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Outside the ivory tower: visualizing university students' top transit-trip destinations and popular corridors

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Universities are where innovations, face-to-face interactions and social capital are commonplace. Nevertheless, often regarded as ‘the ivory tower’, universities cannot be separated from the social and economic transformations outside of them. Traffic, information and financial flows between universities and other locations can be used to reveal connections between the ivory tower and other locales. Therefore, this paper uses the weekday public transit smartcard records from 6 to 9 April 2010 (158,262 transit trips in total, including bus-only, bus plus subway and subway-only trips) to identify and profile the most popular destinations of student riders from the ‘985 universities’ (a short list of top universities designated by the Chinese Central Government in 1999) and associated transit trip flows in Beijing. It identifies destination hotspots for the 985 universities’ students in Beijing, allocates traffic volume to major roads and delineates the transit trips of students from each campus. The results indicate that there exist only weak ties and little movement between the top universities and the most disadvantaged areas.

Keywords: public transit; smartcard records; university student; China; Beijing

Cities are regarded as the foremost places that make us richer, smarter, greener, healthier and happier (Glaeser, 2012). One secret of successful cities lies in innovations facilitated by intensive face-to-face interactions. Interactions enhance the social capital of the interacting parties. Universities are where innovations, face-to-face interactions and social capital are commonplace. Nevertheless, universities cannot be separated from the social and economic transformations outside of them. Traffic, information and financial flows between universities and other locations can be used to show connections between the ivory tower and other locales. Therefore, this paper uses the weekday public transit smartcard records from 6 to 8 April 2010 (158,262 transit trips in total, including bus-only, bus plus subway and subway-only trips) to profile the most popular destinations of the student riders from the ‘985 universities’ and associated transit trip flows in Beijing. The 985 universities are the top 39 universities, as designated by the Chinese Central Government in 1999. Beijing, home to eight of these schools, has the greatest number of the 985 universities in China.

We define ‘popular destinations’ as bus stops and subway stations where a student transit rider stays for longer than 1 hour before s/he starts a second transit trip. Transit

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trip records were extracted, transformed and loaded from a Microsoft SQL Server (2014). The data structure of the smartcard data applied in this study can be found in Long and Thill (2015). The coordinates of bus stops/subway stations were obtained from the Beijing Municipal Institute of City Planning & Design (BICP) and those of the 985 university campuses were obtained from those universities. Cube 5.0 was applied to allocate traffic volume to major roads using an all-or-nothing algorithm. Finally, all maps were produced with ArcGIS 10.3.

As places where people interact, innovate and increase their social capital, we argue that the identified popular destinations are as important as university campuses. Associated transit flows show, at least partially, how the top universities are connected to those popular destinations and where the strongest physical ties between them exist. Figures 1–3 visualize the popular destinations and associated ties. Figure 1 presents a destination hotspot map using the inverse distance weighted (IDW) technique

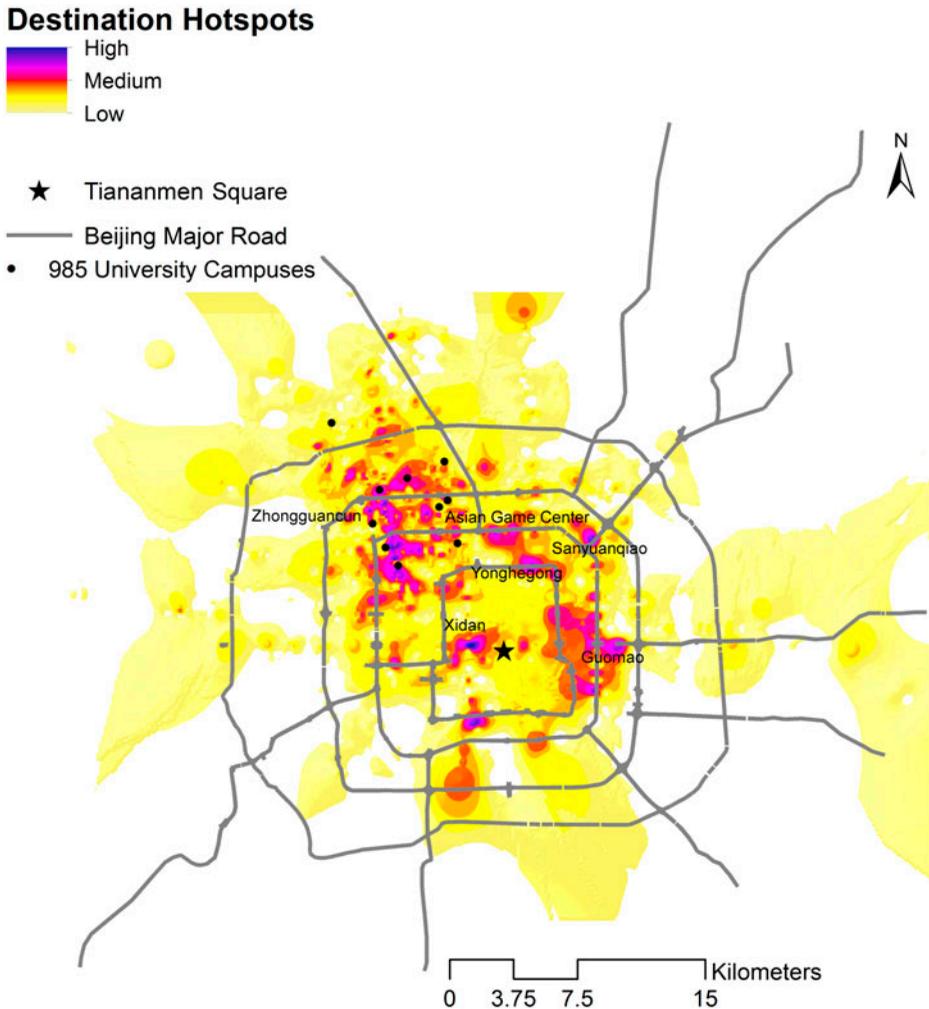


Figure 1. Top student transit trip destinations.

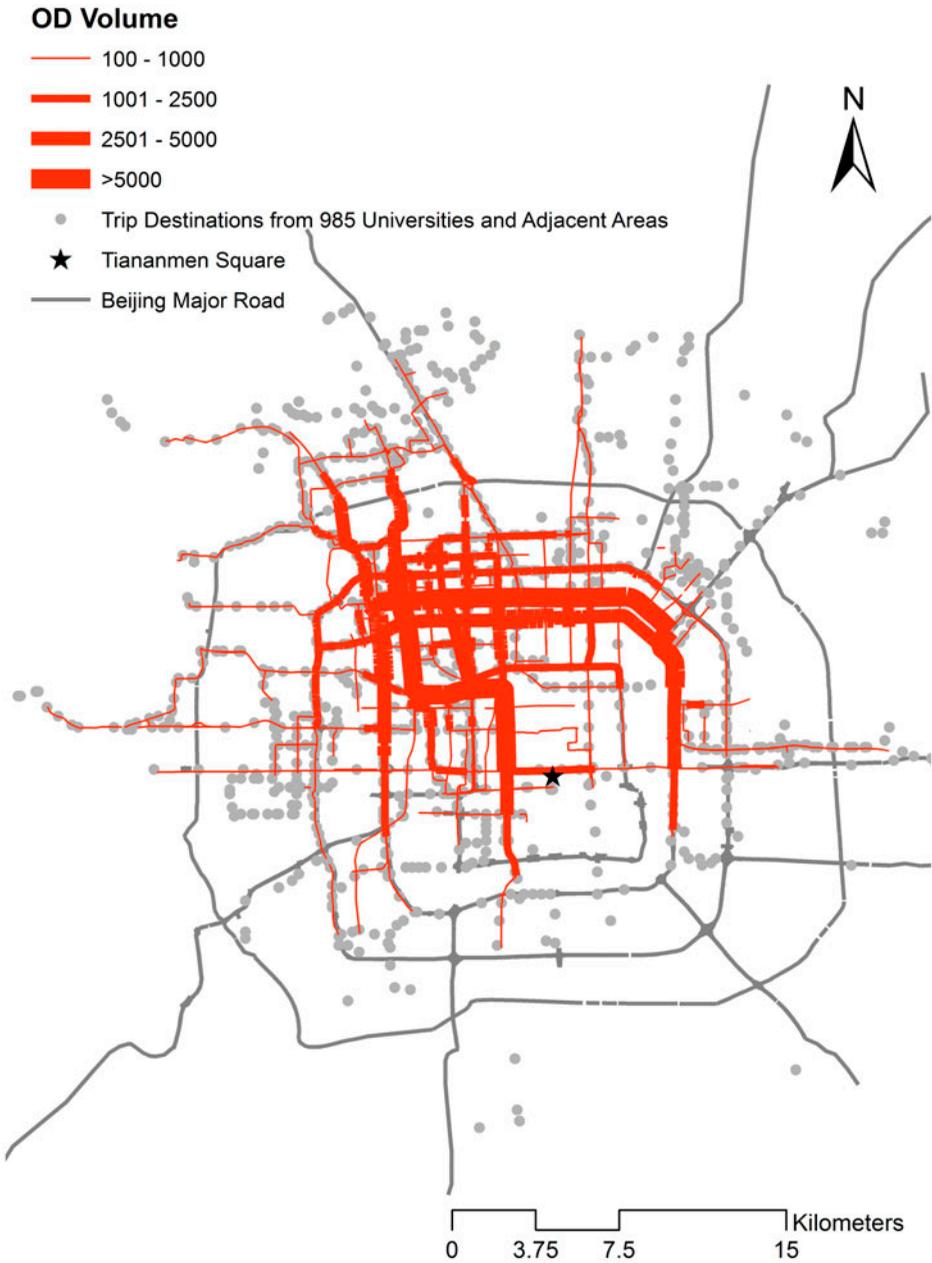


Figure 2. Distribution of all transit trips from the campuses.

provided by ArcGIS 10.3. Not surprisingly, areas adjacent to the 985 universities campuses, such as Zhongguancun, are associated with the most popular destinations. Additionally, the financial district Xidan and the central business district Guomao host the second most popular destinations. Other areas such as Yonghegong, Sanyuanqiao and Asian Game Village also contain a notable number of the popular destinations.

These areas have a high density of office buildings, shopping malls and restaurants. Moreover, from the perspective of university students, cities can be also regarded as sets of interactions that flow across networks (Batty & Cheshire, 2011). The origins and destinations of those university students are physical and visible, but the relational, social and interactional purposes of such trips are often invisible. Figure 2 visualizes the distribution of all the trips, where the traffic flows to and from the universities are allocated to the local road network, assuming that there is no traffic congestion and the trips occur on the shortest route between two nodes. From the perspective of network theory, this approach highlights the network morphology accommodated by the road infrastructure of Beijing, in which roads are ‘containers’ for the flows. Trips from the campuses heavily utilized some corridors, where, we argue, strong ties exist between the universities and other locales, such as Guomao and Yonghegong. Most of the strongest ties and heavily utilized transit corridors are within the third ring road, occupied by the highest concentration of high-income residents, high-profile entities and high-paying jobs in Beijing. Finally, yet significantly, Figure 3 shows where students visit after leaving their respective campuses and adjacent areas. The student riders went to numerous destinations, similar to the general riders (Roth, Kang, Batty, & Barthélemy, 2011). However, they rarely went to the areas south of the third ring road, the location of highest concentration of low-income residents and low-paying jobs in Beijing.

As a whole, therefore, our studies indicate that there exist only weak ties between the top universities and the most disadvantaged areas in Beijing. This is different from Roth et al.’s (2011) findings about general riders in London. Per Roth et al. (2011), most stations in London control their own regions and seem to have their own distinctive basins of attraction. In Beijing, student riders from top universities tend to favour or avoid certain stations or regions, regardless of distance.

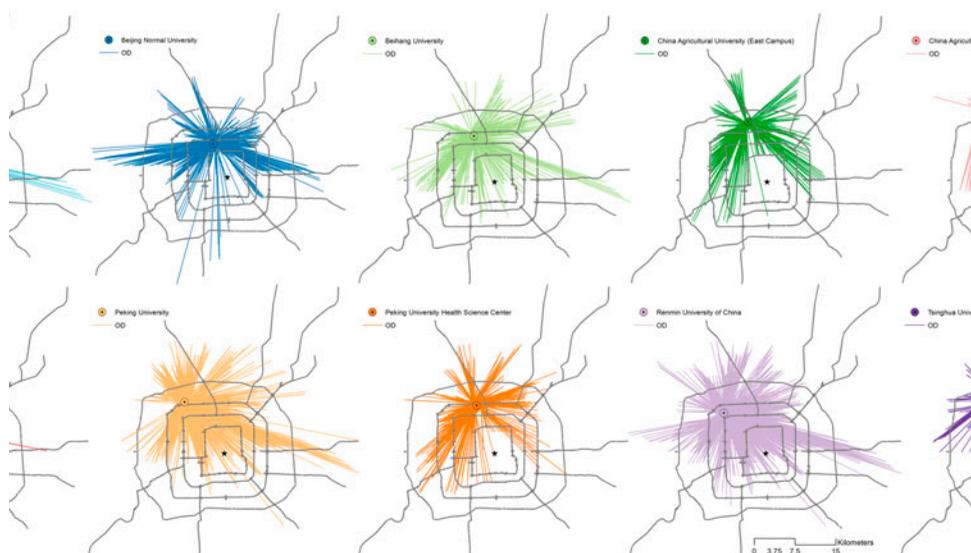


Figure 3. All transit trips between the campuses and different destinations.

Disclosure statement

No potential conflict of interest was reported by the authors.

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