

Housing and transport policies: a spatial general equilibrium analysis for Melbourne

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Dr James Lennox
& Prof Philip Adams

Email: James.Lennox@vu.edu.au

Centre of Policy Studies



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Motivations

Urban policy imperatives in Australia's largest cities:

- ▶ Increase (dramatically) housing supply in established (inner, middle) suburbs—access to new economy jobs and civic amenities, achieve densities to support public transport, avoid loss of natural and agricultural areas
- ▶ Address heavy reliance on private vehicles—alleviate congestion, save road and parking space, reduce CO₂ emissions, air and noise pollution

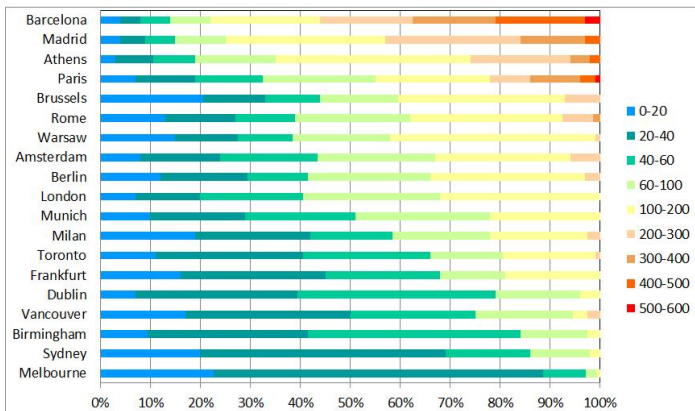
Policy-makers and planners lack tools to study the economic of policies within cities

Melbourne in perspective



Australian cities are very low density

Share of population at different densities (residents per hectare)



Adapted version of Chris Loader's figure at chartingtransport.com, 2016

... and heavily car-dependent

Table: Mode shares: journey to work

| City | Walk or Cycle | Public Transport | Private Vehicle | Survey Year |
|-----------|---------------|------------------|-----------------|-------------|
| Barcelona | 35 | 39 | 27 | 2013 |
| Berlin | 44 | 26 | 30 | 2012 |
| Singapore | 23 | 44 | 33 | 2011 |
| London | 23 | 44 | 34 | 2011 |
| Milan | 23 | 41 | 36 | 2007 |
| Brussels | 28 | 28 | 44 | 2009 |
| Montreal | 11 | 35 | 54 | 2006 |
| Dublin | 22 | 14 | 64 | 2014 |
| Rome | 7 | 24 | 68 | 2001 |
| Sydney | 6 | 21 | 74 | 2006 |
| Melbourne | 6 | 14 | 80 | 2012 |

Various sources reported on Wikipedia

Trams in heavy traffic



Sydney and Melbourne more unaffordable than London?!

- ▶ The 'Great Australian Dream' = owning a 3–4 bedroom house on a quarter acre (1000m²) suburban block.

Table: Median house price to median income, 2016

| | |
|----------------|------|
| Hong Kong | 18.1 |
| Sydney | 12.2 |
| Melbourne | 9.5 |
| Greater London | 8.5 |
| Birmingham | 4.8 |
| Dublin | 4.7 |

13th Annual Demographia International Housing Affordability Survey: 2017 Rating Middle-Income Housing Affordability

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Spatial Computable General Equilibrium (SCGE)

- ▶ What is it?
 - ▶ Spatial: agents make explicit locational choices between places (discrete zones)
 - ▶ GE: prices adjust to clear demand in all markets
 - ▶ Computable: model only solvable using numerical methods
- ▶ Discrete locational choices of households
 - ▶ Multinomial logit (MNL) model represents individual discrete choices probabilistically
 - ▶ High- vs. low-skilled households
 - ▶ Households choose place of work, place of residence and industry
 - ▶ Given local wages, local living costs, commuting costs, residential amenity
- ▶ Comparative static (long run)

VU Cities framework

- ▶ Household income
 - ▶ Wage: depends on skill, industry, workplace
 - ▶ Capital and transfers: depends on household type
- ▶ Conditional on skill & discrete choices, households make continuous choices of
 - ▶ Floorspace, tradables and non-tradable goods
 - ▶ Non-tradables purchases influenced by shopping costs
- ▶ Positive effects of agglomeration
 - ▶ Local density of firms increases productivity
 - ▶ Local density of households increases amenity

VU Cities–Melbourne prototype model

- ▶ Greater Melbourne & Geelong—312 spatial zones
- ▶ Census of Population and Dwellings: persons by place of residence, work, industry & occupation
- ▶ Cadastral and planning layers: amount of land used for residential and commercial structures
- ▶ Travel costs for origin–destination pairs reflect driving times
- ▶ Regional average wages by industry and occupation

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Population growth scenarios

- ▶ Three scenarios:
 1. Expansive Growth: additional greenfield development
 2. Densification: reduce regulatory constraints to permit higher densities in established 'middle' suburbs and prohibit greenfield development
 3. Travel Tax: increase costs of commuting and shopping travel by 20%, still permitting greenfield development
- ▶ All assume 22% increase in total population (10 years growth)

Aggregate effects

Table: Aggregate quantities and price indices (% change vs. calibration)

| | Expansive Growth | Densification | Travel Tax |
|-----------------------------|------------------|---------------|------------|
| Residential land per person | -8.75 | -18.0 | -8.75 |
| Commuting time per worker | 0.58 | -0.60 | -10.7 |
| Output per worker | 1.61 | 1.87 | 4.83 |
| Average wage | 1.73 | 1.95 | 4.25 |
| Floorspace per person | -1.81 | 0.67 | -0.71 |
| Residential rental prices | 3.60 | 1.27 | 5.00 |

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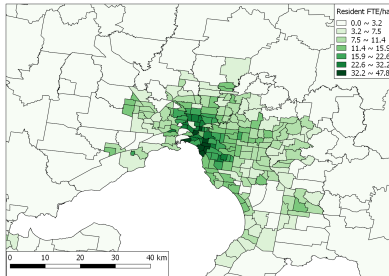
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Urban form under expansive growth

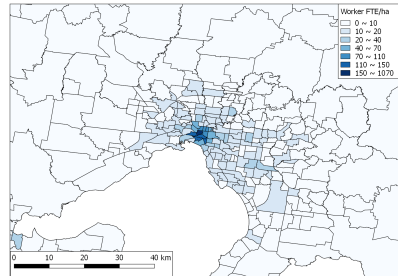
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Urban form under Expansive Growth



Resident workers



Jobs

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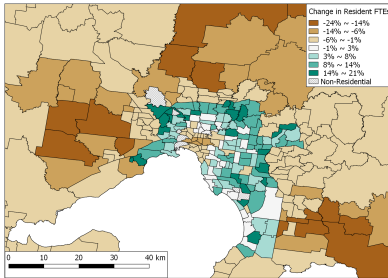
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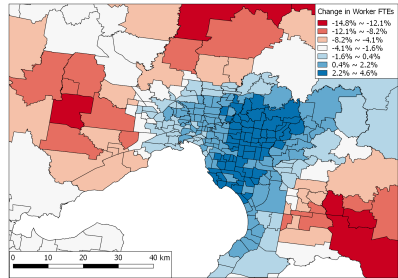
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Spatial impacts of Densification vs. Expansive Growth

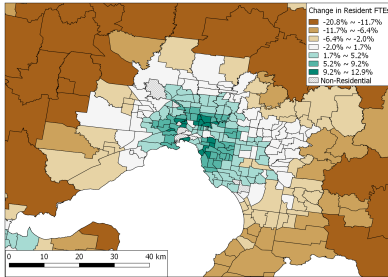


Resident workers

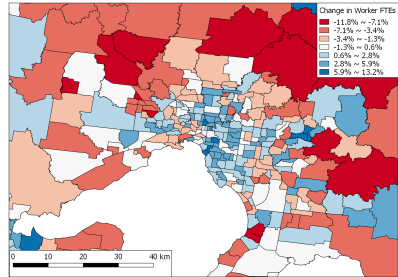


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Spatial impacts of Travel Tax vs. Expansive Growth

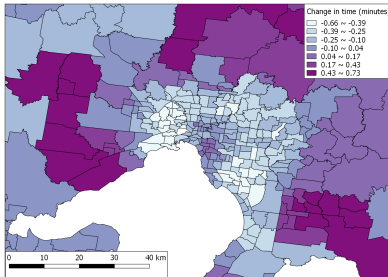


Resident workers

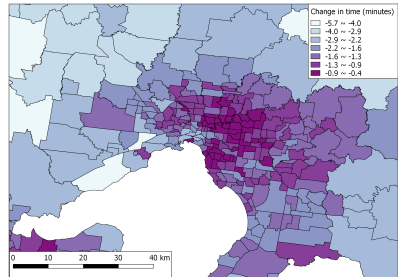


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Spatial impacts on travel times



Workers' average travel times:
Densification vs. Expansive Growth



Workers' average travel times:
Travel Tax vs. Expansive Growth

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- ▶ Existence of productivity and amenity spillovers suggests policies to increase urban density
- ▶ Negative externalities from passenger transport, while not modelled here, motivate policies to reduce travel and induce mode switching
- ▶ Rezoning and transport taxes both increase residential densities
- ▶ Travel tax effective in increasing employment densities and reducing travel
- ▶ Rezoning for densification increases housing supply and affordability
- ▶ These two types of policies are potentially complementary