in its largest city (Henderson, 2002, 2003*b*).
 - The largest city has grown to a point at which additional agglomeration creates more congestion costs than benefits.
 - This also diverts resources from other cities .
- Different types of transport infrastructure have very different effects on such concentration.
 - Hub-and-spoke networks tend to increase urban primacy.
 - Cross-border transport connections facilitating international trade tend to reduce it (Krugman and Livas Elizondo, 1996, Ades and Glaeser, 1995, Hanson, 1997).

Increasing functional specialization

- Transport and communication infrastructure improvements are the main driving force of the shift from sectoral to functional urban specialization (Duranton and Puga, 2005).
- Half a century ago most firms keep their management offices close to their factories.
- Reductions in transport and communication costs have greatly facilitated managing production from a distance. As a result:
 - Many firms have separated management from production.
 - Headquarters increasingly co-locate with other headquarters to share business services. They tend to be in big cities because business services tend to exhibit greater economies of agglomeration, are less land-intensive and employ high-skilled employees valuing amenities.
 - Production facilities increasingly co-locate with other production plants in smaller, more specialized towns and cities.

When sowing and reaping happen in different places

- Firms also increasingly separate innovation from mass production (Duranton and Puga, 2001):
 - Cities with a diverse mix of activities facilitate learning and experimentation at the early stages of a product's life-cycle.
 - Cities that are narrowly specialized in a few sectors create greater economies of agglomeration later on.
- Good accessibility is a crucial determinant of the spatial separation of the various activities of firms (Aarland et al., 2007).
- The most relevant bits of infrastructure in this respect include high-speed rail, airports with frequent non-stop flights, and communication technologies (Puga, 2002, Vives, 2001, Bel and Fageda, 2008).

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