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Measuring Distance to University in Germany: How Accurate is the Straight-Line Approach?

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Oral presentation

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Author

Daniel Hein

Affiliation

German Centre for Higher Education Research and Science Studies

Abstract

Many studies in the field of higher education use distance as a simple measure of accessibility, commuting, or moving. They often define distance as the straight-line distance, while only a few studies measure distance using the actual travel distance. This approach is supposedly more sophisticated, accurate, and realistic. Our aim is to assess whether the straight-line is an adequate proxy for travel distances by car and multimodal public transportation in Germany.

We compare the straight-line and the travel distances between the former school and the current university. We also distinguish between the shortest and the best route. The linear relation between the straight-line and travel distance was analyzed using ordinary least-squares regression. To examine outliers, the difference between the actual travel distance and the predicted travel distance, which is the straight-line distance multiplied by the regression slope, was used. The straight-line distance is a good proxy when the absolute difference between the actual travel distance and the predicted travel distance is less than 5 km, or the relative difference is less than 10 %. The results are based on a representative sample of 2,903 different routes taken by German students.

In 96 % of the cases, the straight-line distance is an adequate proxy for the shortest travel distance by car. However, the straight-line is a good approximation of the best car route 80 % of the time. For the shortest and best public transportation routes, the straight-line is a reliable proxy 66 % and 60 % of the time, respectively. The largest discrepancies occur in areas with physical obstacles such as lakes, rivers, mountains or wilderness and nature conservation areas. These findings suggest that future studies should use travel distances for more realistic results, as they provide significantly greater accuracy than straight-line distances.

Keywords

euclidean distance, road network, detour

Primary author: HEIN, Daniel (German Centre for Higher Education Research and Science Studies)

Presenter: HEIN, Daniel (German Centre for Higher Education Research and Science Studies)

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