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

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Abstract:
オーストラリアの大陸横断鉄道が最近20年間でどのような影響を沿線都市に与えたのかを議論する。大陸横断鉄道が都市に与えた影響を定量的指標を用いて観測した例は非常に少なく、その中でも複数の都市の発展の指標を用いて議論しているものはわずかしかない。本研究では人口、都市面積、収入を用いて都市発展を定義した。最後に産業別人口を用いて鉄道敷設と都市産業の関連がないことを確認した。将来鉄道を建設する際、どのようなルートがいいのかを考える際に役立つだろう。
まず、オーストラリア政府が定義した国内の主要貨物交通網を参考にし、鉄道がとおっている都市とそうでない都市を取り上げた。人口、都市面積、収入のデータを20年間にわたって収集した。人口と収入に関しては政府の統計局から、都市面積はランドサット衛星画像から算出した。これら3指標を用いて対象の全てのとしをクラスター分析で分類した。この結果、鉄道沿線の都市とそうでない都市は異なるグループに分類された。一方産業別人口を用いて都市をクラスター分析行ったところ、産業と鉄道の有無の関係はないことが分かり、以上より鉄道は人口、都市面積、収入に影響を与えたと言える。

Background

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 (Silveria 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.

Objective

To detect the effect of freight railways to the surrounding cities in a comprehensive way in the past 20 years.

Methodology

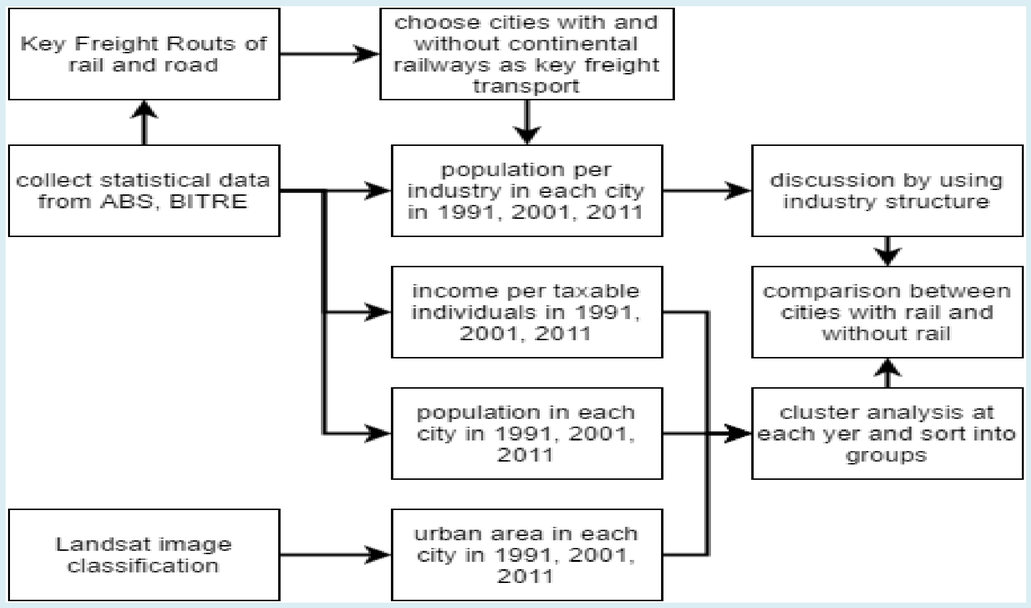

Figure 1. Flowchart

Results

1. Urban area expansion

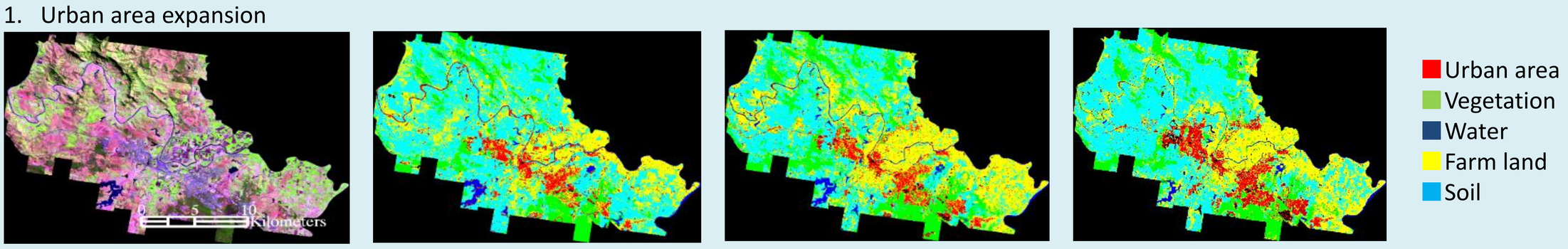

Figure 2. Urban area expansion of 1991, 2001, and 2011

2. Developmental status

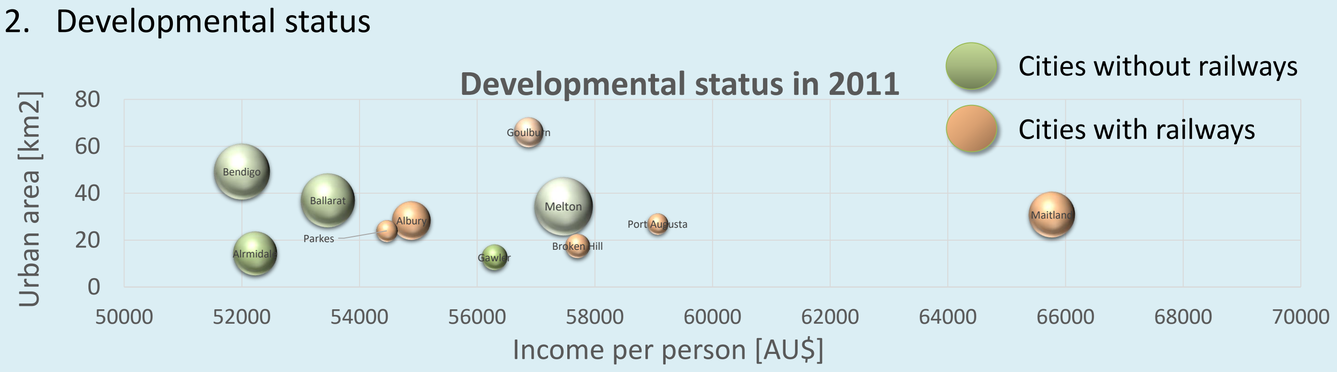

Figure 3. Developmental status in 2011

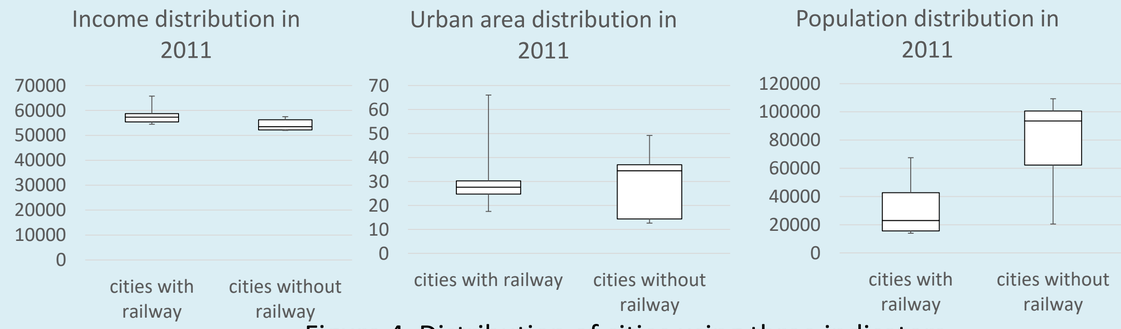

Figure 4. Distribution of cities using three indicators

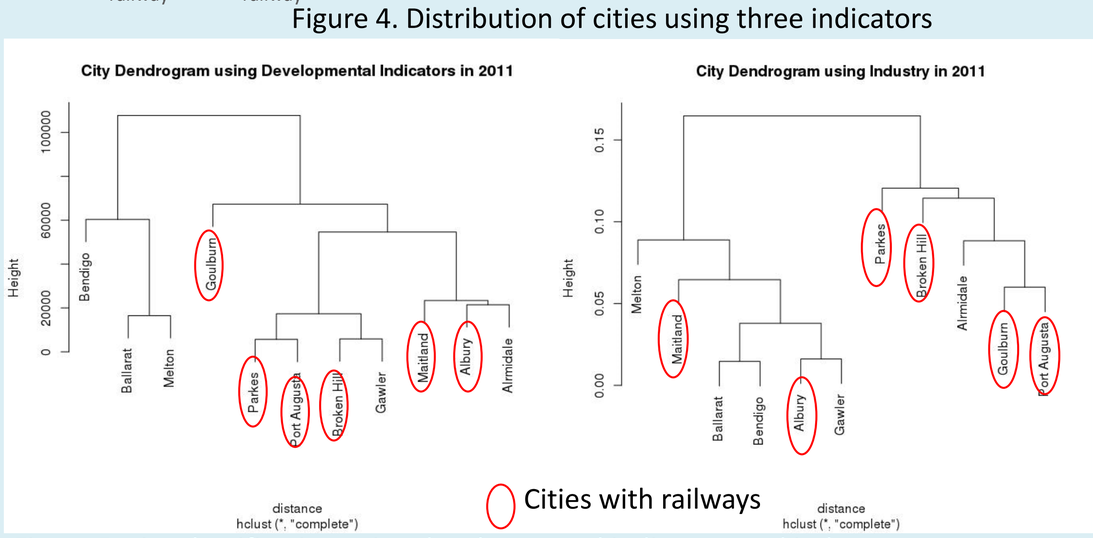

Figure 5. city classification using developmental indicators and industry structure

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 searched. 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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