



Several multiplexes in the same city: The role of socioeconomic differences in urban mobility

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The Economist

World politics Business & finance Economics Science & technology Culture

Income equality

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The ratio of the share of national income going to the richest 20% of households in a country to the share of the poorest 20% is a useful measure of inequality. Figures from the World Bank show that by this indicator many of the world's most unequal countries are in Latin America. In Colombia the incomes of the top fifth are nearly 25 times those of the bottom fifth. Most emerging Asian countries are less unequal: the incomes of the richest 20% of Chinese are about eight times those of the poorest 20%. In Thailand, one of Asia's most unequal countries, the ratio is 15:1. Qatar's income per person is among the world's highest. But income is unequally distributed: the richest Qatari receive over 13 times as much as the poorest.

Timekeeper



3.8k



320

Income equality

Percentage share of income held by*:

poorest 20% richest 20%



Source: World Bank

*Latest available year, 2005-09

An un-equal world



Travellers are not all the same!



Question:

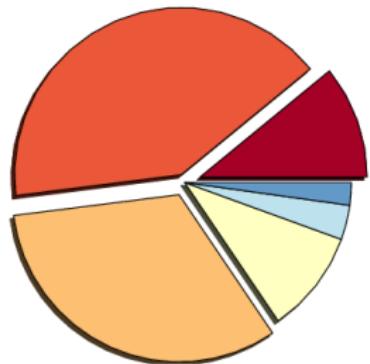
How the differences in the socio economic status of travellers affect the urban mobility?



Datasets

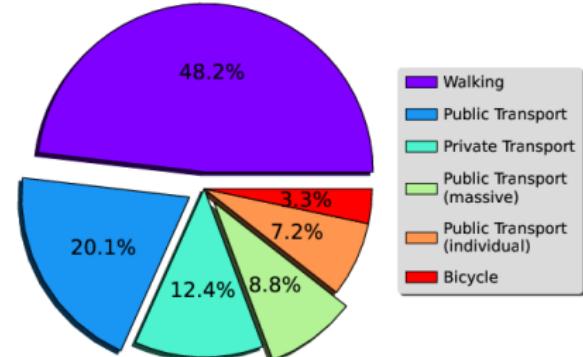
Main features:

- ▶ Method of data collection: Survey.
- ▶ Two Colombian cities: Bogotá and Medellín.
- ▶ Population divided in six Socio Economic Status (SES).
- ▶ Transport modes grouped into six different classes (layers).



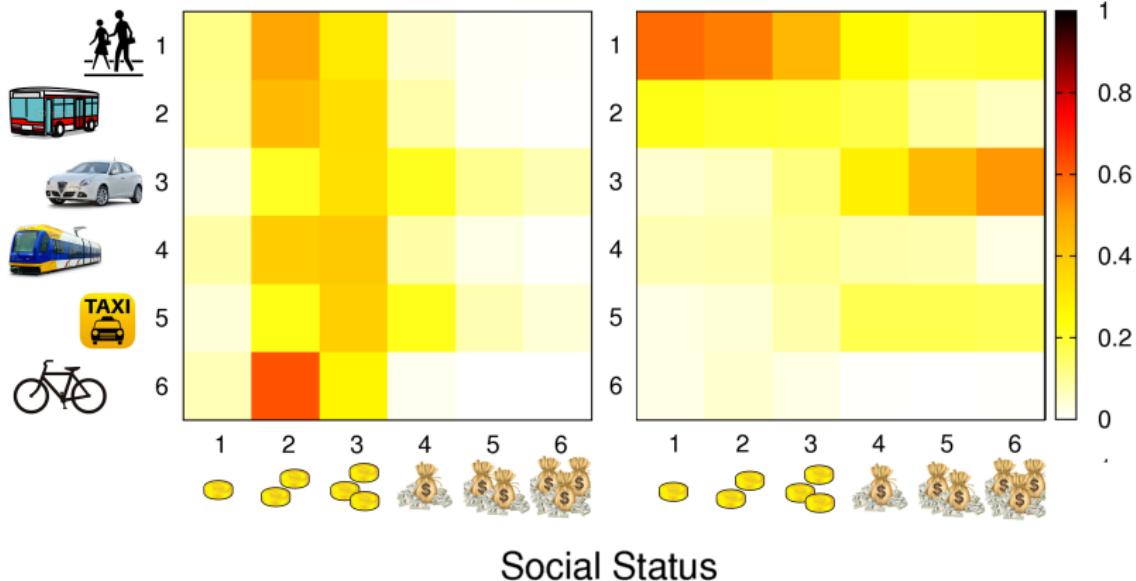
Population

Transportation



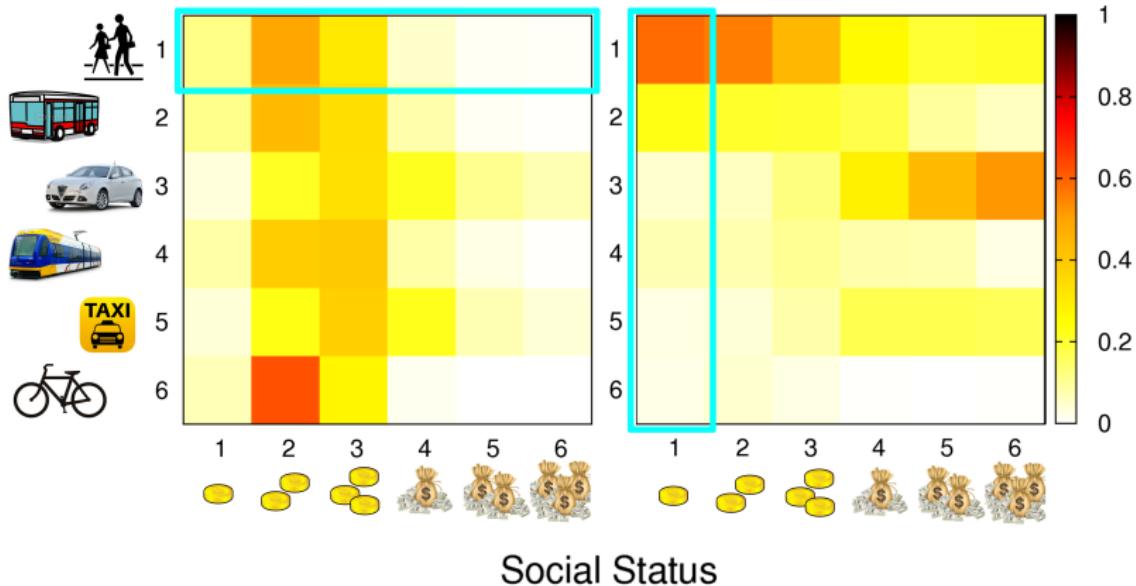
Segregation ≠ Multimodality

Transportation Mode



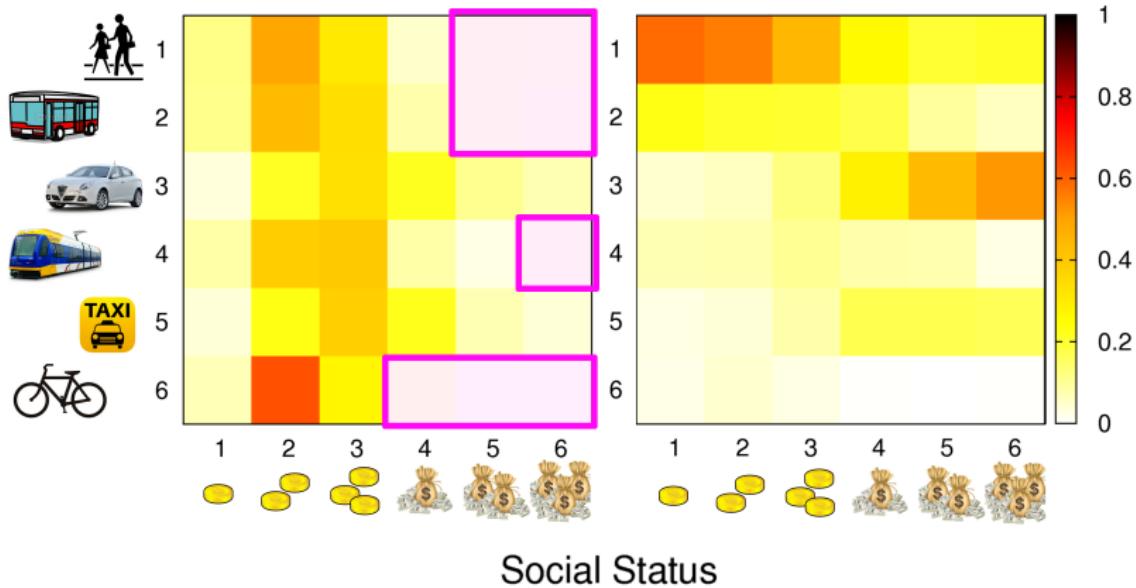
Segregation ≠ Multimodality

Transportation Mode



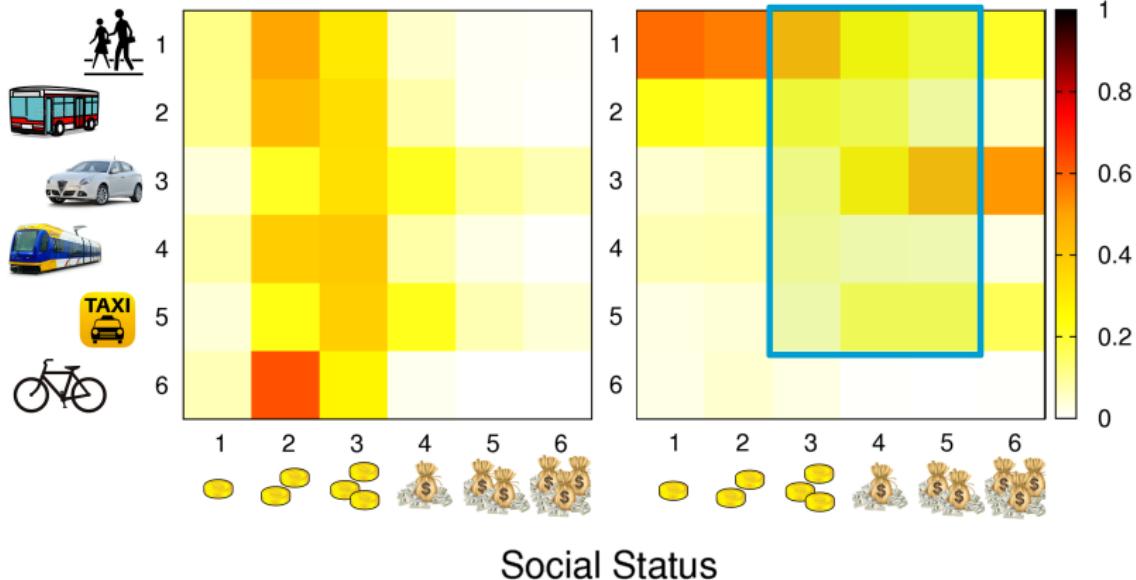
Segregation ≠ Multimodality

Transportation Mode

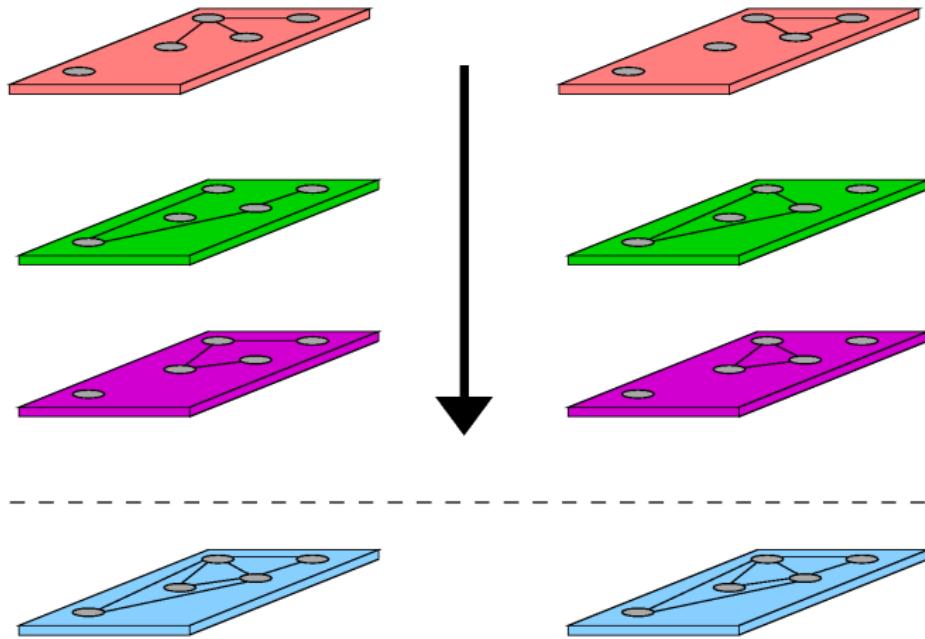


Segregation ≠ Multimodality

Transportation Mode



Multiplex adiabatic projection



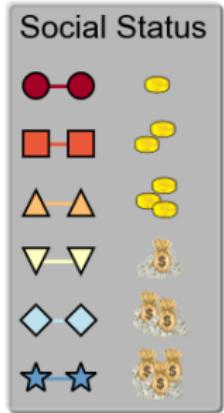
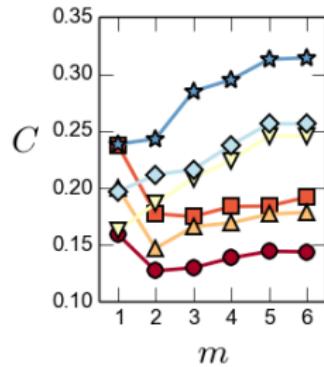
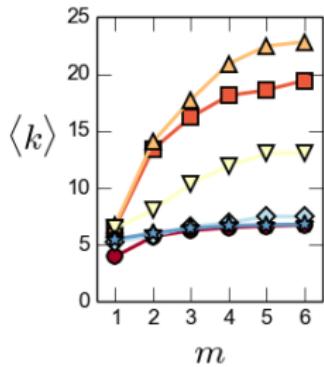
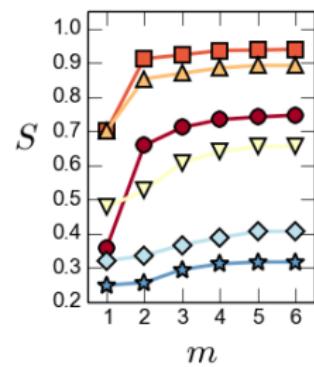
AC et al. "Emergence of network features from multiplexity". Sci. Rep., 3, 1344. (2013).

Multiplex adiabatic projection

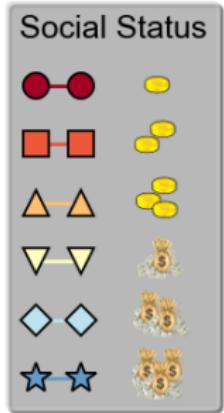
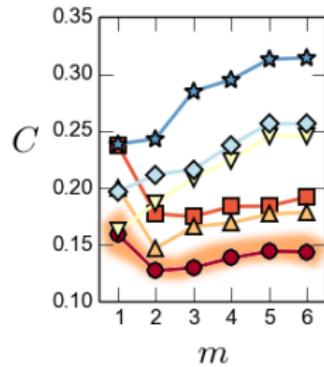
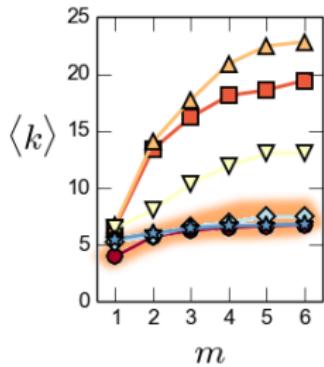
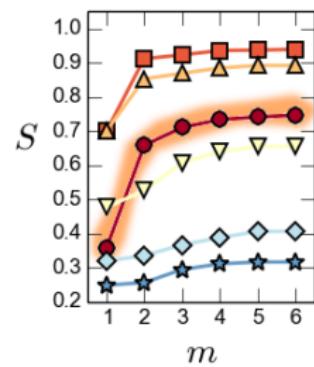


How the topological properties of mobility networks emerge when we collapse transportation modes?

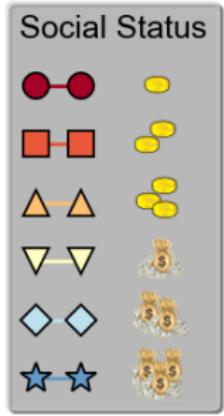
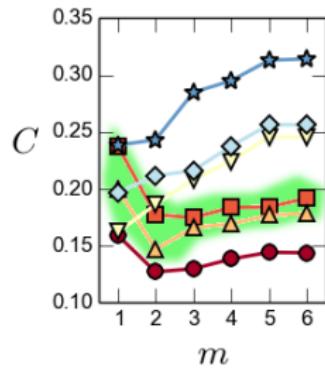
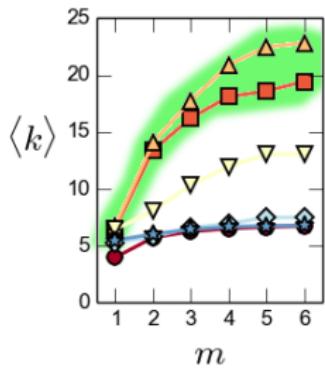
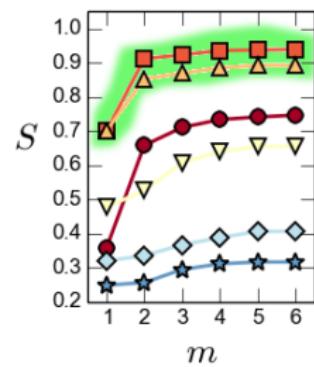
Percolation ≠ Connectivity



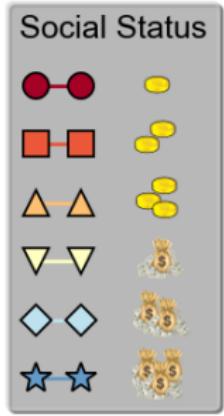
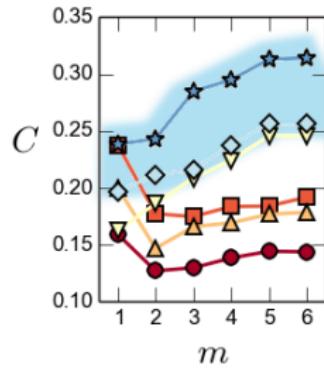
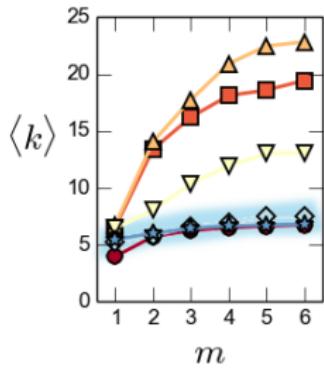
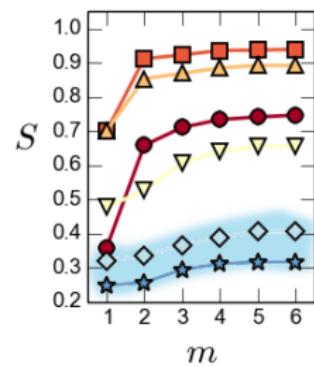
Percolation ≠ Connectivity



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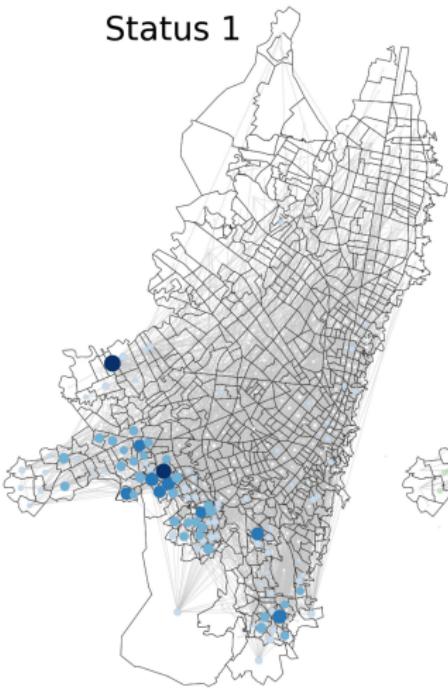


Percolation ≠ Connectivity

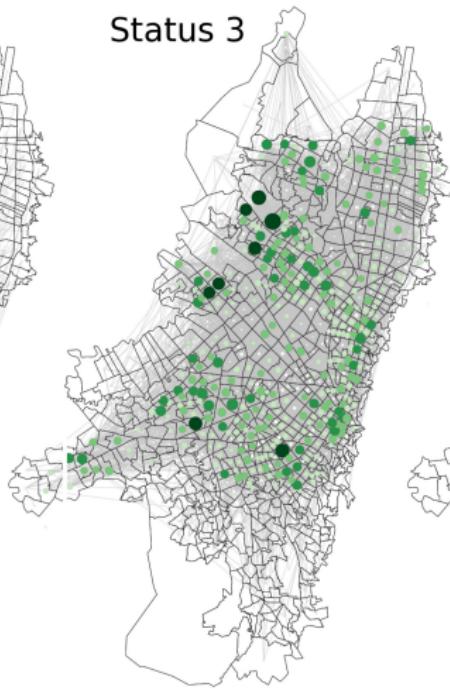


Percolation ≠ Connectivity

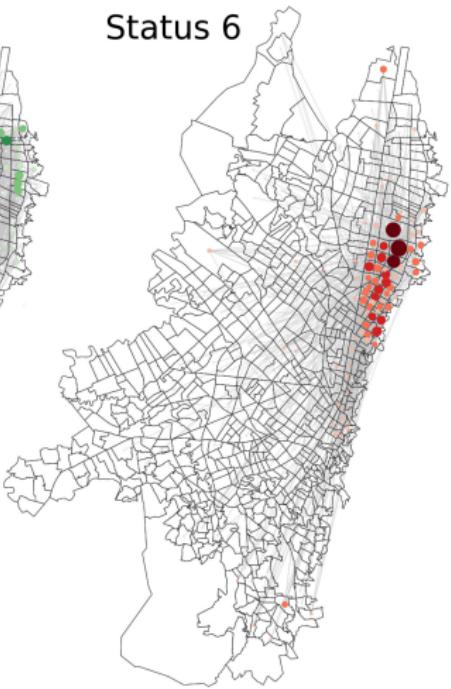
Status 1

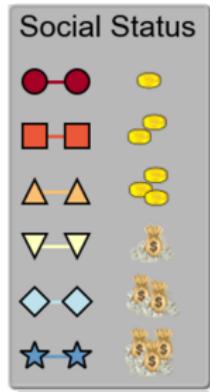
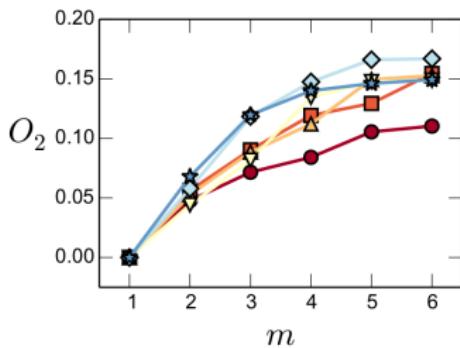
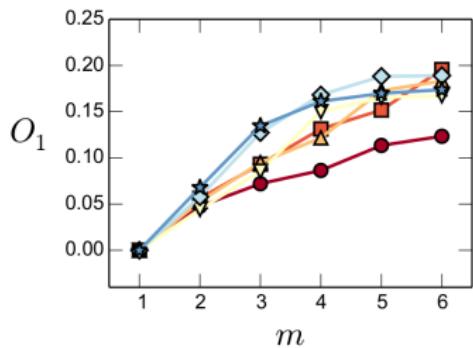


Status 3



Status 6





$$O_1 = \frac{W - K}{K}$$

$$O_2 = \frac{D}{K}$$

- ▶ Differences in the wealth status of travellers reflect on the topological properties of mobility networks.
- ▶ Some social status use only few transportation modes (**segregation**) while others display **multimodality**.
- ▶ The adiabatic projection technique as a tool to understand the relation between mobility and topological properties.



DO THE RIGHT MIX



Acknowledgements

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<http://arxiv.org/abs/1408.2484>

To appear in the book "Interconnected Networks",
Springer complexity series (2015).