

Under the Resource Management Act 1991

In the matter of hearings of submissions and further
submissions on the Proposed Wellington
City District Plan

By **Newtown Residents' Association**
Submitter

STATEMENT OF EVIDENCE OF TIMOTHY HELM
12 JUNE 2023

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INTRODUCTION

1. My full name is Timothy Walter Helm.

Qualifications and Experience

2. I am an independent economic consultant covering transport, housing, tax policy, and environmental regulation. I also work part-time as the Director of Research and Policy for think tank Prosper Australia.
3. I have previously worked as a Senior Consultant at Ernst & Young, a Senior Economist at the Victorian Treasury (Australia), and a Senior Associate at the Grattan Institute.
4. I have a PhD in Economics from Melbourne University, a Masters in Economics (Hons) from Melbourne University, and a joint Bachelor of Commerce (Hons) / Bachelor of Science from Victoria University of Wellington.
5. My housing economics work has included analysis of land and housing taxes, developer contributions, land and housing market impacts of transport projects and zoning changes, and rezoning windfall gain value capture.

Scope of Evidence

6. I have been engaged by Newtown Residents' Association.
7. I understand Newtown Residents' Association will file a submission that supports the Proposed District Plan (PDP) designation of Newtown as a local centre, and opposes proposals for local centre height limits to allow high-density development, amongst other positions.
8. My evidence comprises a survey of economic theory and evidence in relation to the general question of how land-use restrictions (zoning) affect new housing supply and housing affordability. This is provided as context for the Panel's deliberations over submissions by Newtown Residents' Association and others in relation to planning controls for urban centres.
9. My evidence does not analyse or endorse the specific positions taken by any submitter.

Code of Conduct

10. I have read the Code of Conduct for expert witnesses in the Environment Court Practice Note 2023 and I have complied with it when preparing this evidence. My evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

EXECUTIVE SUMMARY

11. The assumption that District Plan zoning choices pose inevitable trade-offs between housing affordability on the one hand and heritage, amenity, and the local environment on the other is not well grounded in economics.
12. Economic theory and empirical evidence in relation to new housing development establishes that there are generally no such trade-offs. Zoning shapes where housing is built and what it looks like, but does not generally change how much is built across the city. This rate is set by the market.
13. When the market rate of new housing supply is not constrained by land-use rules, zoning for additional capacity does not change housing supply or affordability. Providing excess zoned capacity is like 'pushing on a string'.
14. This is the case in Wellington, where under the operative District Plan there is zoned capacity for 100 years' growth, and only one in 35 profitable development projects is taken up each year.
15. Claims that zoning has effects on housing costs based on the Alonso-Muth-Mills (AMM) model, including in WCC submissions, are not well grounded. The AMM model is inherently incapable of identifying such effects.

MATERIAL REVIEWED

16. In preparing this statement of evidence I have reviewed the following materials:
 - (a) Wellington City Council Proposed District Plan – Section 42A report for Hearing Stream 4, Part 1, City Centre Zone
 - (b) Statement of evidence of Dr Kirdan Ross Lees on behalf of Wellington City Council, Hearing Stream 4 (24 May 2023)

- (c) Colliers International and Sense Partners, Market and Retail Assessment for WCC (November 2020)
- (d) Housing and Business Development Capacity Assessment (HBA) for WCC (October 2021)
- (e) Various economics publications which are footnoted in my evidence.

CONTEXT

- 17. The designation of centres and specification of height limits in the District Plan will shape future built form, with consequences for local environments, heritage, character and amenity.
- 18. I understand Newtown Residents' Association in its submission will support the PDP designation of Newtown as a local centre and oppose height limits that allow for high-density development, on the basis that zoned capacity is adequate under lower-density zoning that better preserves local amenity.
- 19. I expect other parties will advocate for higher-density zoning on the basis that additional zoned capacity will lead to more affordable housing.
- 20. District Plan decisions on such matters involve value judgements in the face of various policy trade-offs, and should be informed by accurate information about the nature of those trade-offs.
- 21. Much commentary on the District Plan appears premised on the idea that there are unavoidable trade-offs between housing affordability and preserving heritage, amenity, and the local environment. My perception is that many commentators assume planning is holding back new housing supply and making housing expensive, such that the interests of existing residents are necessarily at odds with housing affordability.
- 22. I also expect the Panel sees its role as striking a balance between pursuing housing affordability and supporting the interests of existing residents.
- 23. My evidence provides a summary of the economics of housing development which establishes that there is generally no such trade-off. Zoning shapes where housing is built and what it looks like, but does not generally change how much is built overall, nor change market prices. Zoning rules have only

localised effects on prices. The upshot is that Wellington can, colloquially, “have its cake and eat it too” by preserving what local residents value at no cost to housing supply or affordability.

24. The immediate purpose of this evidence is to provide the Panel with this context as it considers submissions by the Newtown Residents' Association and others in relation to District Plan zoning rules applying to Newtown.
25. Newtown is expected to experience significant population growth, and the thrust of my evidence is that Plan settings which facilitate a built form that preserves local environment, heritage, character and amenity in accordance with residents' preferences are not likely to reduce housing supply or affordability. These objectives are not in tension.
26. The Panel may also find my evidence useful in considering other District Plan decisions where submitters perceive there to be trade-offs between the interests of existing residents and housing affordability.
27. My evidence does not take a position on the PDP or on proposals in submissions by the Newtown Residents' Association submission or others.
28. The first part of my statement sets out key concepts from economic theory in relation to how planning affects housing development. The second part surveys key empirical evidence on this topic. The third part addresses a misconception about the valid means of modelling the effects of planning on housing supply.

ECONOMIC THEORY: ZONING AND THE RATE OF NEW HOUSING SUPPLY

The economics of new housing supply

29. The economics of new housing development – the science of what, why, when and how much housing development occurs – is a relatively new field. These questions have been historically underexamined. Past lines of enquiry focused on the determinants of land prices (classical rent theory) and the long-run determinants of urban form (urban economics), but not on the conduct of developers and its consequences for housing supply.
30. The following sections step through core concepts from this field relevant to the question: how do zoning rules affect housing affordability?

The rate of new supply is the key policy outcome

31. Housing affordability is a matter of housing costs (e.g. rent) against income. Housing costs are determined by demand – which depends on population, incomes and preferences – against the supply of dwellings available.
32. The housing stock only grows via the ‘flow’ of new housing. Therefore if zoning makes housing less affordable, it must do so by reducing the rate of supply of new housing. If relaxing zoning rules (‘upzoning’) improves affordability, it must do so by increasing the rate of new supply.
33. This rate is the key metric for assessing the impact of policy on affordability.

New supply, zoned density, urban density and feasibility are distinct concepts

34. Zoned density (or intensity) refers to the number of dwellings allowed on a site. Density is distinct from new supply, because although developers typically build to the maximum zoned density, they typically do not build on every site available to develop. Thus supply can change without any change in density limits, and density limits can change without changing supply. Zoned density and new supply are not synonymous.
35. Site density and urban density are also different. Urban density relates to geographic concentration of people. High site density a long way from population centres can result in low urban density. Equally, high urban density can be achieved with relatively low site densities (when more sites are fully developed). Urban density is the proper goal for productivity, environmental impact, and efficient infrastructure use. Site density is a better predictor of disamenity impacts, e.g. tree loss, run-off, overshadowing.
36. Development feasibility refers to the profitability of converting land from lower-value to higher-value use (e.g. farmland to housing). Development feasibility can change without changing the rate of supply, because although development must be feasible to take place, most sites feasible to develop are not developed in any given period. Policies that increase feasibility will not necessarily increase supply.
37. Distinguishing these concepts is important. Claims about upzoning and affordability are often based on the unexamined premise that zoning for density is identical to providing new housing. This ignores the critical role of the private sector, which develops most housing.

Housing development is a timing choice

38. For the private sector there exists an equilibrium rate of new supply that is privately most profitable. This equilibrium is in the flow of new housing, not the stock. The equilibrium does not involve developing all projects profitable to develop.
39. The reason feasible projects are not developed is that property development is fundamentally about asset reallocation – converting land and cash to housing. Because this is irreversible, and because under-developed land and cash assets earn returns, development is at heart a timing choice (a choice of when to build).
40. From models of timing choices under uncertainty economists study the drivers of the rate of development.¹

Development happens at a market absorption rate

41. The market rate of new supply is called the 'absorption rate'. Economists explain this as the rate which balances the profitability of development and the profitability of speculation (landbanking).²
42. Even when it is profitable to build, it can be more profitable not to build, because development-ready land rises in value through time, and over-supplying housing means selling at a discount. The absorption rate is determined by the balance of these considerations.
43. The absorption rate is primarily a function of growth in demand (e.g. population). It acts to stabilise price growth: when demand grows and rents rise, market supply responds to limit that rise. Similarly, in a declining market, developers will pull back and supply less new housing, limiting the amount by which rents fall: developers will not voluntarily 'flood the market' with housing.

¹ The 'absorption rate' framing and findings discussed below are from Murray (2021). Other timing choices models of housing development include Lange and Teulings (2021) and Guthrie (2022). See Murray (2021), [A housing supply absorption rate equation](#), Journal of Real Estate Finance and Economics; Lange and Teulings (2021), [The option value of vacant land: Don't build when demand for housing is booming](#), Tinbergen Institute Discussion Paper; Guthrie (2022), [Land Hoarding and Urban Development](#), Journal of Real Estate Finance and Economics.

² Letwin (2018), [Independent Review of Build Out Rates](#); Murray (2020), [Time is money: How landbanking constrains housing supply](#), Journal of Housing Economics; Murray (2021), [A Housing Supply Absorption Rate Equation](#), The Journal of Real Estate Finance and Economics; Murray (2021), [The Australian housing supply myth](#), Australian Planner; Huang et al. (2015), [Is insufficient land supply the root cause of housing shortage?](#), Habitat International.

44. There are no alternative theories of new housing supply that can explain the fact of profitable development opportunities not being taken up other than the idea of a built-in market 'speed limit' for supply of new housing.

Land-use regulations do not constrain the absorption rate

45. Paradoxically, zoning rules can bind on each and every housing development, reducing the profits of each and every developer, without binding (constraining) the market rate of new housing supply. This is because most feasible development opportunities are rationally left undeveloped as strategic investments, in what is described as speculation or landbanking.
46. This means that zoning rules just shape where housing goes and what it looks like – not how much is built.
47. For example, if total demand growth is for six dwellings per year, zoning rules determine whether a city sees development of:
- (a) Six buildings with single dwellings under low-density zoning;
 - (b) Two buildings of three dwellings each under medium-density zoning; or
 - (c) One building of six dwellings, with other sites held vacant, under high-density zoning.
48. How much housing is built is a market decision. The public decision to allow more housing is necessary but not sufficient for the private decision to build it.
49. Economic models find the absorption rate to be generally unaffected by zoning rules. The only effect is a counterintuitive one: looser zoning on a site makes development *less* likely. This is because delaying development is more profitable when developers can benefit not only from rising prices but from step-changes in the optimal built density (e.g. six stories instead of three). Restrictive zoning, by contrast, discourages developers from speculating on the possibility of a higher-density development becoming profitable later. The upshot is that upzoning a site to encourage its development might achieve the opposite.³

³ Murray (2021), [A housing supply absorption rate equation](#), Journal of Real Estate Finance and Economics; Titman (1985), [Urban land prices under uncertainty](#), American Economic Review.

Zoned capacity has no influence on new housing supply

50. There is no grounding in theory (or evidence) for the idea that the stock of zoned sites determines the rate of new supply, or that without extensive zoned capacity (e.g. 30 years) supply will slow and house prices will rise.
51. Price pressure reflects changes in population and income relative to changes in housing stock. Nothing suggests that additions to the housing stock depend on the stock of zoned land. Rather, new supply depends primarily on the rate of growth in demand.
52. Subject to there being enough zoned capacity to meet market demand for new housing, increasing zoned capacity is like pushing on a string.
53. In particular, it is important to note that the share of zoned capacity developed over a period (the 'realisation rate') is an outcome of the absorption rate (new dwellings per period) – not the other way around. The realisation rate is an effect, not a cause.
54. Arguments that "only X% of zoned capacity is developed, therefore to increase development we must increase zoned capacity" are flawed. There are no credible theories that the rate of new supply (dwellings per period) responds to zoned capacity. The realisation rate is a summary statistic, not a fixed parameter that is independent of zoned capacity. It is not an economic variable with any causal influence.

Development costs and development rights affect land values, not house prices

55. Taxes that increase development costs, and regulations that reduce development profit by restricting site density, are not passed forward into higher house prices, but back into lower land values. This is one of the oldest findings in the economics of land.⁴ It is formalised in professional development feasibility and land valuation practices.

⁴ In his 1817 work *Principles of Political Economy and Taxation* classical economist David Ricardo expressed this by saying that "[the price of] corn is not high because a rent is paid, but rent is paid because [the price of] corn is high". Ricardo's theory of rent remains central to the economic understanding of land.

56. If developers could increase their sale prices in response to higher costs without losing sales, they would clearly do so regardless of the specific costs they face.
57. Rents and prices reflect the market's willingness-to-pay for housing, not the costs of construction or the price paid for land. Housing is not priced on a 'cost-plus' approach, since the major component, land, has no underlying cost of production. The price it sells for is a residual, determined by buyers' willingness to pay for housing, less development costs.
58. Equivalently, zoning changes that grant new development rights are capitalised into higher land values. Landowners do not receive a financial benefit from restrictive zoning – rather, additional land use rights provide option value to develop, causing houses to appreciate in value. The more development-ready the land, the higher the uplift (windfall gain) from upzoning, as was observed in Auckland following the 2016 upzoning.⁵

More housing makes for a larger city, and trickles down slowly to the bottom

59. More supply with unchanged demand does lower prices. But this is not the whole picture of how housing policy interventions work. More supply and lower prices also induce two adaptive responses on the demand side:
 - (a) Faster in-migration
 - (b) Increased consumption of housing by all consumers, not just low-income households.

Migration and spatial equilibrium

60. A key principle in urban economics is 'spatial equilibrium', summarised in the phrase "migration equalises quality of life". The elements of quality of life that drive migration include wages, rents, travel times, crowding disamenity, and location-specific features (e.g. natural features, climate).
61. In-migration bids up rents and bids down wages by way of competition. It also increases congestion and crowding. These changes erode quality of life differences between locations over time, re-establishing equilibrium.

⁵ Greenaway-McGrevy (2018), [Rezoning to allow more intensive development brought windfall profits for some property owners, not so much for others](#), Interest.co.nz, 19 April.

62. When a construction boom pushes rents lower, this induces in-migration, which restores rents to levels comparable to elsewhere. Thus lower rents are only ever a temporary outcome. The long-run outcome is that more supply creates a larger (not cheaper) city. If it remains cheaper, it is because another element of quality of life has changed, e.g. congestion or amenity.
63. The recent experience of Christchurch, where cheaper housing prompted fast population growth and quickly-rising housing costs, illustrates this point.

Housing consumption

64. Demand for housing is 'elastic' – as the price falls, people consume more and better housing by renting or buying more floor space or land area and by bidding up preferred locations. As a stylised empirical fact, the share of household budgets dedicated to housing is fixed.⁶
65. Faster market supply therefore does not mean more housing will be provided for those in greatest need. Markets allocate resources – e.g. land and construction resources – according to purchasing power, not need. More market housing will 'filter' or 'trickle down' to improve affordability for low-income households only slowly and indirectly.
66. The upshot of migration and consumption responses is that supply-side policy interventions to lower housing costs can only ever have temporary and limited effect. The primary levers for affordability for those on low incomes are income support and non-market housing, not market supply.

EMPIRICAL EVIDENCE: ZONING AND THE RATE OF NEW HOUSING SUPPLY

67. Three key sources of evidence reinforce the theoretical relationship between zoning and housing supply summarised above:
 - (a) Measures of zoned capacity and landbanking
 - (b) Case studies of upzoning
 - (c) Observation of housing cycles.

⁶ Murray (2022). [Why is the rent-to-income-ratio flat?](#), Fresh Economic Thinking, 3 October.

Zoned capacity and landbanking

68. Zoned land supply (plan-enabled capacity) is often many multiples of what is realistically required as 'inventory' in the process of converting under-used land into dwellings, given the timeframes for planning approval, enabling works, and construction. This indicates some other factor, not planning, is binding the rate of new housing supply. Otherwise, development would be much faster, and would rapidly deplete zoned capacity.
69. In Wellington, the Housing and Business Development Capacity Assessment identified sites with zoned capacity for over 100,000 additional dwellings under the operative District Plan. Of these, 35,000 are estimated to be feasible to develop profitably immediately. But each year only around 1,000 are developed (one in 35, or 3%).⁷
70. The tiny fraction of zoned capacity developed each year is not evidence that more capacity is needed in Wellington to encourage more development. It is evidence that more than enough capacity is already available for developers' needs.
71. Similar support for the market absorption rate being independent of zoned capacity is available elsewhere:
 - (a) Only one in 60 zoned and profitable projects in Auckland (2%) is developed in any given year.⁸
 - (b) Across South East Queensland, only 10,000 lots are developed each year from land zoned for over 400,000 lots (2.5%).⁹
 - (c) Murray (2020) showed that Australia's eight largest listed developers hold over 13 years of new supply in their landbanks,

⁷ Property Economics (2021), [Wellington City commercially feasible residential capacity assessment](#), Appendix 2.2 to May 2022 HBA, October; Stats NZ, [Building consents issued: December 2022](#).

⁸ Fernandez et al (2021), [Housing assessment for the Auckland region](#), Auckland Council HBA; Stats NZ, [Building consents issued: December 2022](#)

⁹ QGSO (2023), [Residential land development activity spreadsheets](#), Queensland Government Statistician's Office.

with eight years of land in subdivisions already approved and ready for sale.¹⁰

- (d) Prosper Australia (2022) found that major developments are drip-fed over an average 40 year timeframe, with sales rates fluctuating according to market conditions, consistent with a market absorption rate but not with the idea that rates of new supply are constrained by regulation.¹¹
- (e) A recent assessment of the Los Angeles planning system showing that the number of landowners with zoned capacity that were issued planning permits in any given year ranged from 0.1 percent to 0.3 percent.¹²

72. When developers report investment strategies to their shareholders or testify under oath their statements make clear that the rate at which they supply new housing is unrelated to regulatory constraints.¹³

Case studies of upzoning

73. If zoning is constraining new supply, upzoning should generate more development. Most case studies of upzoning find upzoning to have localised effects (i.e. displacement between locations) but no overall effect on supply.

74. For instance:

- (a) Freemark (2019) found that the short-term (five-year) local-level impact of upzoning in Chicago was higher property prices but no additional new construction.¹⁴
- (b) Murray and Limb (2022) used a 20-year dataset covering more than 25,000 sites in Brisbane to find that repeated upzoning had no observable price effects, and that the vast majority of zoned

¹⁰ Murray (2020), [Time is money: How landbanking constrains housing supply](#), Journal of Housing Economics.

¹¹ Prosper Australia (2022), [Staged Releases: Peering Behind the Land Supply Curtain](#), July.

¹² Romem (2021), [Technical Summary of Econometric Approach to Estimating Housing Element Site Capacity in the City of Los Angeles](#), City of Los Angeles Housing Element 2021-2029.

¹³ Murray and Helm (2022), [Economic incidence of developer contributions](#), report for Auckland Council, Box 4.1, p28.

¹⁴ Freemark (2019), [Upzoning Chicago: Impacts of a Zoning Reform on Property Values and Housing Construction](#), Urban Affairs Review.

capacity (78%) available in the first period remained undeveloped 20 years later.¹⁵

- (c) Freemark's (2023) review of upzoning case studies concluded that *"upzoned areas may or may not experience increased housing construction over the short term, but likely experience small increases over the long-term, compared to areas without such changes"*.¹⁶

75. The 2016 Auckland Unitary Plan (AUP) is an important case study in the NZ context. One academic study has been conducted into the effect of the AUP on construction. It found a significant effect: of around 50,000 dwellings added over 2016-2021, 22,000 would not have happened without the AUP.¹⁷

76. However there are serious methodological flaws with this paper, and data that contradicts the findings, as I have published with co-author Dr Cameron Murray.¹⁸ These include that:

- (a) Auckland exhibited no significant growth above comparable cities that were not upzoned. The AUP tripled zoned capacity from around 300,000 dwellings to around 900,000 dwellings. But from 2015 to 2022 dwelling consents increased by the same percentage (230%) in the Auckland region as in the Wellington region.¹⁹
- (b) The estimated uptick in consents post-2016 only arises in the partial and biased data sample used by the authors, but not in the full dataset.
- (c) The main finding rests on an assumption that absent the AUP, total consents would have grown at a percentage rate of

¹⁵ Murray and Limb (2022), [We Zoned for Density and Got Higher House Prices: Supply and Price Effects of Upzoning over 20 Years](#), Urban Policy and Research.

¹⁶ Freemark (2023), [Zoning Change: Upzonings, Downzonings, and Their Impacts on Residential Construction, Housing Costs, and Neighborhood Demographics](#), Journal of Planning Literature.

¹⁷ Greenaway-McGrevy and Phillips (2023), [The impact of upzoning on housing construction in Auckland](#), Journal of Urban Economics.

¹⁸ Murray and Helm (2023), [The Auckland myth: There is no evidence that upzoning increased housing construction](#), Fresh Economic Thinking, 4 June.

¹⁹ Stats NZ, [Building consents issued: December 2022](#)

growth significantly lower than in the years prior to the change (about half).

Cyclical evidence

77. NZ building consents in the latest data (for the year to April 2023) are down 9% on the previous year and have fallen in most regions.²⁰ Developers are pulling back on development – which is inconsistent with the idea that planning is constraining the rate of new supply, but consistent with the idea that private decisions determine this rate.
78. Despite broadly unchanged planning rules, annual consents for Wellington have varied by over 50% over the last six years (from a high of 1,442 in 2020 to a low of 922 in 2022).²¹ Variation over longer cycles is even larger. This would not occur if developers were building as fast as planning rules allowed.
79. It is well known that scarce construction resources were limiting house-building during the market peak in 2021. This suggests that even when developers wish to build faster, construction constraints bind before planning constraints do.

FLAWED EVIDENCE : THE ALONSO-MUTH-MILLS (AMM) MODEL

Context

80. Not all past approaches to identifying regulatory effects on housing supply and prices have been methodologically sound. Several have been subject to critique within the profession, and remain contested or are no longer used.²²
81. One currently popular approach centres on the Alonso-Muth-Mills (AMM) model of the monocentric city. Analysis based on this model is increasingly

²⁰ Stats NZ, [Building consents issued: April 2023](#)

²¹ Stats NZ, [Building consents issued: April 2023](#)

²² For instance, the 'zoning tax' method that Lees (2018) used to suggest land use regulations constrain housing supply in NZ was criticised by Murray (2020). See: Lees (2018), [Quantifying the costs of land use regulation: evidence from New Zealand](#), NZ Economic Papers, and Murray (2020), [Marginal and average prices of land lots should not be equal: A critique of Glaeser and Gyourko's method for identifying residential price effects of town planning regulations](#), Environment and Planning A: Economy and Space. See also: Murray and Phibbs (2022), [Evidence-lite zone: The weak evidence behind the economic case against planning regulation](#).

being used to claim that regulating land use increases rents and house prices.

82. WCC's s42A report for the City Centre Zone, at paragraphs 520-525, refers to modelling of this type within Colliers International and Sense Partners' 2020 Market and Retail Assessment.²³
83. The statement of evidence of Kirdan Ross Lees on behalf of Wellington City Council, 24 May 2023, at paragraphs 56-69, also bases its claims on AMM modelling.
84. For instance, Dr Lees' evidence states at paragraph 60 that *"the key benefit of relaxing height restrictions and allowing building up is an increase in housing affordability, not just within the city centre, but across the city. Figure 2Figure 15 [sic] shows a stylised example of how building up provides additional supply that reduces the cost of housing. Compared with the case of height restrictions, removing restrictions allows more people to live in the city centre. This reduces demand on the edges of the city, lowering the price of land and the cost of housing."*
85. This statement confuses density with the rate of new supply (see paragraph 35 above).
86. More generally, while the AMM model can and has been used to study the long-run determinants of urban form (e.g. transport costs and building technologies), it cannot be sensibly repurposed for the question of how planning controls affect housing supply and affordability. The following sections explain why this type of modelling is meaningless as to the effects of planning on housing supply, such that evidence based on it should be ignored by the Panel.

²³ WCC s42A report, [Hearing Stream 4, Part 1 – City Centre Zone](#); Colliers International and Sense Partners (2020), [Retail and Market Assessment for WCC](#), 30 November

Alonso-Muth-Mills (AMM) model: introduction

87. The AMM model is a stylised representation of how different housing outcomes (e.g. rents) vary by distance from the CBD in a hypothetical perfectly-circular and monocentric city.²⁴
88. Unlike models of development timing, which establish an equilibrium flow of new housing, the AMM model claims to identify an equilibrium stock.
89. The basic AMM model takes the following assumptions:
 - (a) Population and incomes are fixed
 - (b) Physical area and transport technology are fixed
 - (c) The central location is most valuable
 - (d) Rural uses have a fixed value.
90. An equilibrium urban form is calculated by distributing the fixed population across the available space so that each person is indifferent between their location and all others. This results in an equilibrium population density, housing stock, and rental price gradient from centre to fringe.
91. In the AMM equilibrium, the difference in rent between locations exactly reflects the private benefit or cost from being closer to or further from the centre. All sites where the value of occupancy exceeds the value in rural use are built upon – i.e. all sites worth developing are already developed.
92. The effects of alternative policies are estimated by altering model parameters (e.g. height limits or rural-urban boundaries) and re-calculating the equilibrium housing stock and rents. Dr Lees' evidence at paragraph 65 provides graphical examples of such analysis.

Alonso-Muth-Mills (AMM) model: critique

93. There are two major problems with this approach to understanding the housing supply and price effects from land use regulation:

²⁴ Kulish et al (2011), [Urban Structure and Housing Prices: Some Evidence from Australian Cities](#), Reserve Bank of Australia.

- (a) Housing development is not modelled
- (b) The population is assumed fixed.

Housing development is not modelled

- 94. The AMM model does not model the process of housing development itself. This means it yields no insight into the rate of the new supply, the key metric for understanding how planning affects housing costs (paragraphs 32-34).
- 95. The AMM model is 'static', meaning it provides a snapshot of the city in long-run equilibrium. It is not 'dynamic' in the sense of modelling the rate of change between old and new equilibria.
- 96. The implicit assumption is that any change in regulations (or other model parameters) results in all dwellings being demolished and immediately rebuilt to the new optimal density. This is clearly unrealistic. In the real world, housing is a valuable capital asset, so changes in land use occur only over long timeframes.
- 97. Because the city is always fully developed in this model, analysis of regulatory constraints *always* finds they cause higher rents and house prices. This conclusion is 'baked' into the model: any land use constraint forces the population and housing into a smaller area, which in this model raises rents.
- 98. On the most charitable interpretation, the AMM model can be said to offer a snapshot of a city in the very long run after all historical land-use patterns have been erased by demolition and rebuilding. The differences between snapshots under different regulations might tell us about the direction of change, but can tell us nothing about the pace of change. AMM model insights are a poor guide to policy effects over timeframes we care about.
- 99. This limitation is well known. Pines (1989) concluded that "*The static approach in the Alonso-Mills-Muth model is useless in explaining many stylized facts regarding the urban structure and its evolution through time. In the static analysis... land is continuously utilized within the city boundaries and the city boundaries are continuously extended with income and population size... The*

reason for the failure of the static model ... is that the housing stock is assumed to be perfectly malleable, which, of course, is highly unrealistic.”²⁵

The population is assumed fixed

100. The second flaw is that the AMM model assumes a fixed population. This is referred to as the closed city assumption. There is no possibility of migration between cities in response to lower or higher costs of living. People are assumed to move frictionlessly to establish a spatial equilibrium within a city, yet there is no movement or spatial equilibrium between cities.
101. Given that the AMM model represents (at best) a long-run view of urban form, this assumption is clearly unrealistic. It suggests the effects of policy changes on rents are always entirely borne by the existing population and never trigger adaptive responses via migration, on any timescale. This ignores a central principle of urban economics (see paragraphs 61-64).

Unrealistic outcomes: NZ Infrastructure Commission example

102. The 2022 report from the NZ Infrastructure Commission, *The decline of housing supply in New Zealand: Why it happened and how to reverse it*, is a useful example to illustrate how AMM modelling produces unrealistic estimates of the housing and price effects of regulatory constraints.²⁶
103. The report claims that “*If we had not downzoned central Auckland in the 1970s, or if we had chosen to adopt successful congestion-mitigation policies, then housing would now be more abundant and house prices would be lower*” (p3-4). It estimates Auckland could have experienced “*a 70% reduction in price inflation [over 1978-2018] relative to what actually happened. In this counterfactual world, Auckland housing prices would be roughly half as high as they were in 2018*” (p24).
104. These findings highlight the unrealism of the AMM assumptions applied to policy change.

²⁵ Pines (1989), [Book Review: Handbook of regional and urban economics, volume 2: Urban economics](#), *Regional Science and Urban Economics* 19(4)

²⁶ NZ Infrastructure Commission (2022), [The decline of housing supply in New Zealand: Why it happened and how to reverse it](#), March.

105. First, due to the closed city assumption, in-migration to Auckland is assumed to be no faster in the counterfactual scenario in which house prices are 50% lower than they actually were. In both cases the population is assumed to grow by 78% over 40 years (Table 3 of the report).
106. Over the 20 years to 2018 Auckland rents averaged around 28% of household income. Other major cities averaged around 24%.²⁷ The Infrastructure Commission AMM results suggest Auckland rents could have instead been as low as 14% of income under different policies. This means instead of paying a premium to live in Auckland, residents of elsewhere could have saved about 42% on housing costs by moving there. Yet the model setup assumes none would choose to do so, over a 40 year period. This is clearly unrealistic, and massively amplifies the potential for regulations to change modelled prices.
107. Second, due to the assumption that all development opportunities are taken up, the implied scale of extra housing development is unrealistically high.
108. In the model counterfactual, building density and urban land area in 2018 are respectively 45% and 19% higher than they were in reality. This suggests the housing stock (by floor area) would be 73% larger than it currently is.
109. Auckland's actual population grew by 78% over the 40 years to 2018. The AMM results suggest that with different policies, construction could not only have matched this growth, but also expanded per-capita housing space by about as much again. That is, these policies would have caused the construction sector and rate of new housing supply (by floor area) to be around three times larger than it actually was, despite no change in population and incomes, which is unrealistic.

AMM model: related fallacies

The space fallacy: physical space limits housing supply

110. The AMM model formalises a more general fallacy in thinking: the idea that the availability of physical space (in the horizontal and vertical dimensions) is what determines housing prices.

²⁷ Jonette Consulting (2022), [Rent proportion of Pre-tax Household Income by Region](#).

111. It does not – rather, housing prices for any given level of demand are determined by the availability of dwelling space, i.e. floorspace.
112. Natural and regulatory constraints do place physical limits on building. But the private sector determines actual dwelling space, according to incentives to supply new housing to the market.
113. Because regulatory constraints do limit potential dwelling space on each site, and can be binding at small geographic scale, they are effective in shaping where new housing goes. But the physical limits they impose on building space at larger scales (e.g. Wellington city) are several orders of magnitude larger than levels that would begin to limit the dwelling space supplied across the city as a whole. Put another way, the market constraint is what binds new supply; the planning constraint is slack.
114. The AMM model embodies this 'space fallacy' by assuming that all profitable development opportunities are already taken, i.e. no land that could be profitably developed today is being banked for later development. The 35,000 dwellings of feasible capacity identified in WCC's HBA do not exist in the AMM equilibrium.
115. This means the AMM model applied to zoning and house prices is equivalent to the space fallacy expressed in mathematical notation. Because this fallacy is wrong, AMM results and insights derived from them in this context are meaningless.

The anchor fallacy: urban limit land prices peg inner-urban house prices

116. A second fallacy is the idea that urban fringe land prices 'anchor' inner city house prices, such that lower house prices can be achieved by engineering lower outer-urban land prices. On this basis some economists advocate for allowing more greenfields development as well as more intense urban development.
117. For instance, Dr Lees in his evidence states at paragraph 60 that "*Compared with the case of height restrictions, removing restrictions allows more people to live in the city centre. This reduces demand on the edges of the city, lowering the price of land and the cost of housing.*"
118. This fallacy is a product of the AMM model assumption that population is fixed (there is no migration). Under these conditions, inner-urban prices are

effectively pegged by urban fringe prices, and urban fringe prices are a function of population against the available physical space in the city (mediated by construction and transport costs).

119. In the real world, inner-Wellington prices are disciplined by competition not just from fringe development areas such as Upper Stebbings and Glenside West development areas, but from other cities: the Hutt Valley, Auckland, etc. With zero migration, the AMM model assumes a spatial equilibrium within the city, but not between cities: under these conditions, fringe prices anchor inner prices. In the real world inner and fringe prices are both influenced by prices elsewhere, via migration.

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