Impacts of regional railways to the transition of population, urban area, and income in Australian cities

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Abstract:
The critical aim for constructing railways is to enhance the economy and improve our quality of life. However, most of the previous researches which studied about railways’ role only focused on population to detect how the city has changed (Silvera et al., 2011). There are some studies which focused on several indicators to define city development other than population (Iyer, 2010, Becker et al., 2012), but those were quantitative research, not quantitative research, leaving us the issue that we cannot compare the situation between different cities. In order to make the best use of knowledge about railways and city development when constructing new railways, it’s quite important for us to quantitatively study using several factors to define city development and its relation with railways.

Background
The objective of this study is to quantitatively evaluate the developmental status of the cities with and without railways using three indicators (population, urban area, and income). We compare the developmental status using dendrograms made with three indicators (population, urban area, and income) of each city. Some results support the idea that development status of cities with freight railway is different from that of cities without railways. Next, in order to see whether this result is because of railway or not, industry structure of each city was checked. Dendrograms made by industry structure are shown in Figure 5. Eight major industries were used to develop dendrogram. We can see in this dendrogram, cities with and without railways are not separated, which means that freight railway and industry doesn’t have any relation. Railways were not constructed according to a certain industry, and also existence of railway hasn’t changed the industry structure of the city.

Methodology

Results
1. Urban area expansion

![Figure 1. Flowchart](image)

2. Developmental status

Discussion
Developmental status using three indicators (income, population, urban area) of each city, in each year is shown in Figure 3. In this graph, the size of bubbles shows the size of population. When comparing within cities of the same population size, cities with railways tend to have larger income and larger urban area. The same trend can be seen in Figure 4 as well.

Dendrograms made with three indicators at each year are shown in Figure 5. All cities with railway are sorted in the same group if we group them into two groups. This result supports the idea that developmental status of cities with freight railway is different from that of cities without railways.

Next, in order to see whether this result is because of railway or not, industry structure of each city was checked. Dendrograms made by industry structure are shown in Figure 5. Eight major industries were used to develop dendrogram. We can see in this dendrogram, cities with and without railways are not separated, which means that freight railway and industry doesn’t have any relation. Railways were not constructed according to a certain industry, and also existence of railway hasn’t changed the industry structure of the city.

Conclusion
- Cities along railways developed more in terms of population, urban area, and income
- There is no relation between railways and industry structure, so this results above is because of railways

Future works
- Even within cities with railways have different characteristics. We need to carry out qualitative analysis to know the meaning of this difference.
- Use more cities to make it more reliable
- Carry out the same analysis on Russia and Japan, and compare the situation between countries

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