MRCagney

BETTER TRANSPORT • BETTER PLACES • BETTER CHOICES

Modelling and valuing land use change

Peter Nunns

Engineering NZ - Transportation Group conference
Wellington, March 2019

What are we doing?

http://www.suekedgley.com/article/let%E2%80%99s-avoid-auckland-paradox

MRC

https://www.greaterauckland.org.nz/2017/08/31/rail-reaches-20-million-trips/

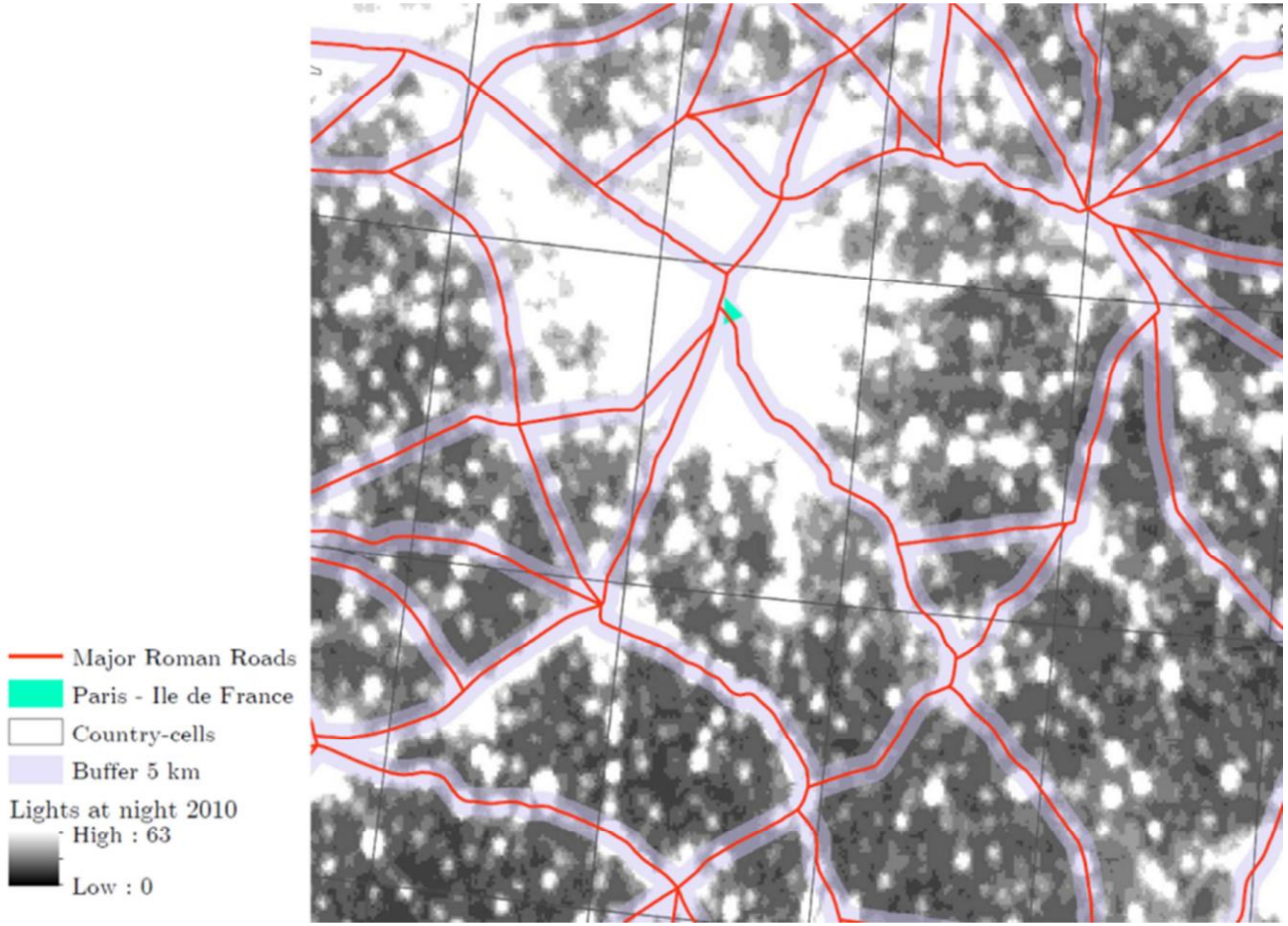
http://www.thewellingtoncompany.co.nz/projects/sponsorships/cubadupa/

In the long run, transport *is* land use

MRC

Roman roads, 2000 years later

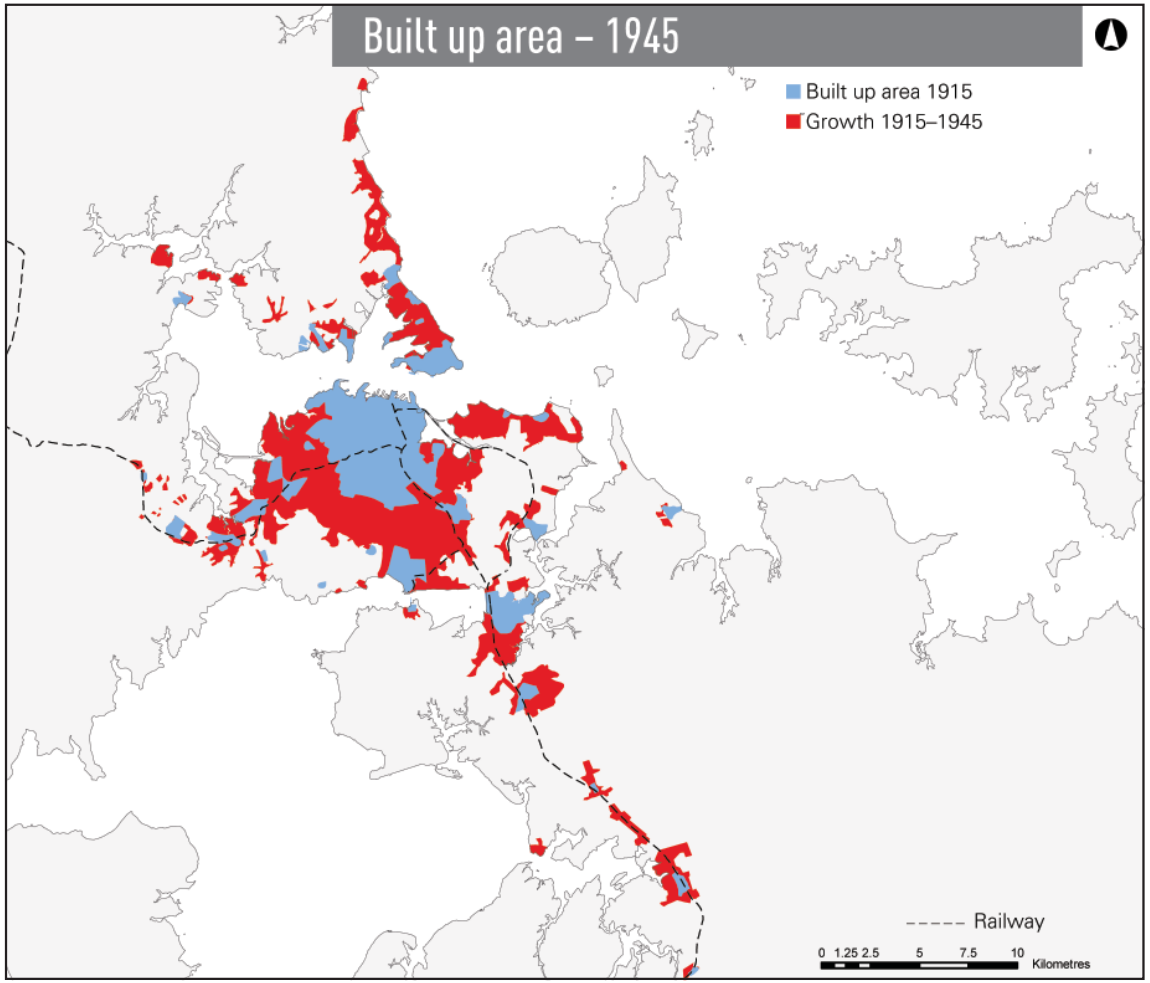
Figure 3: Roman roads and contemporary nightlights intensity around Lutetia (Paris)



Dalgaard, C. J., Kaarsen, N., Olsson, O., & Selaya, P. (2018). *Roman Roads to Prosperity: Persistence and Non-Persistence of Public Goods Provision*. University of Gothenburg Department of Economics Working Paper No 722.

MRC

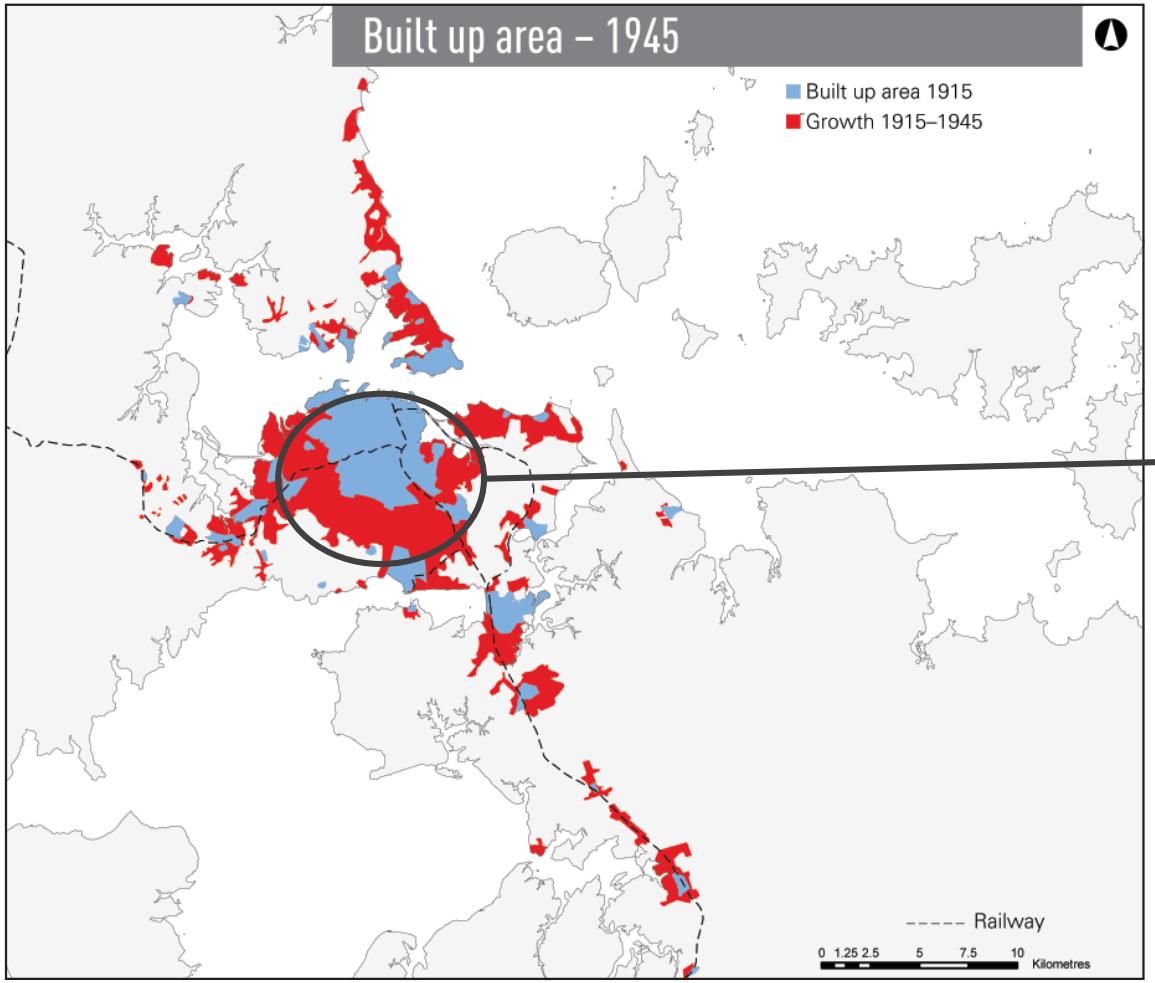
A growing Auckland



http://knowledgeauckland.org.nz/assets/publications/Brief_history_of_Auckland_s_urban_form.pdf

MRC

A growing Auckland

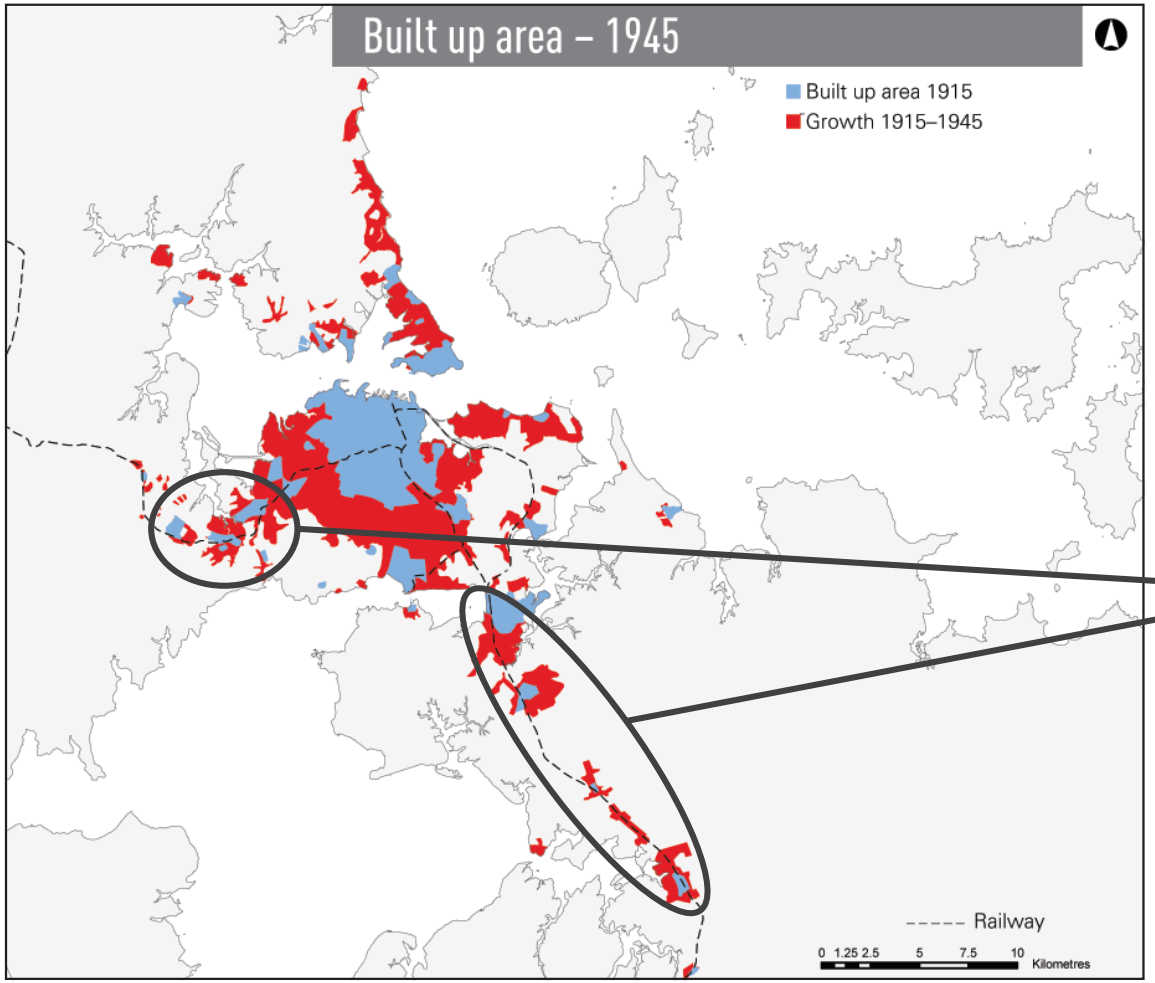


Tramway suburbs

http://knowledgeauckland.org.nz/assets/publications/Brief_history_of_Auckland_s_urban_form.pdf

MRC

A growing Auckland

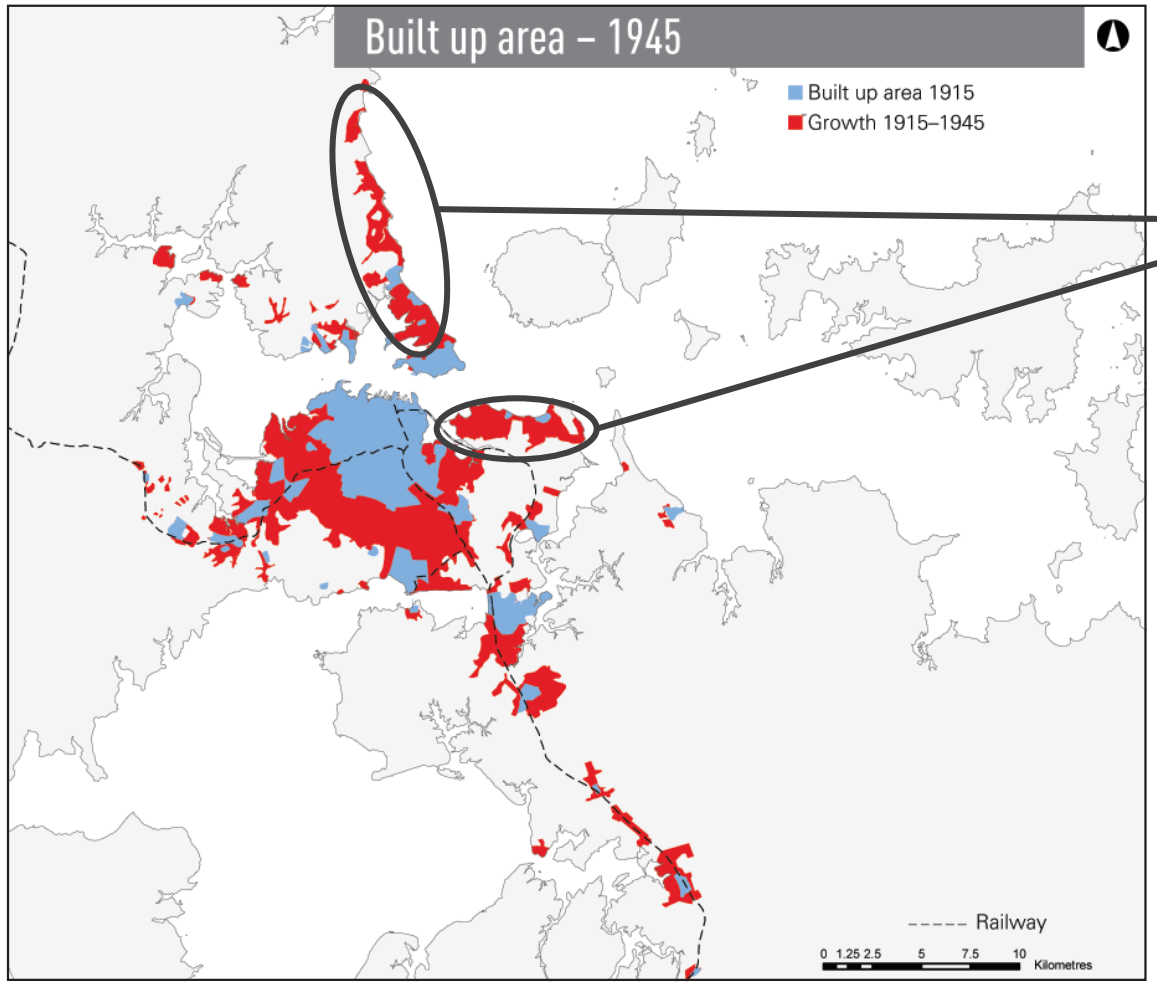


Railway suburbs

http://knowledgeauckland.org.nz/assets/publications/Brief_history_of_Auckland_s_urban_form.pdf

MRC

A growing Auckland



Inaccessible but scenic

http://knowledgeauckland.org.nz/assets/publications/Brief_history_of_Auckland_s_urban_form.pdf

MRC

Bridges to somewhere

https://en.wikipedia.org/wiki/Auckland_Harbour_Bridge#/media/File:Auckland_Harbour_Bridge_Under_Construction.jpg

MRC

Some econometrics

Model	Population density model		Employment density model	
Outcome variable	ln(2016 population density)		ln(2016 job density)	
Estimator	OLS	IV	OLS	IV
Explanatory variables				
ln(effective job density)	**0.184**	**2.012*** **	**1.924*** **	**1.552*** **
ln(distance to CBD)	-0.682***	-0.129	-0.283***	-0.396***
Elevation of zone centroid	-0.006***	-0.002	-0.002*	-0.003**
Constant	7.383**	-15.5*	-0.139***	-9.3*

*Statistical significance: *** p-value<0.001 ** p-value<0.01 * p-value<0.05*

MRC

Some econometrics

Model	Population density model		Employment density model	
Outcome variable	ln(2016 population density)		ln(2016 job density)	
Estimator	OLS	IV	OLS	IV
Explanatory variables				
ln(effective job density)	**0.184**	**2.012*** **	**1.924*** **	**1.552*** **
ln(distance to CBD)	-0.682***	-0.129	-0.283***	-0.396***
Elevation of zone centroid	-0.006***	-0.002	-0.002*	-0.003**
Constant	7.383**	-15.5*	-0.139***	-9.3*

*Statistical significance: *** p-value<0.001 ** p-value<0.01 * p-value<0.05*

MRC

Two modelling approaches

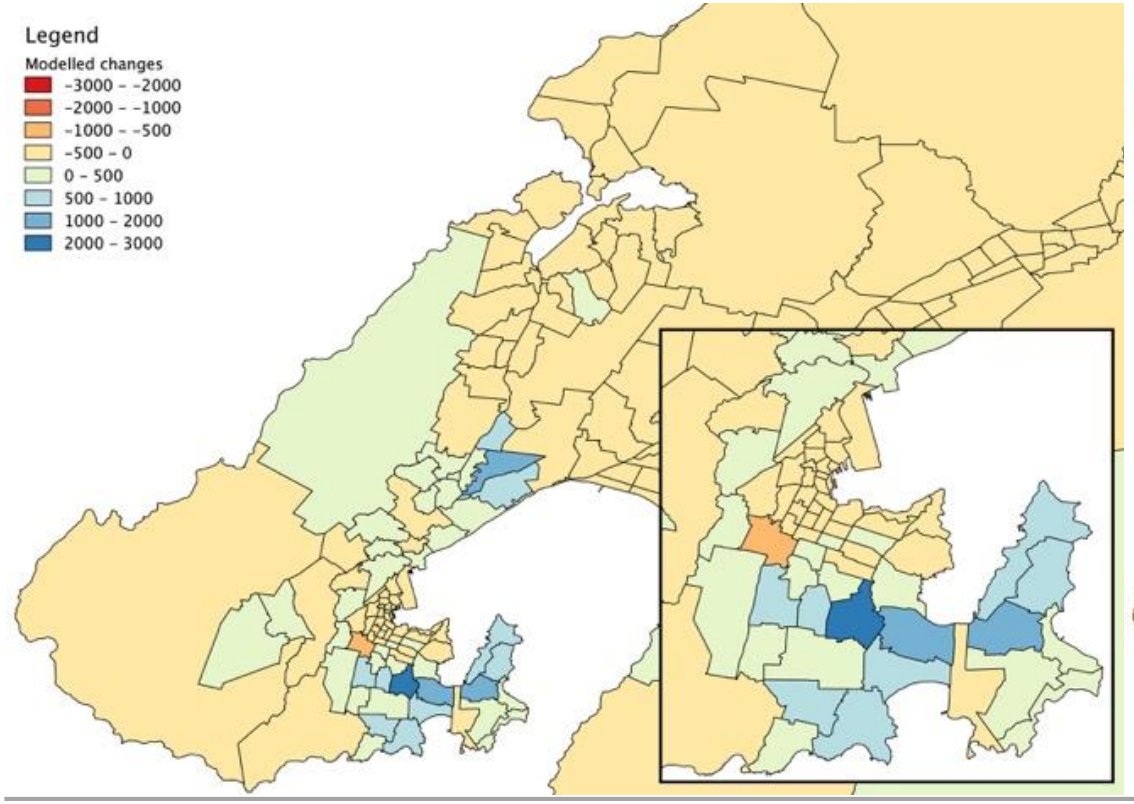
1. **Accessibility-density model:** Estimates how transport access influences local population / employment density

2. **Location choice model:** Estimates how faster journey times affect commuting flows between locations

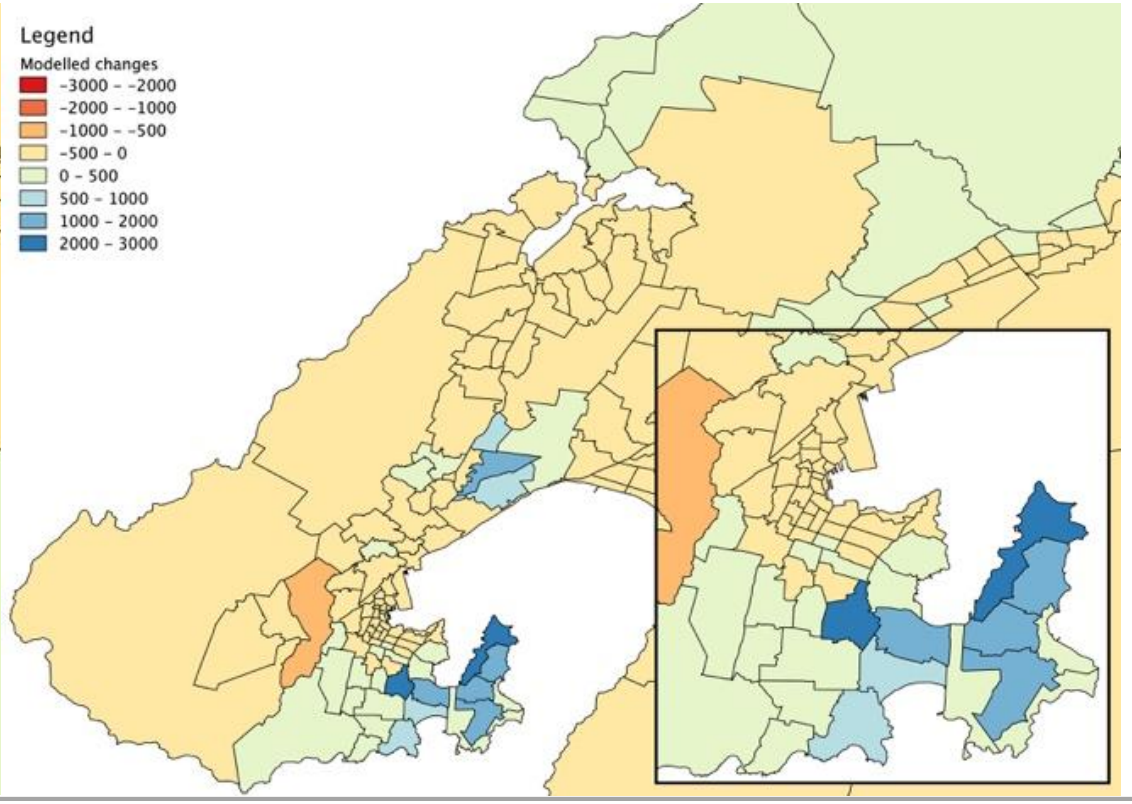
Case study 1: Let's Get Welly Moving

Predicted change in distribution of population growth

Accessibility-density model



Location choice model

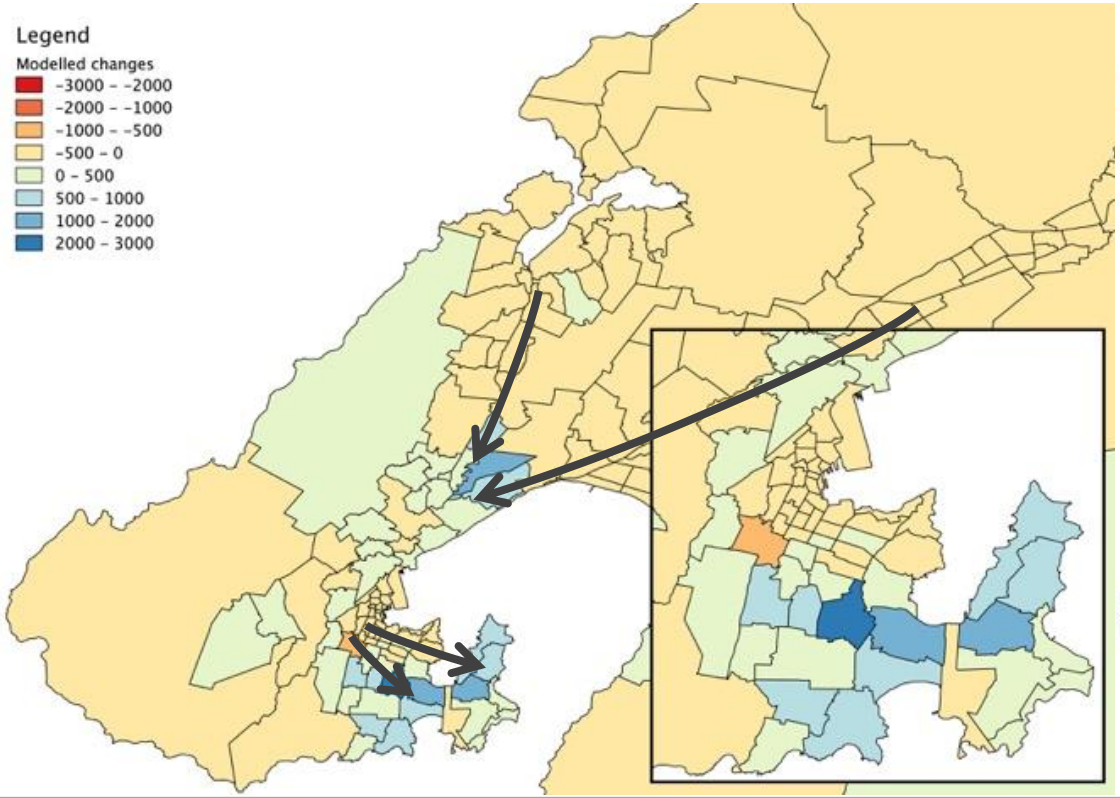


MRC

Case study 1: Let's Get Welly Moving

Predicted change in distribution of population growth

Accessibility-density model



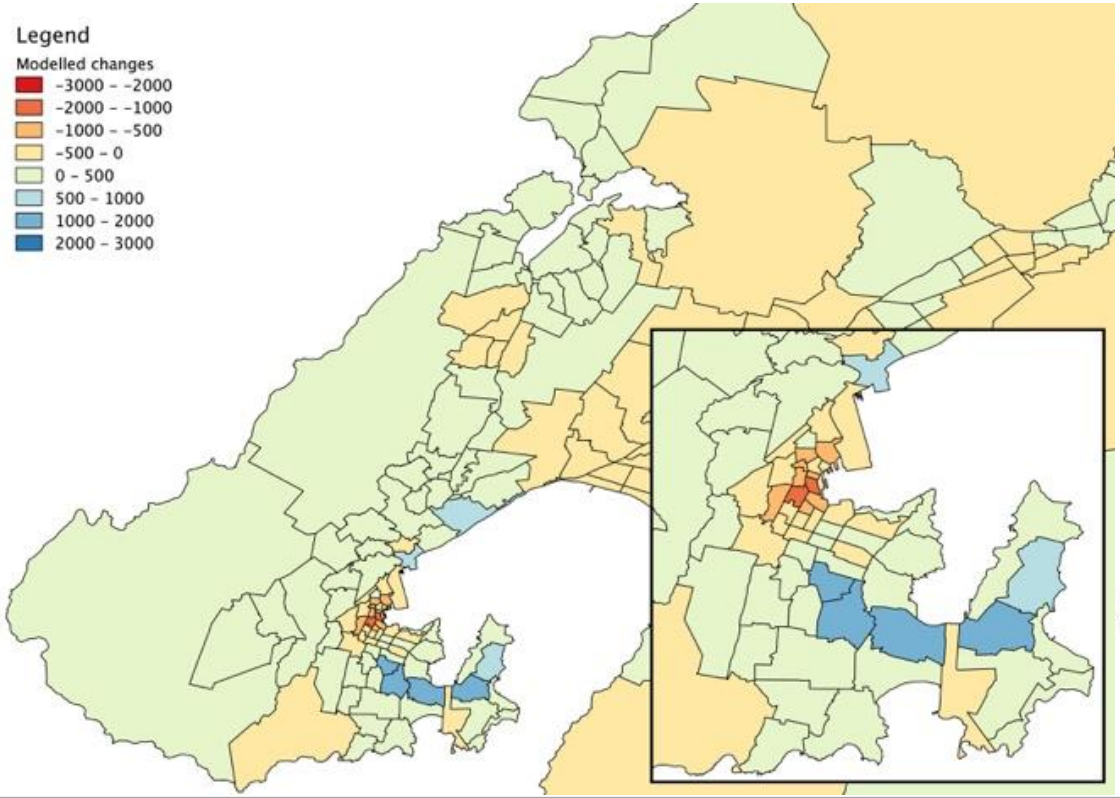
Location choice model

MRC

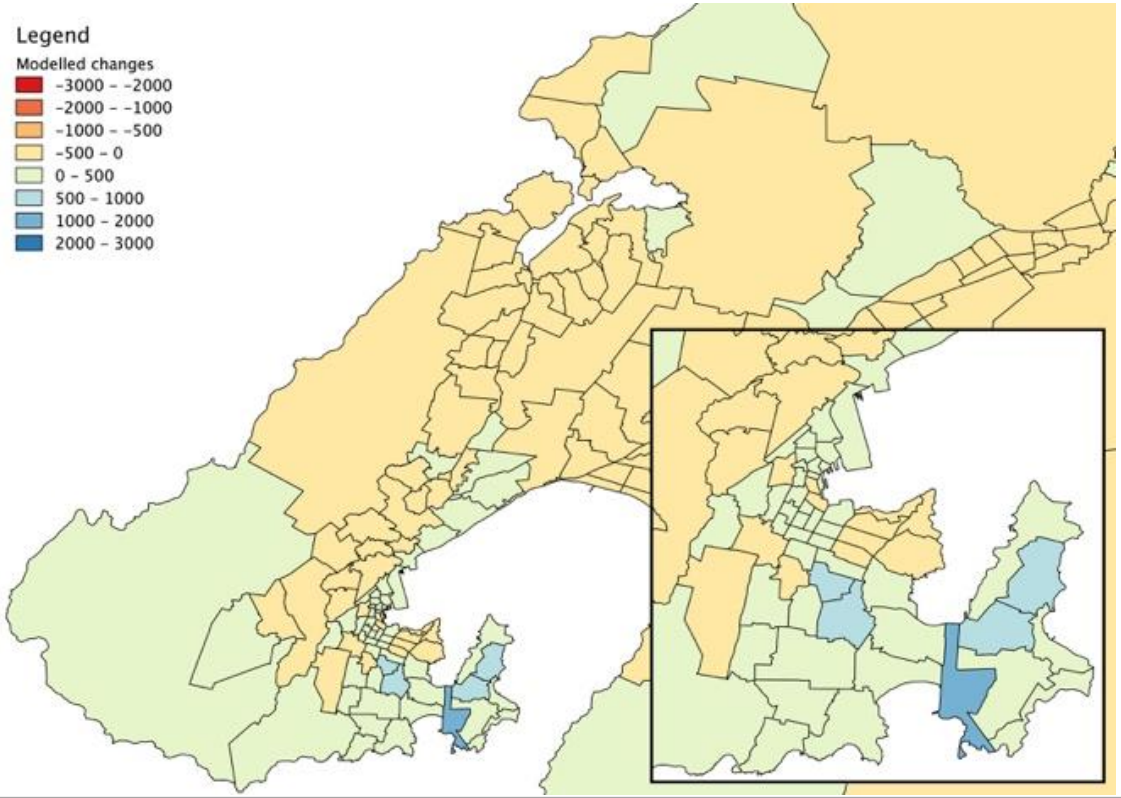
Case study 1: Let's Get Welly Moving

Predicted change in distribution of job growth

Accessibility-density model



Location choice model

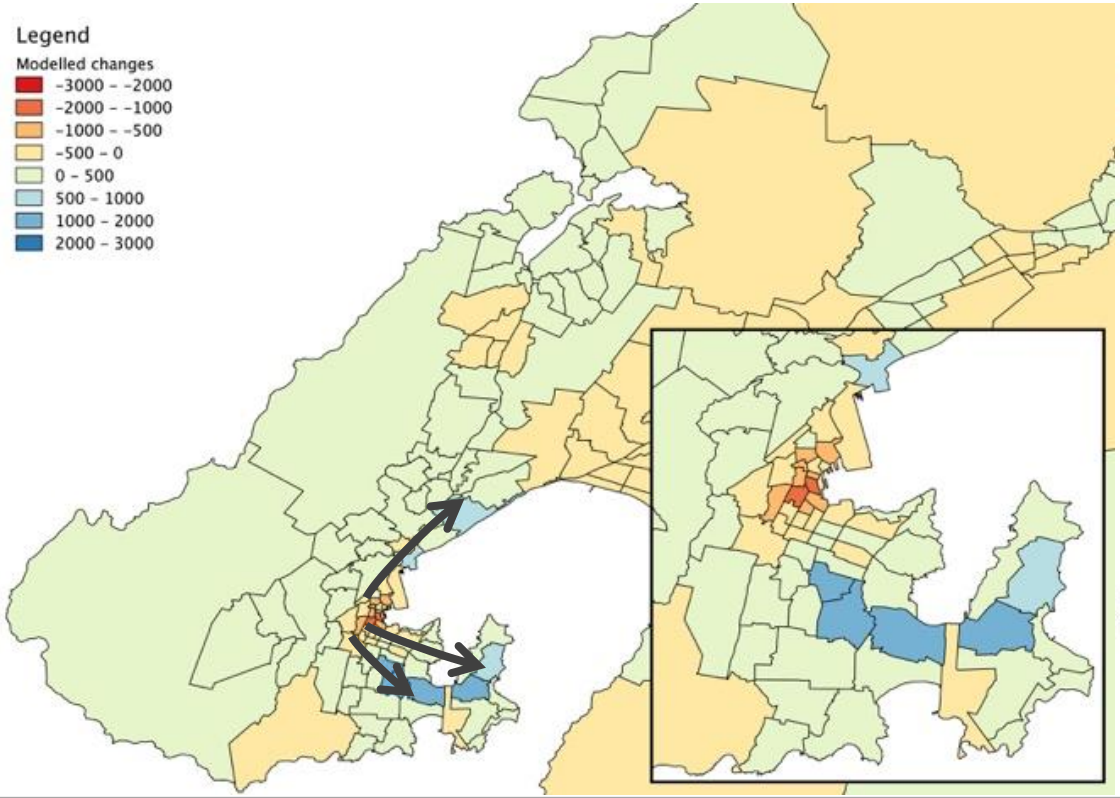


MRC

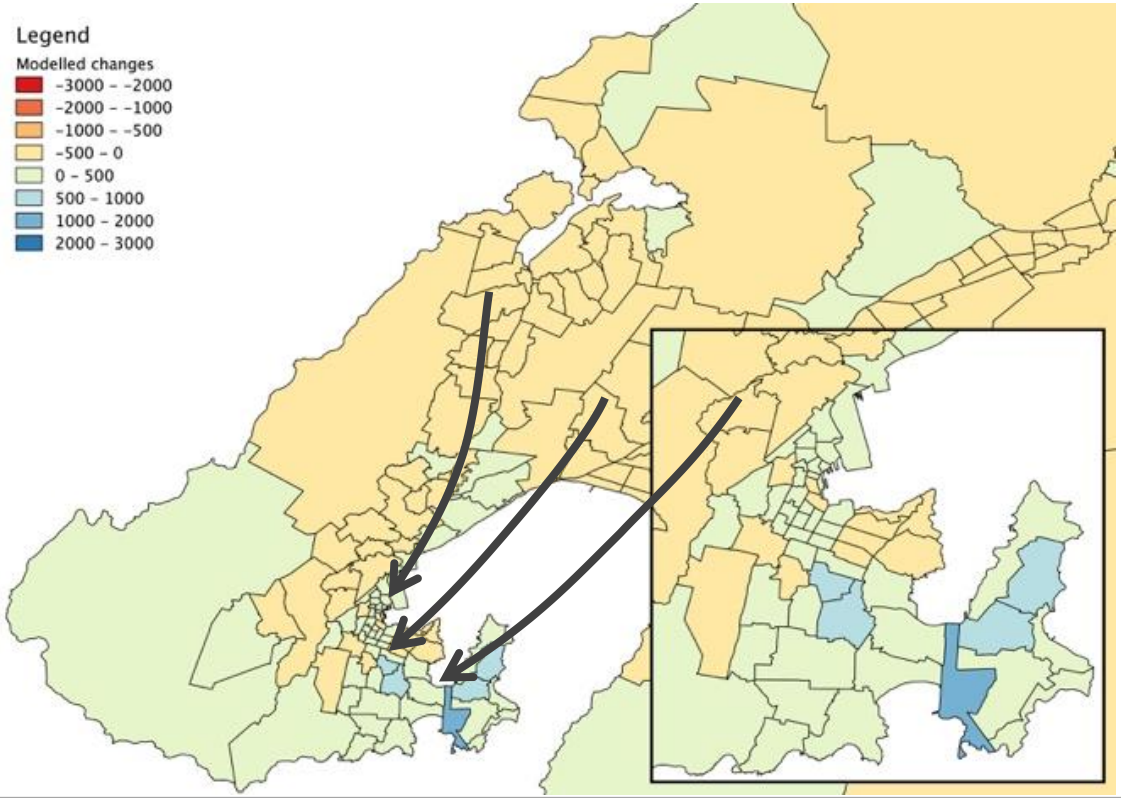
Case study 1: Let's Get Welly Moving

Predicted change in distribution of job growth

Accessibility-density model



Location choice model

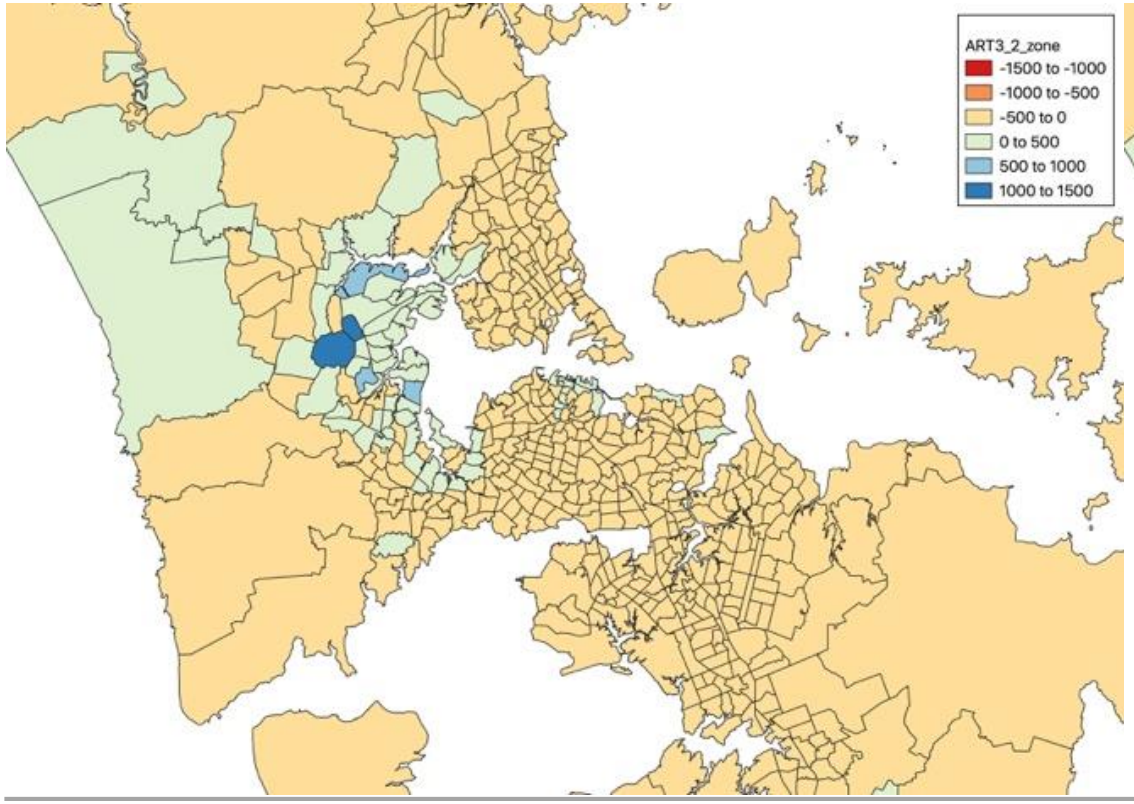


MRC

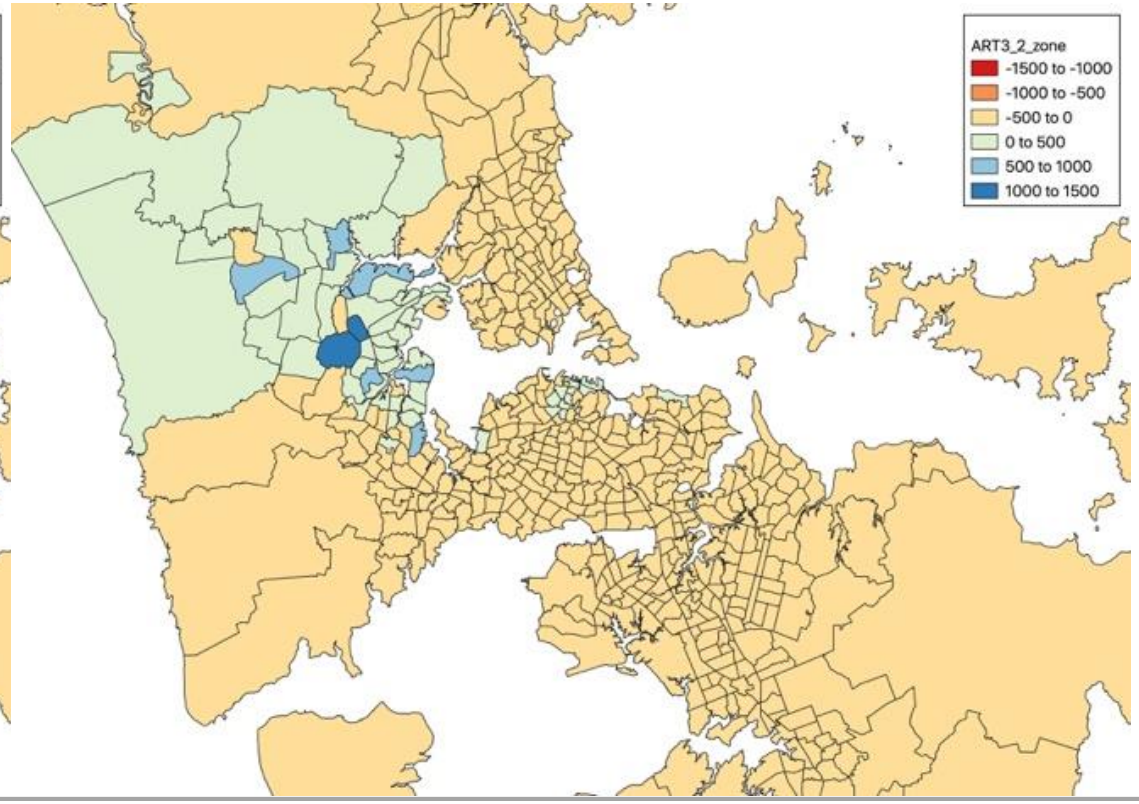
Case study 2: Northwestern Rapid Transit

Predicted change in distribution of population growth

Accessibility-density model



Location choice model

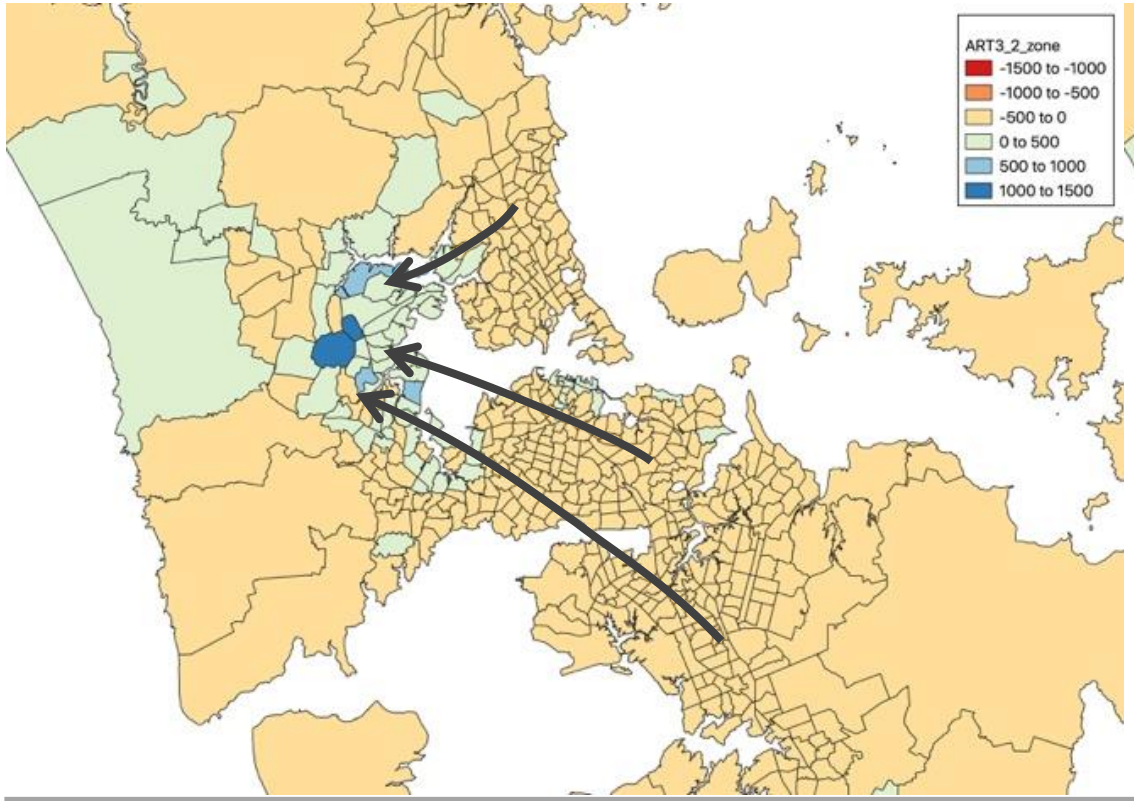


MRC

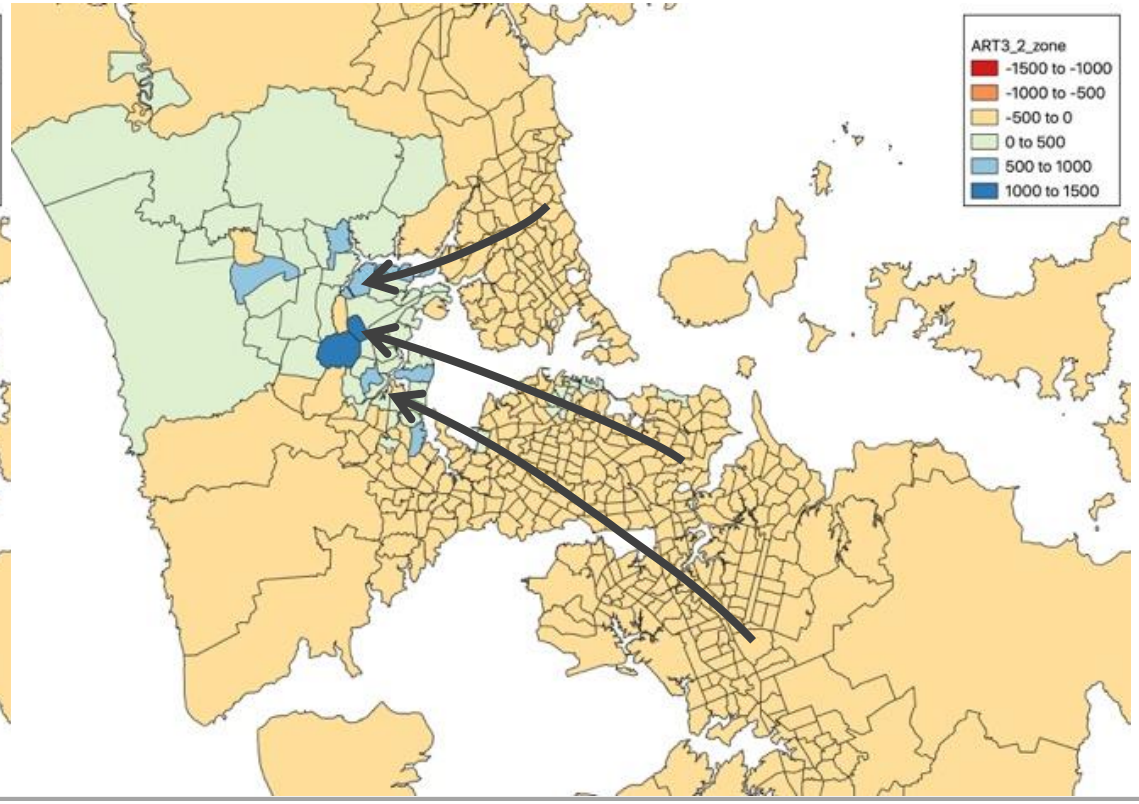
Case study 2: Northwestern Rapid Transit

Predicted change in distribution of population growth

Accessibility-density model



Location choice model

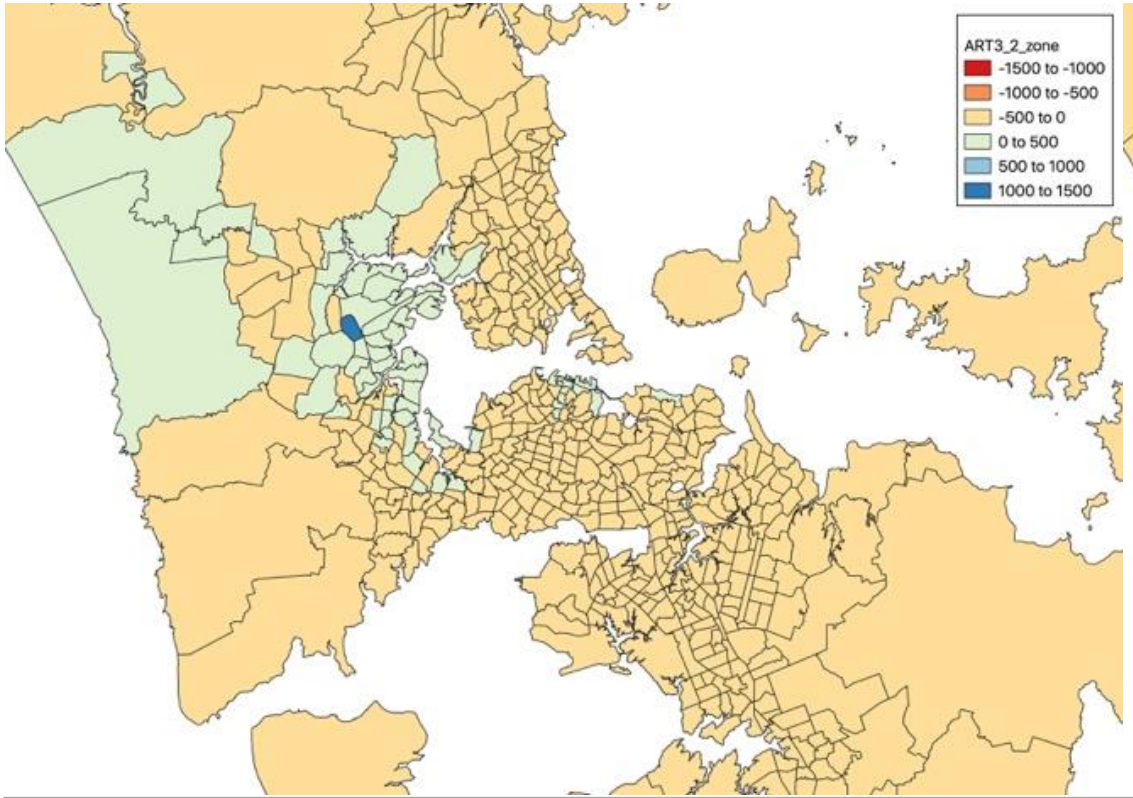


MRC

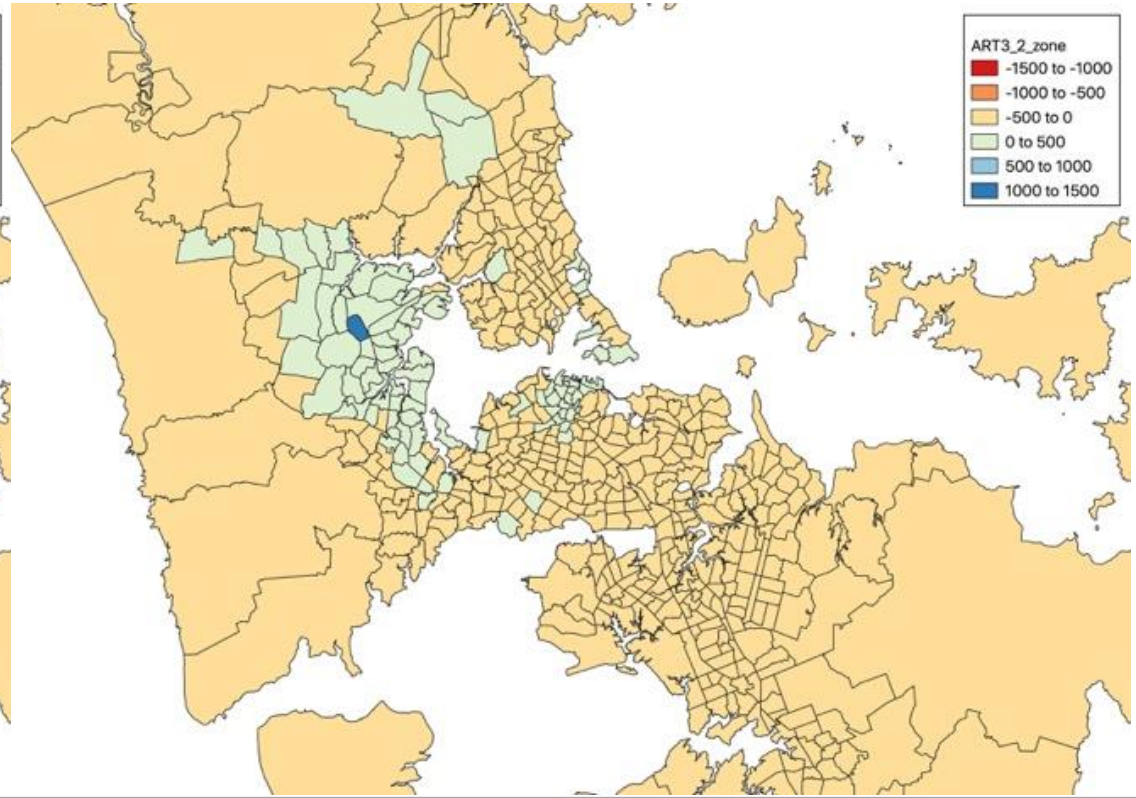
Case study 2: Northwestern Rapid Transit

Predicted change in distribution of job growth

Accessibility-density model



Location choice model

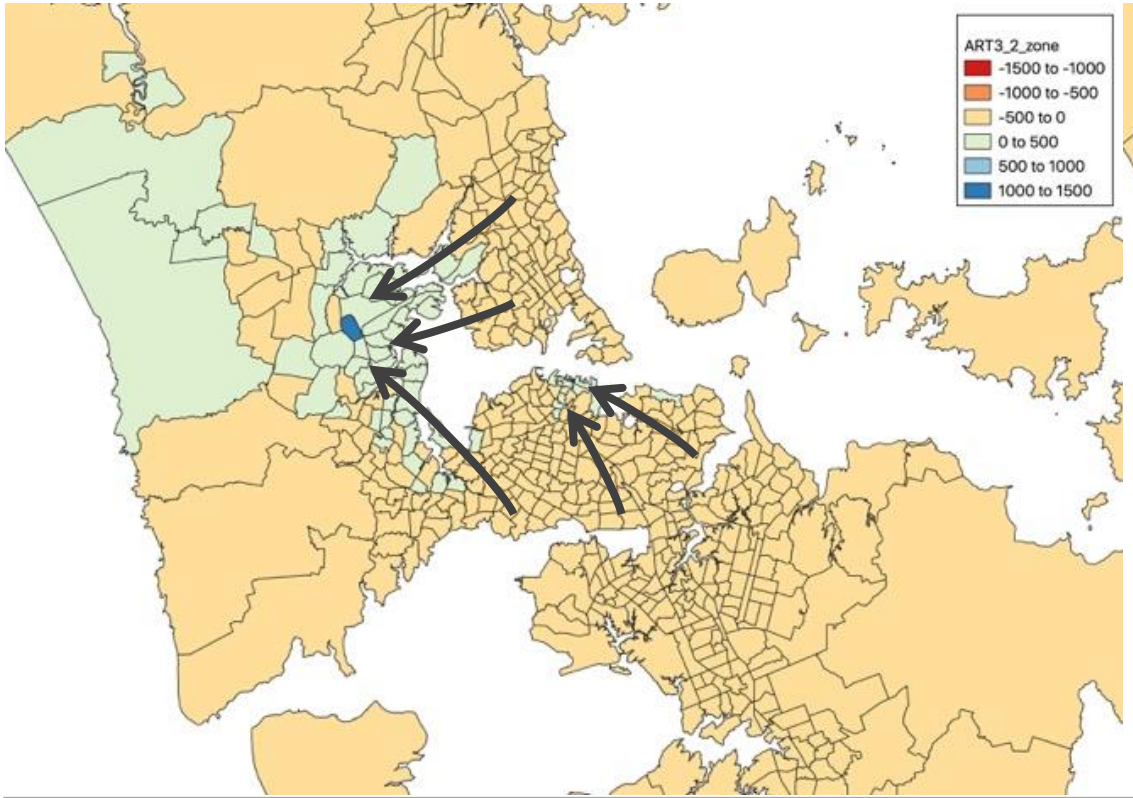


MRC

Case study 2: Northwestern Rapid Transit

Predicted change in distribution of job growth

Accessibility-density model



Location choice model

MRC

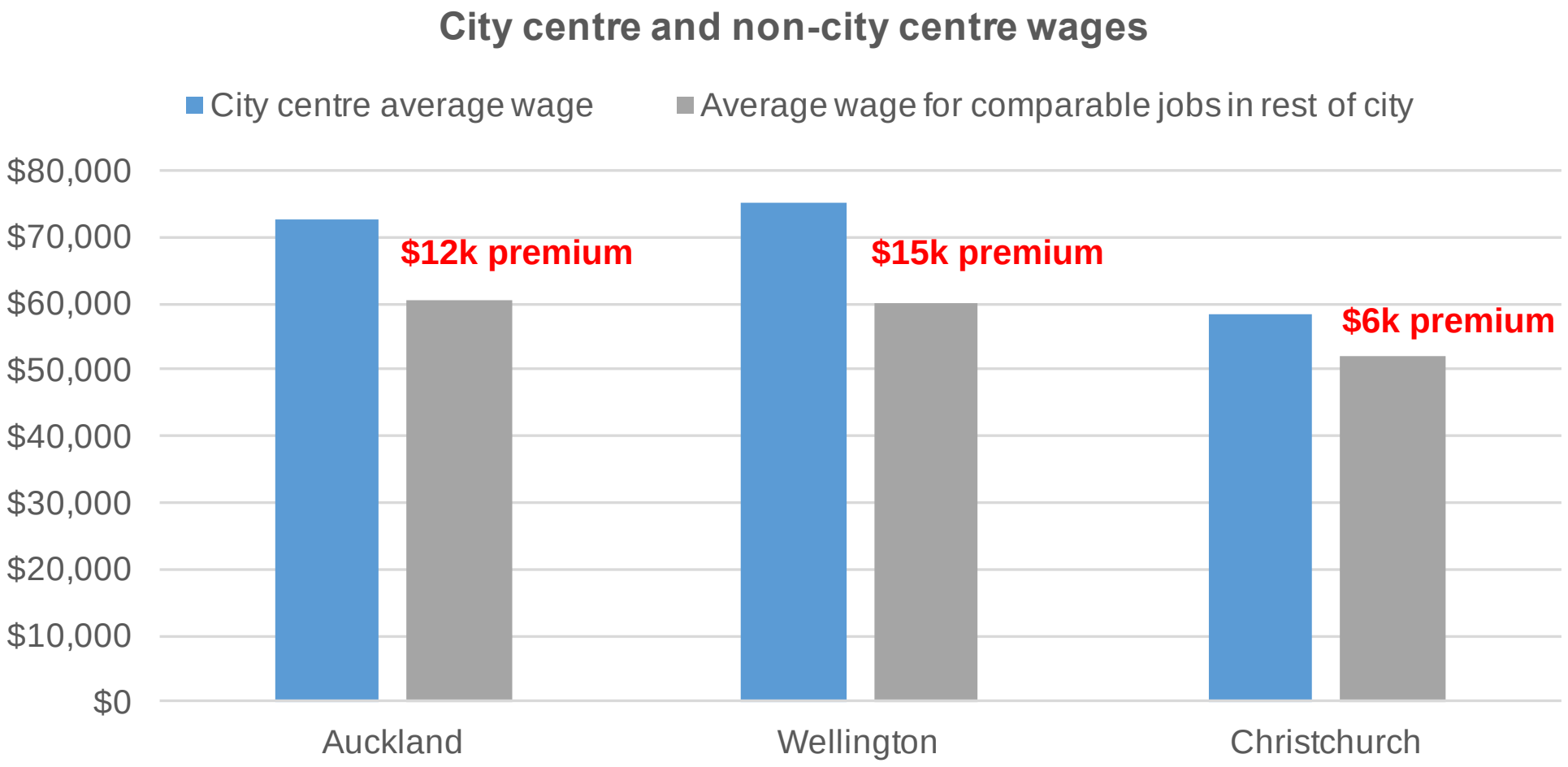
What is land use change worth?

City centre wage premia

Source: Based on analysis of aggregated Census data on incomes by place of work and industry. Comparisons control for industry composition but not worker characteristics

MRC

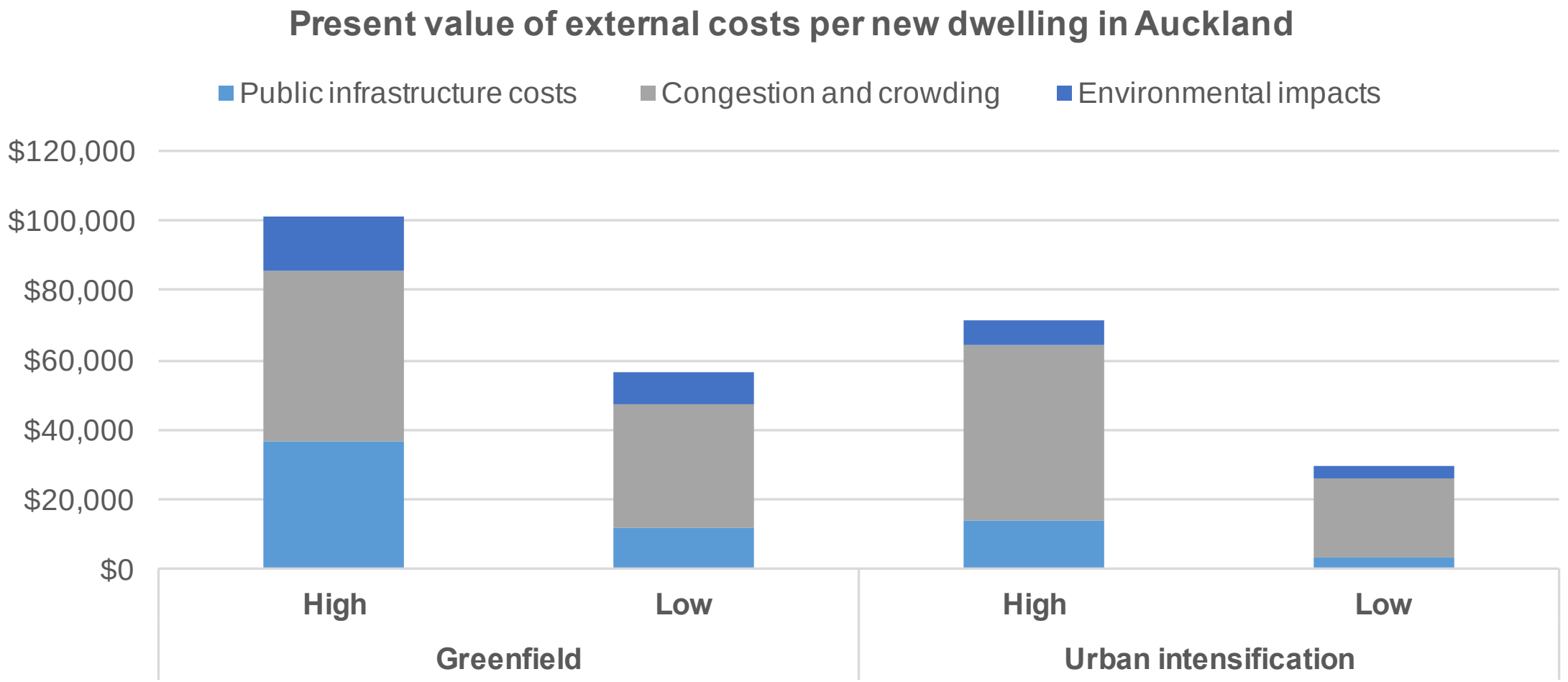
City centre wage premia



Source: Based on analysis of aggregated Census data on incomes by place of work and industry. Comparisons control for industry composition but not worker characteristics

MRC

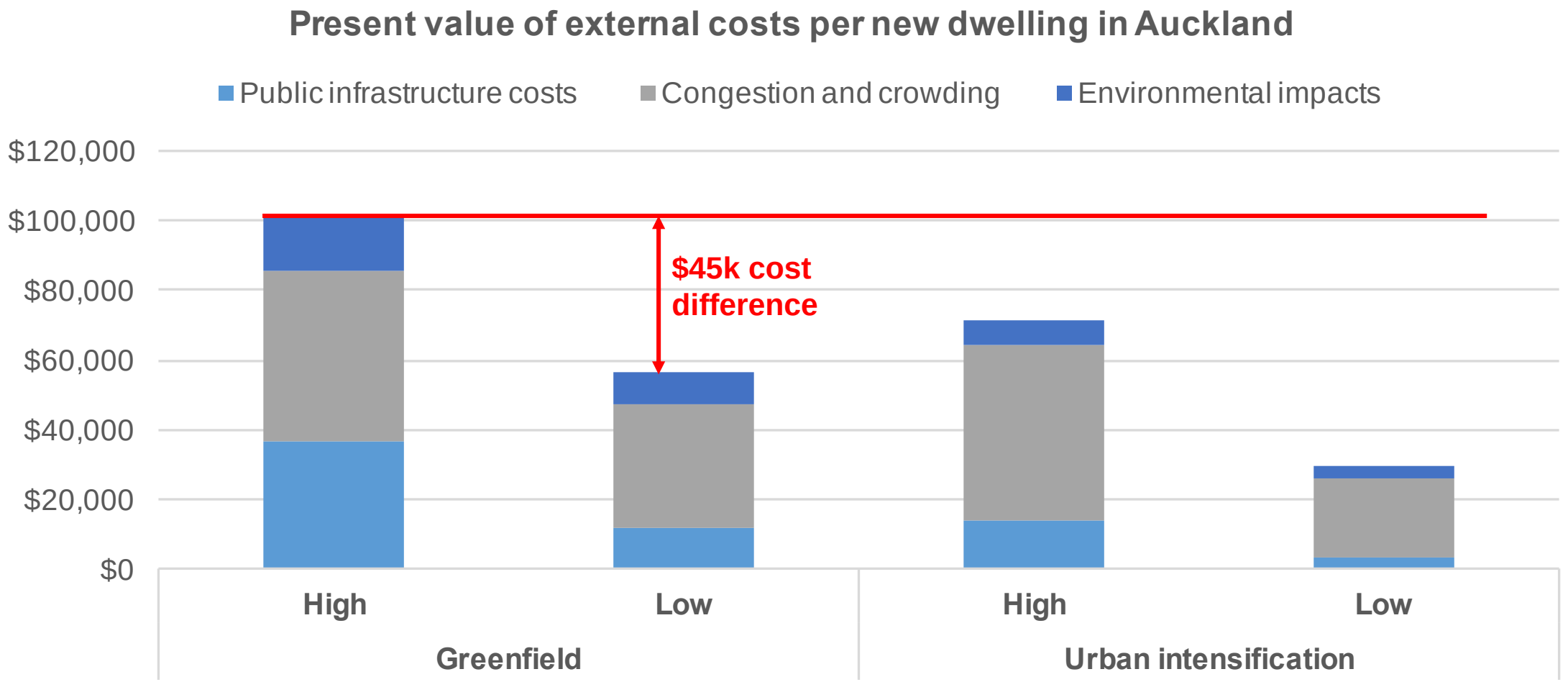
External costs of urban development



Source: Nunns and Denne (2016). External cost estimates have been derived using a mix of methods.

MRC

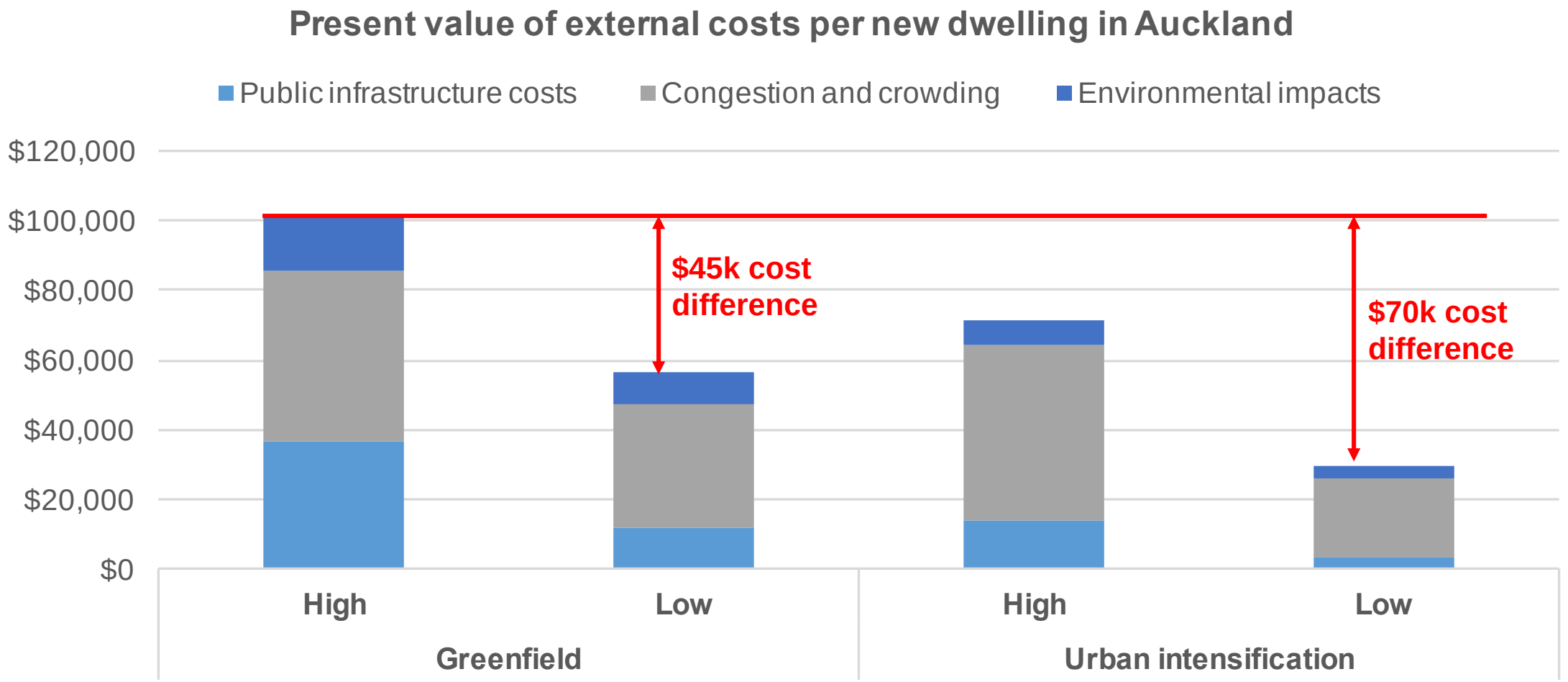
External costs of urban development



Source: Nunns and Denne (2016). External cost estimates have been derived using a mix of methods.

MRC

External costs of urban development

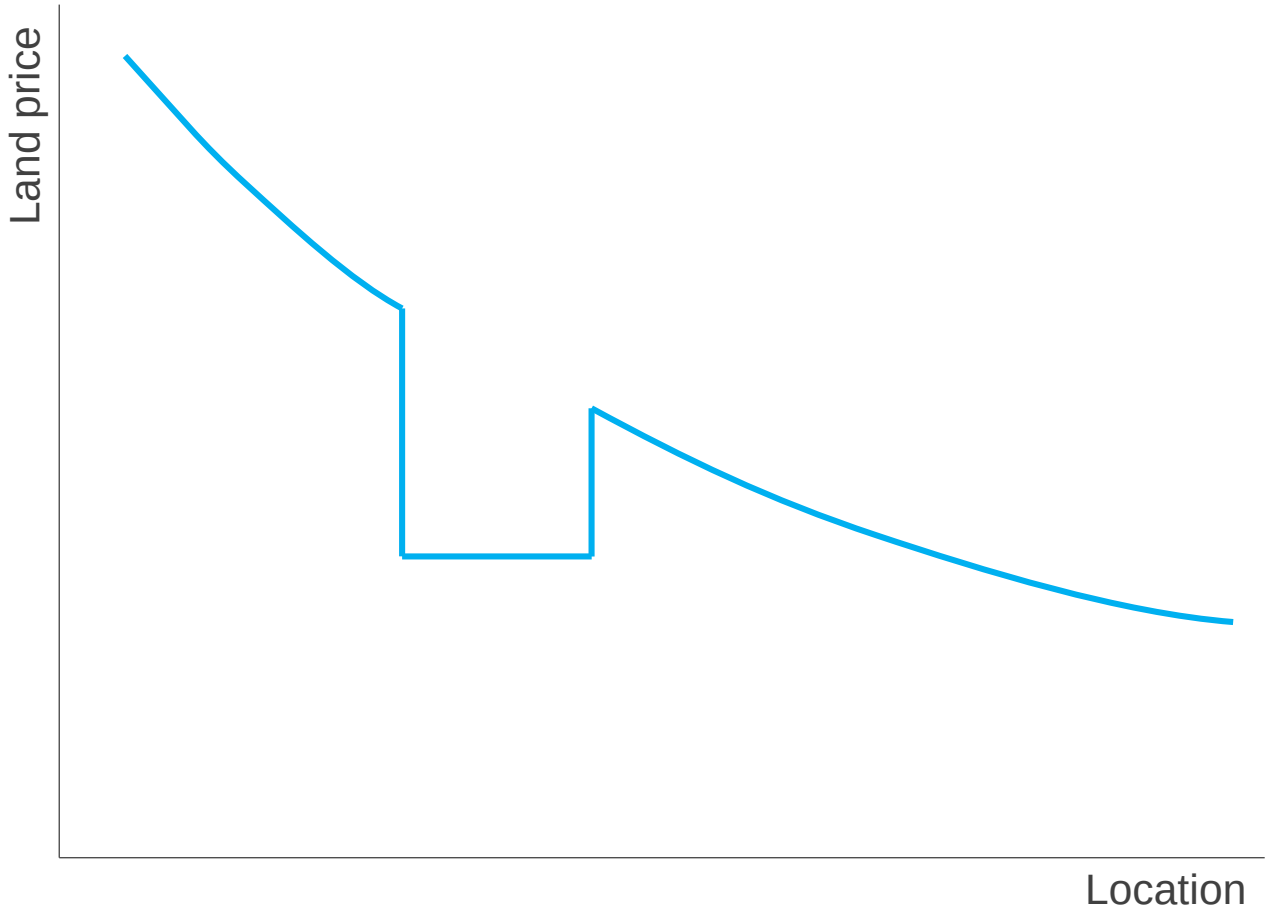


Source: Nunns and Denne (2016). External cost estimates have been derived using a mix of methods.

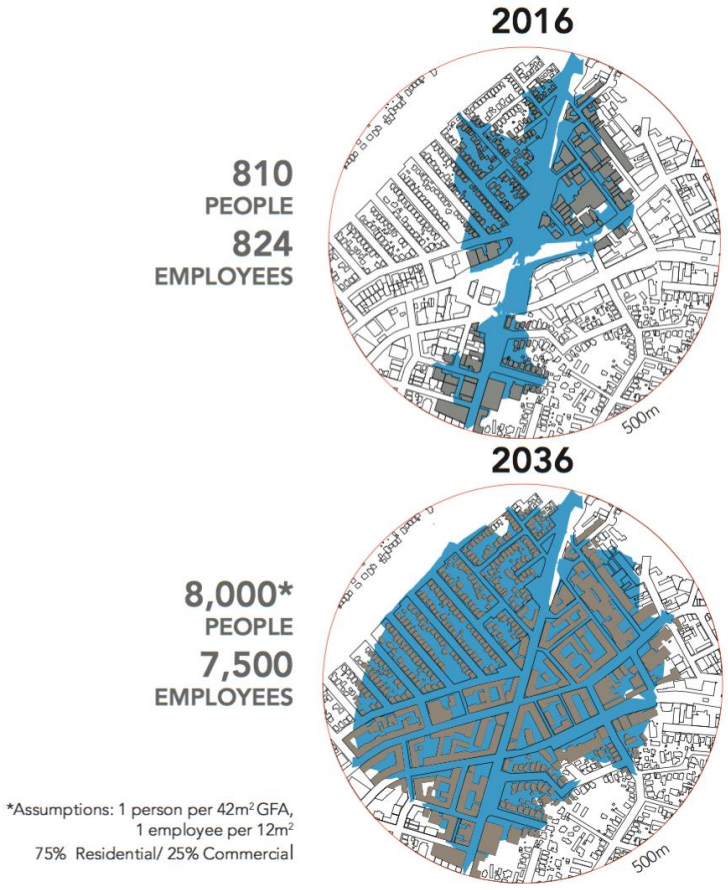
MRC

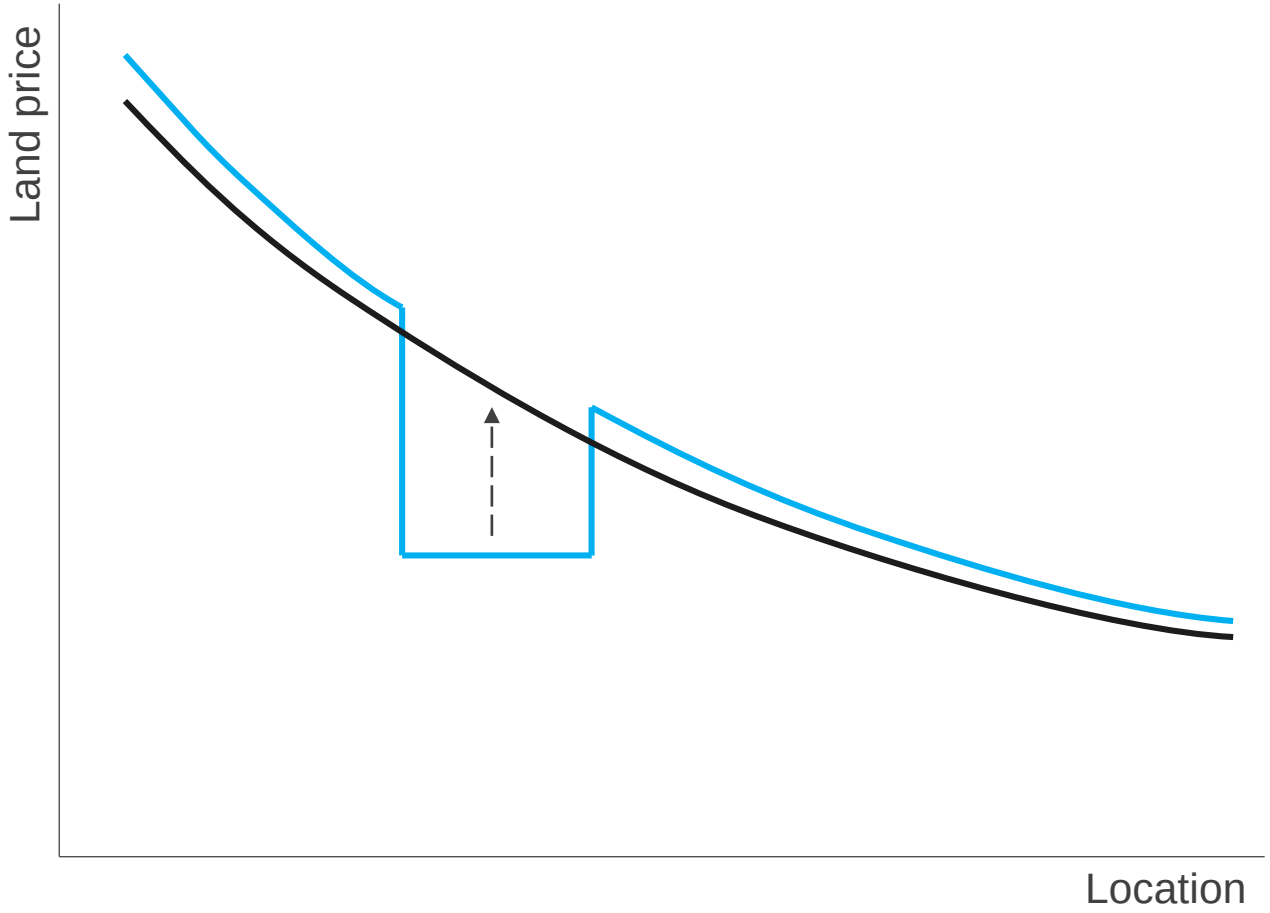
Wait, what about housing?

Incremental or systemic changes?



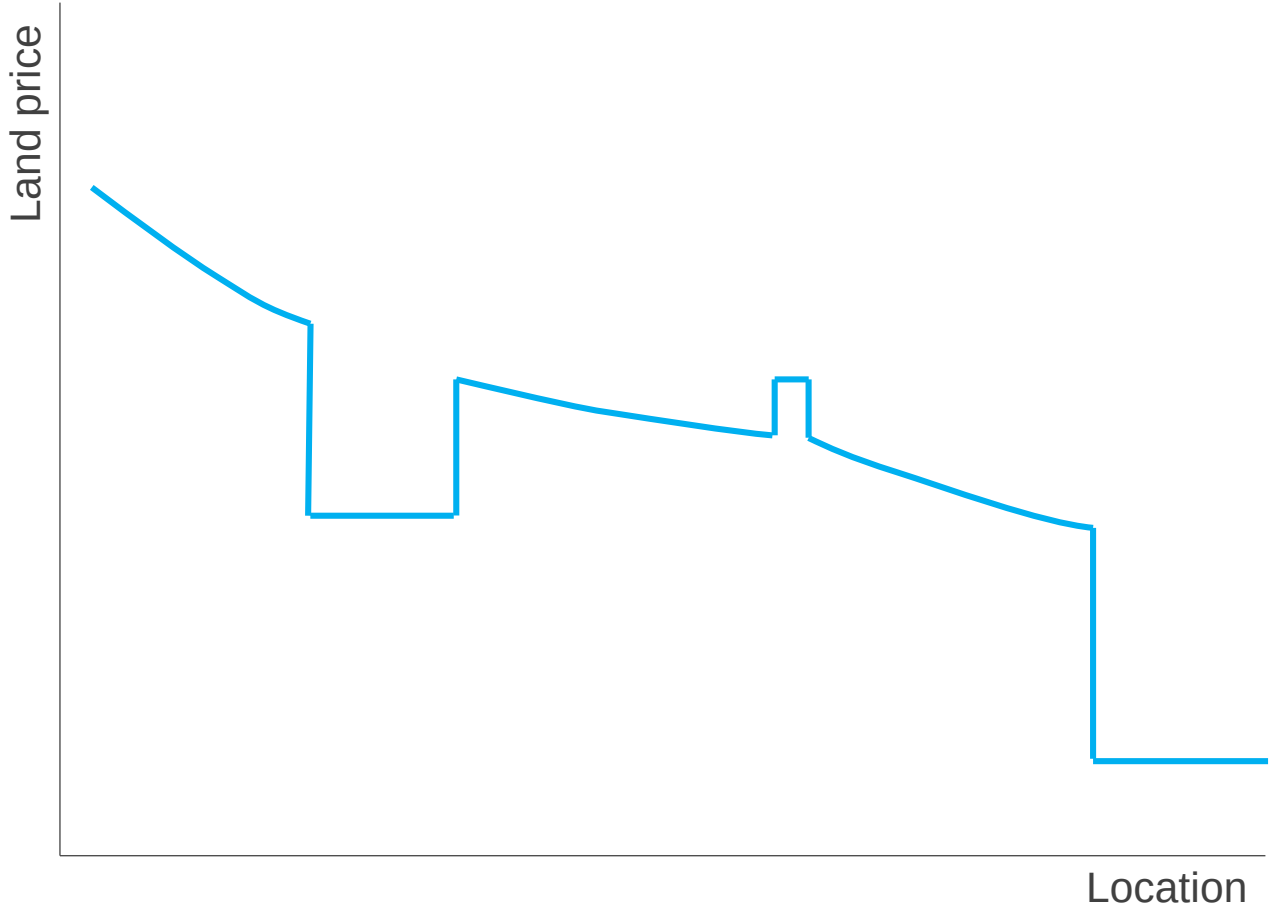
Incremental or systemic changes?





MRC

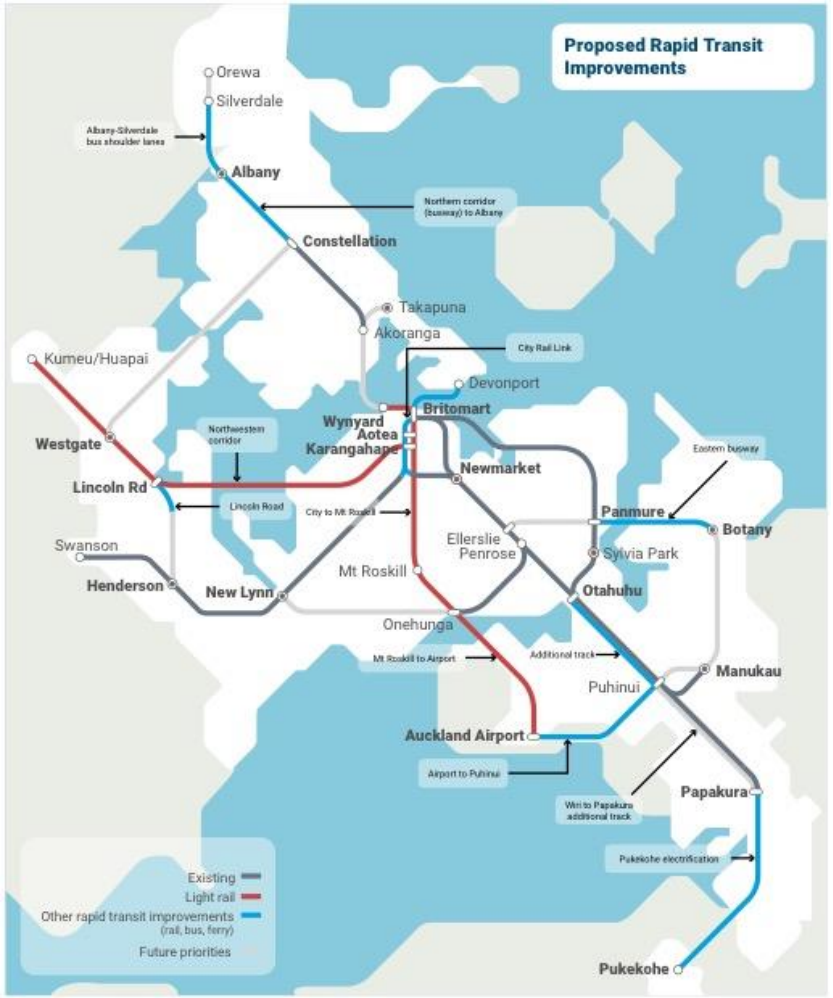
Incremental or systemic changes?

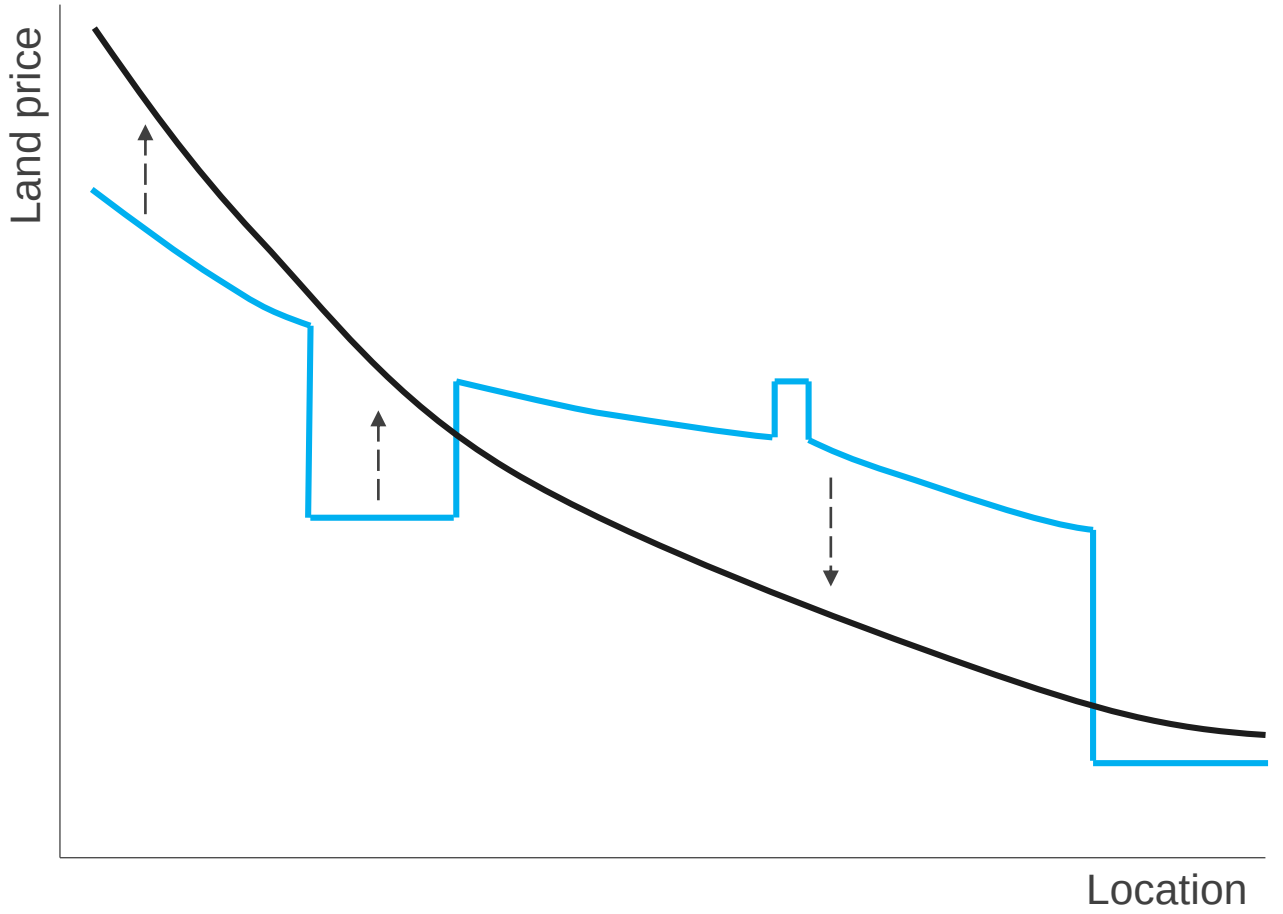


https://www.noted.co.nz/money/economy/auckland-housing-crisis-house-of-the-rising-sum/

MRC

Incremental or systemic changes?

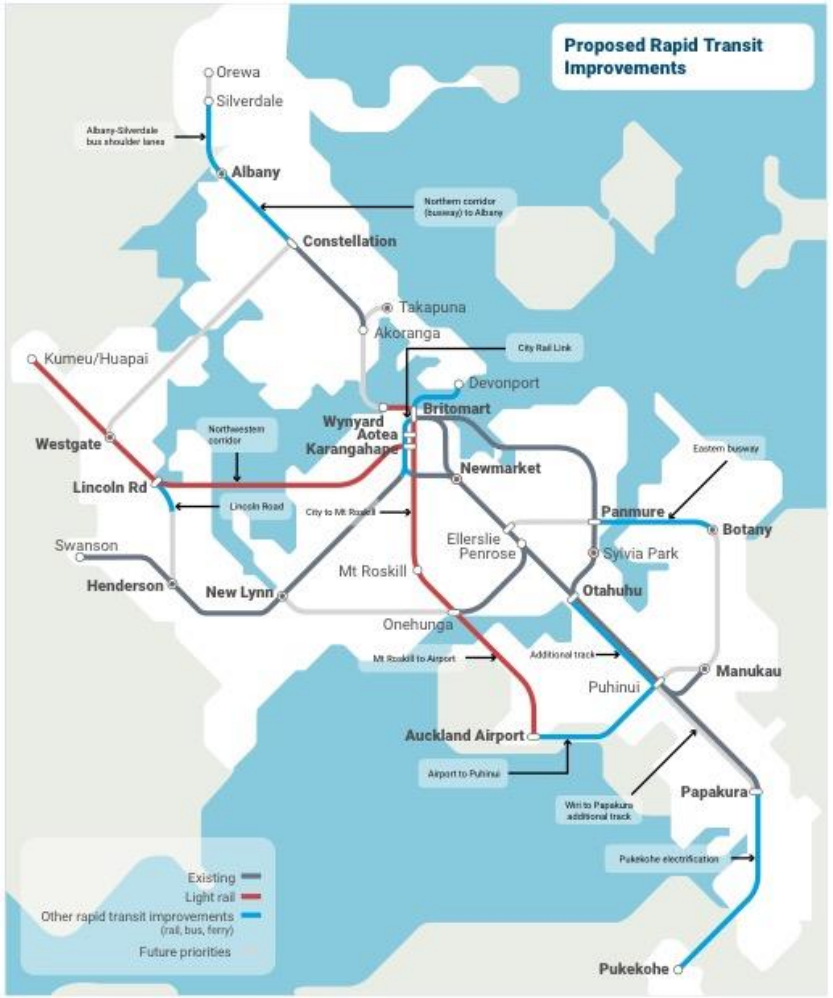


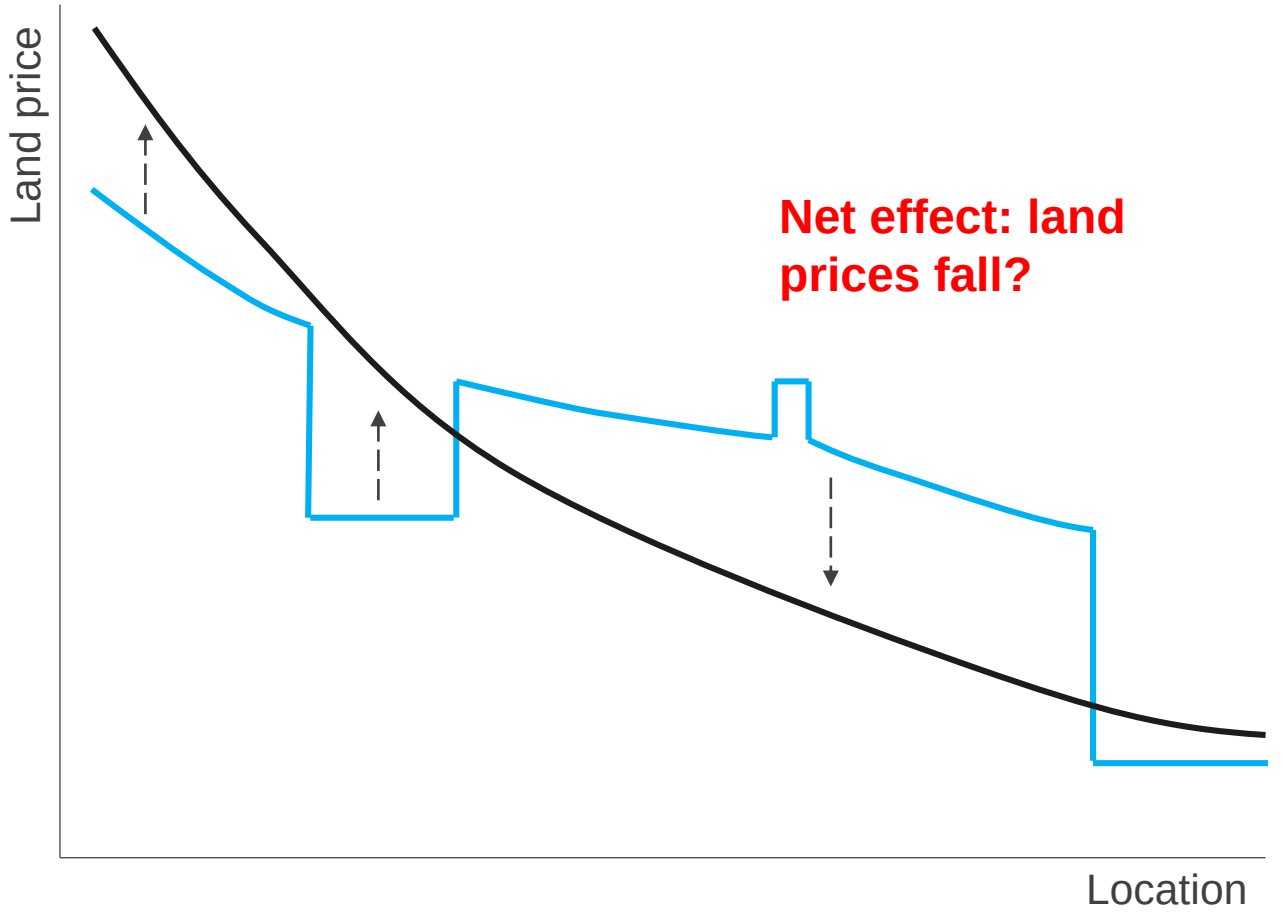


Source: https://www.transport.govt.nz/land/auckland/atap/

MRC

Incremental or systemic changes?

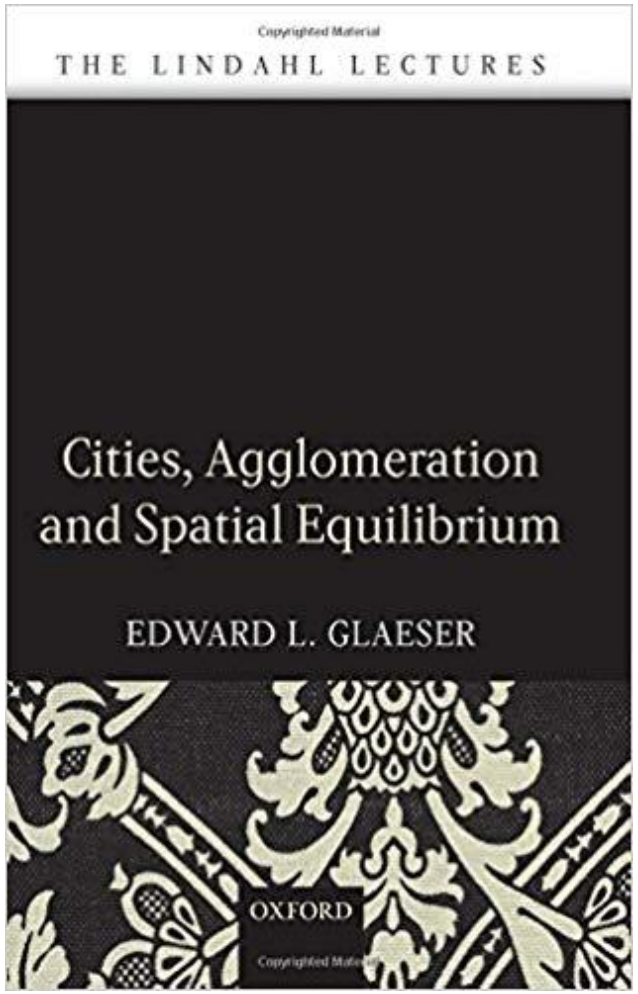




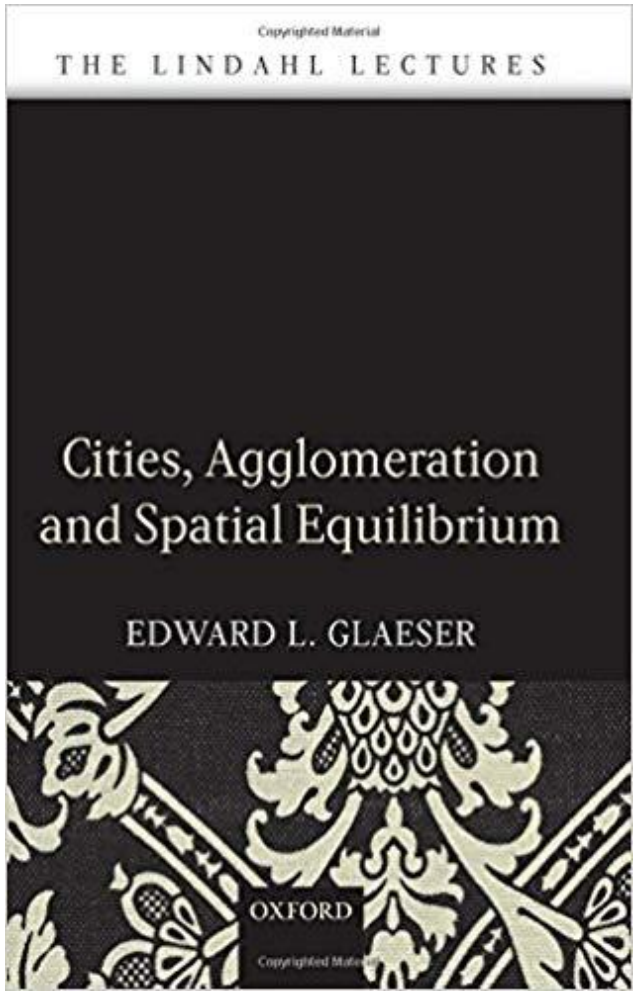
Source: https://www.transport.govt.nz/land/auckland/atap/

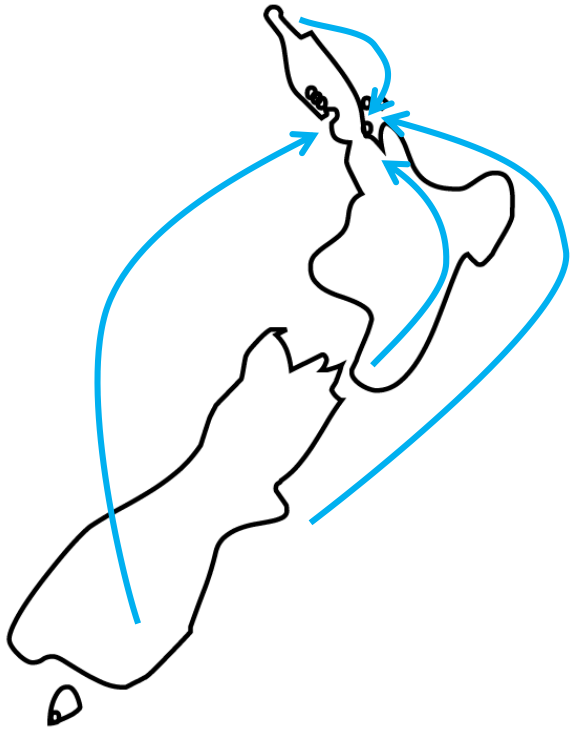
MRC

Spatial equilibrium?

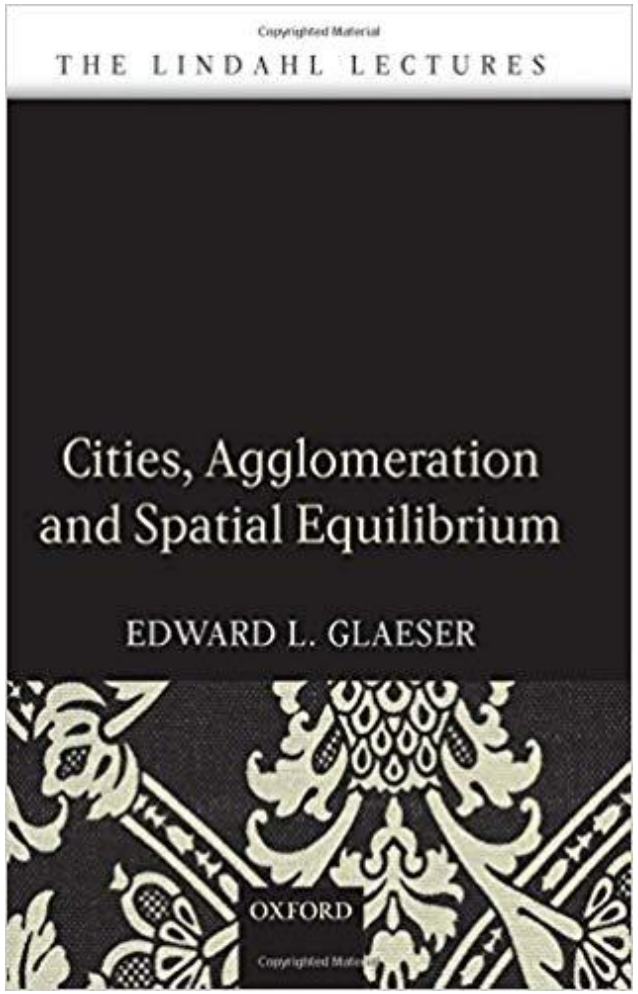


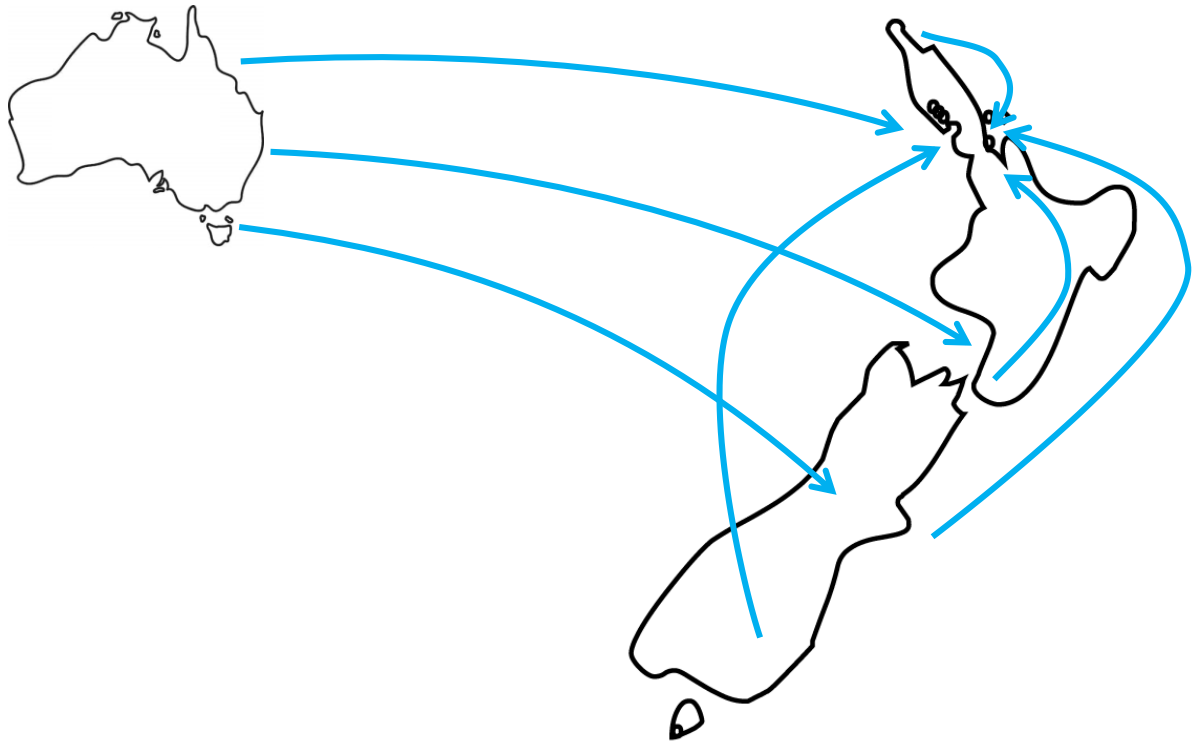
Spatial equilibrium?





Spatial equilibrium?





Concluding thoughts

Concluding thoughts

1. Don’t consign land use change modelling to the ‘too hard’ basket

Concluding thoughts

1. Don’t consign land use change modelling to the ‘too hard’ basket

2. **Some of the impacts of land use change are easy to value (at least in principle)**

MRC

Concluding thoughts

1. Don’t consign land use change modelling to the ‘too hard’ basket

2. Some of the impacts of land use change are easy to value (at least in principle)

3. **We don’t know how to credibly value impacts on housing development**

MRC