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Zoning Reform and State-Developed Housing in Auckland

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Abstract

Zoning reform is often characterized as a market-enabling response to housing shortages and unaffordable housing. Regrettably this framing belies the potential for zoning reform to encourage state-developed housing, as upzoning enables both private and government developers to produce more housing with less land. A recent zoning reform in Auckland exemplifies this point. The proportion of housing starts issued to government-controlled institutions has increased from 3.1% over the ten years prior to the reform, to 9.9% over the six years after. Proportions this high were last seen in New Zealand prior to the 1980s neoliberal reforms that substantially reduced state intervention in the economy. A synthetic control for Auckland indicates that the reform generated a near threefold increase in state-built dwellings. These findings suggest that zoning reform can enable both the market and the state to construct more housing.

Keywords: Upzoning, Land Use Regulations, Redevelopment, State-Developed Housing.

JEL Classification Codes: R14, R31, R52.

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1 Introduction

Housing has become increasingly scarce and unaffordable in numerous cities around the world, leading many researchers and policymakers to call for increased state intervention in housing markets, including state supply of housing to alleviate housing shortages (Freemark, 2021; Wetzstein, 2021).[1]

State interventions are often contrasted against market-enabling responses to housing shortages, such as zoning reform, which primarily relies on private sector developers to construct housing in response to widespread relaxation of binding land use regulations (LURs). Some proponents of state intervention dismiss zoning as a significant constraint on supply, or the ability of zoning reform to redress shortages (Gurran and Bramley, 2017; Imbroscio, 2021; Wetzstein, 2021), with some explicitly arguing against zoning reform (Griffith and Jefferys, 2013).

However, LURs constrain both private and public development alike. Restrictions on lot sizes and floor-area-ratios frequently require developers to use more land than necessary to supply a given amount of housing, inflating land costs of dwelling construction (Greenaway-McGrevy, 2023b). It is therefore plausible that relaxing binding regulations would enable not only private housing development, but state development as well, at least in contexts where government institutions to construct housing exist.

This paper argues that zoning reform can enable state developers to construct more housing, using a recent zoning reform in Auckland as an example. In 2016, Auckland upzoned approximately three-quarters of residential land under the Auckland Unitary Plan (Greenaway-McGrevy and Jones, 2023), and permits for new dwellings subsequently reached record highs in both absolute and per capita terms (Greenaway-McGrevy, 2023a).[2] However, it is, as yet, unclear how the reform affected state-developed housing, if at all. Figure 1 exhibits new dwelling permits issued in Auckland to government-controlled institutions, showing that there has been a substantial increase in both per capita and absolute terms.[3] State dwelling permits[4] have increased from an average of 176 per year over the ten years prior to the notification of the reform in 2013, to 1,557 per year over the six years after the reform was made operative in 2016. This increase occurred during a period when private residential construction was also booming (see Figure 12 in the Appendix). As a proportion of all new dwelling permits issued, public institutions accounted for 3.1% of all permits issued over the ten years prior to the reform (2004–2013). This proportion increases to an average of 9.9% over the six years after the reform was operative (2017–2022). Because this proportion is increasing during a period when public and private permits are rapidly growing, the increase in state-developed housing after the reform is proportionately greater than the increase in

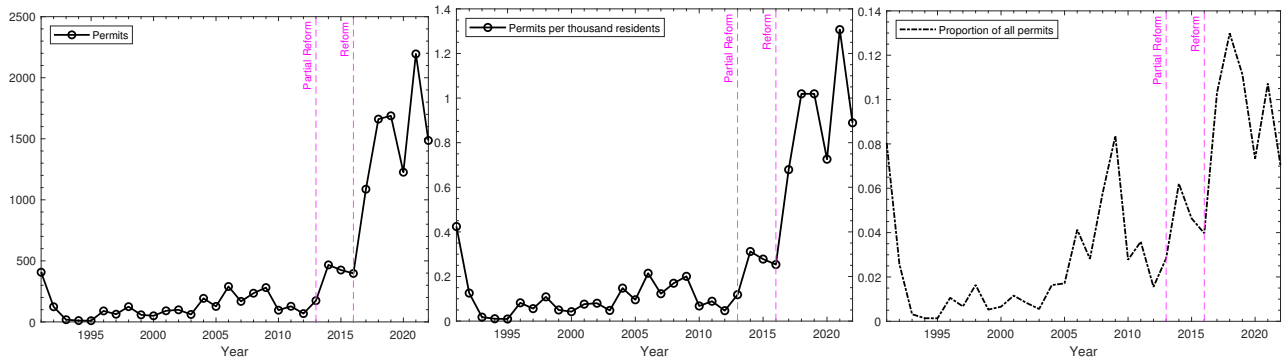
[1] We use "state" and "government" interchangeably throughout.

[2] As we explain in Section 2 in more detail, the policy began to have an effect on housing development from September 2013 onwards, including state-developed housing.

[3] These include permits issued to government-owned enterprises and general government organizations. The data do not identify the intended purpose of the new dwelling. State developers in New Zealand produce a mix of tenanted, affordable and market housing, often within the same development.

[4] For brevity, we refer to new dwelling permits issued to government-controlled institutions as "state dwelling permits" or "state permits" throughout the paper.

Figure 1: New Dwelling Permits issued in Auckland to Government-Controlled Institutions, 1991 to 2022



Source: Statistics New Zealand data. Notes: Permits for new dwellings issued to central and local government-controlled institutions in the Auckland functional urban area. Data begin in 1991. "Reform" refers to when Auckland Unitary Plan was made operative in November 2016. "Partial Reform" refers to notification of the Proposed AUP in September 2013. From this date, developers could build to the more relaxed LURs of the Proposed AUP in exchange for a ten percent affordable housing provision in the development. See section 2 for further details.

the private sector.

Of course, we do not know what would have happened had Auckland not reformed its zoning regulations. The observed increase in state-developed housing after the reforms could be due to other concurrent policy changes or confounding events. For example, the center-left government sought to increase state housing construction through the "KiwiBuild" program after winning the national election held in September 2017. To measure the policy impacts, we require a counterfactual to the zoning reform that tells us what would have happened to state housing construction had Auckland not upzoned.

We use a synthetic control method to specify the policy counterfactual. The method has been applied to evaluate policies in a variety of contexts (see Abadie (2021) for a comprehensive review), and is used by the Minneapolis Federal Reserve Bank to evaluate the impact of zoning changes under the "Minneapolis 2040 Plan" on a variety of housing outcomes.[5] The counterfactual is a weighted average of outcomes in other New Zealand cities, where the weights are selected through a statistical algorithm to ensure that the weighted average (or "synthetic control") resembles observed outcomes prior to the policy change. Because the synthetic unit is also subject to potential confounders, such as central government directives to increase state development, it provides a plausible counterfactual by which policy impacts can be measured.

The synthetic control for Auckland indicates that the zoning reform generated a more than two-and-a-half-fold increase in state dwelling permits issued per capita. The increase in the permitting rate corresponds to an approximate 280% increase in the number of new dwelling permits issued to public institutions.[6] These estimates account for Auckland's reform potentially displacing state

[5] See https://minneapolisfed.shinyapps.io/Minneapolis-Indicators/ [accessed 22 December 2023]

[6] This figure is taken over the nine year period between 2014 and 2022. As we explain below in section 2, proposed zoning changes began to have an impact on state-developed housing from September 2013 onwards, soon after the

housing construction in the donor cities that would otherwise generate over-estimation of policy impacts (see section 4.3 below for further details).

The position of New Zealand's primary state developer on zoning reform further supports the argument that upzoning helps the government to construct housing. The state developer credits the AUP as increasing the development capacity of its land holdings in Auckland from 3,000 units to 30,000 units. In addition, it has been highly supportive of zoning reform proposals, frequently making submissions on proposed zoning changes to support or advocate for upzoning, request the removal of protections for extant dwellings, and simplify regulations. For example, it recently requested the abolition of single family dwelling zones in Auckland in response to a nationwide upzoning directive from the central government.

The remainder of the paper is organized as follows. The following section provides the institutional details and history of state housing construction in New Zealand and Auckland's zoning reform. It also demonstrates that the state housing developer, Kāinga Ora, has been supportive of zoning reform in recent years, and that its predecessor, Housing New Zealand, credited Auckland's reform with enabling it to meet demand in the region. Section three describes the data. In section four presents the synthetic method and results. Section five concludes.

2 Institutional Background

This section provides institutional background on state-developed housing in New Zealand and zoning reform in Auckland. It also provides evidence that New Zealand's primary state housing developer has consistently advocated for zoning reform over the past few years.

2.1 State Housing in New Zealand

As in many mixed economies, the state has historically played a significant role in the housing sector in New Zealand.

Government-owned housing (or "state housing" as it is commonly referred to in New Zealand) began in 1905 under the Liberal government (1891–1912) with the Workers' Dwellings Act. Intended to provide urban workers with low cost housing, only several hundred dwellings were built under the scheme. The first Labour government (1935–1949) reinvigorated state housing, securing hundreds of hectares of suburban land across the country, and employing private builders to construct thousands of high-quality detached and semi-detached houses during the Great Depression.

The post-war era through to the 1990s is characterized by steady decline in the state housing construction, punctuated with brief resurgences in construction under (center-left) Labour governments (see Schrader, 2014). Construction peaked in 1941, thereafter steadily declining until the early 1970s, when there are brief resurgences in construction under the third (1972–5) and fourth (1984–90) Labour governments. The 1960s and 1970s saw the construction of high-rise flats, but in the 1980s, there was a shift towards lower-density builds (Schrader, 2005).

proposed version of the AUP was published.

The 1990s saw significant changes in state housing policy under the (center-right) fourth National government (1990–1999). Social housing was outsourced to the private sector through the home leasing program, obviating the need for the state to construct and provide housing itself (Olssen et al., 2010). Meanwhile the State Housing Corporation was corporatized and the government sold many state-owned houses. The fifth Labour government (1999–2008) imposed a moratorium on further sales, and introduced a "social allocation system" to prioritize social housing based on need, resulting in a moderate increase in state housing construction, particularly in Auckland (Schrader, 2005).

The fifth National government (2008–2017) resumed its previous policy of selling down state housing stocks. However, state-developed housing began to increase in Auckland from 2013 onwards under its tenure, as state developers were enabled to take advantage of relaxed zoning restrictions under a preliminary version of the city's zoning reform. Co-owned by Housing New Zealand and Auckland Council, the Tāmaki Regeneration Company (TRC) was created in 2013 to redevelop public land in the eastern suburb of Tāmaki. Meanwhile, the "Auckland Housing Programme" and the "Crown Building Project" enabled state developers to provide a mix of tenanted social, affordable and market housing in large-scale projects in other suburbs. As we explain in the following subsection, state developers could build under the more relaxed regulations of the "Proposed" AUP through a national inclusionary zoning program called "Special Housing Areas" (SpHAs), created in September 2013.[7]

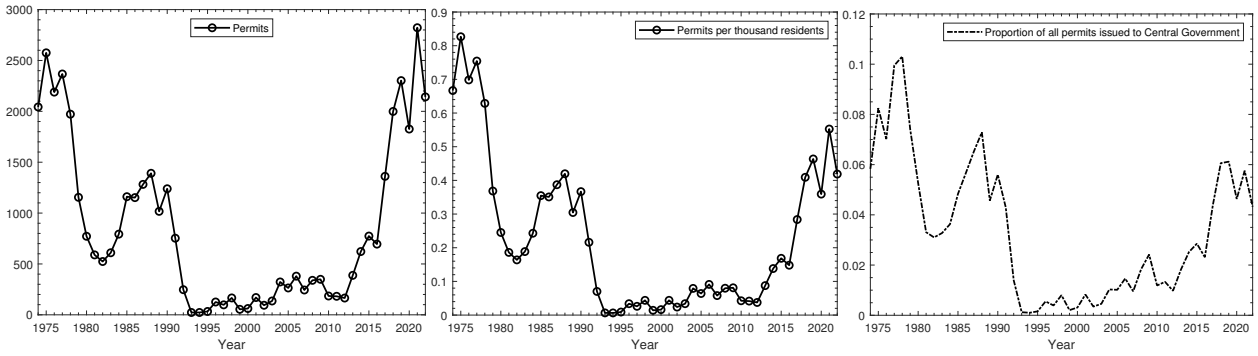
The sixth Labour government (2017–2023) introduced a subsidized building scheme for first time home buyers ("KiwiBuild") in 2018. It then amalgamated New Zealand Housing Corporation, its urban development subsidiary "Homes, Land, Community", and the KiwiBuild program into a single institution, Kāinga Ora, which had both social housing and urban development roles. Kāinga Ora constructs a mix of tenanted social housing, affordable housing and market housing. It is a "crown entity" monitored by the Ministry for Housing and Urban Development. It is not a for-profit enterprise.

Figure 2 exhibits the number of new dwelling permits issued to central government-controlled institutions between 1974, when the Statistics New Zealand data begin, to 2022. Local government data only become available from 1991, and are therefore omitted from the figure. (Figure 2 in the Appendix includes permits issued to local and central government for 1991 to 2022 in the figure, showing that the number of central government permits far outweighs local.) Central government housing construction has recently returned to levels not seen since prior to the housing reforms of the early nineties. Between 2018 and 2022, permits issued to central government institutions reached levels last seen in the mid-1970s, reaching a record high of 2,822 units in 2021. Meanwhile, in per capita terms, central government permits currently exceeds the levels of the 1980s. Permits per thousand reached a high of 0.55 in 2021, a level last exceeded in 1978. The effect of the early nineties changes to state housing policy are clearly evident, with permits bottoming-out after 1993, before recovering from 2013 onwards. The resurgence in state housing construction under the sixth

[7]The "Housing Accords and Special Housing Areas Act 2013" (HASHAA). See https://www.legislation.govt.nz/act/public/2013/0072/latest/DLM5369001.html

Labour government is also evident, with permits climbing from around 700 per year between 2014–2016, to over 2000 per year, on average, between 2018–2022. The resurgence is centered primarily in Auckland, with approximately 70% of all state dwelling permits being issued in Auckland, on average, between 2018 and 2022, despite the city being home to only one-third of the nation's population.[8]

Figure 2: New Dwelling Permits issued to Central Government-Controlled Institutions in New Zealand, 1974 to 2022



Source: Statistics New Zealand. Data on permits issued to general government institutions begin in 1974. Data on permits issued to local government begin in 1991. Figure 13 in the Appendix includes permits issued to local and central government for 1991 to 2022.

2.2 Auckland's Zoning Reform

Auckland in the largest city in New Zealand, with rapidly growing population that increased from 1.16 million in 2001 to of 1.57 million in 2018 (source: New Zealand census).[9] Centered on an isthmus between two harbors, the entire metropolitan region, as well as large amounts of outlying rural land and offshore islands fall under under the jurisdiction of a single local government, Auckland Council.

Prior to 2010, the region comprised seven different city and district councils, each with their own planning regulations. The councils were amalgamated through an Act of Parliament,[10] and the newly-formed Auckland Council required to create a consistent set of planning rules for the region.[11] In March 2013, Auckland Council announced the first ("draft") version of the "Auckland Unitary Plan" (AUP), which introduced a standardized set of planning zones for the jurisdiction. It then released the "Proposed" AUP in September 2013 and notified the public that the plan was

[8] Source: Author's calculations. The proportion of all state dwelling permits issued in Auckland increases after the zoning reform in 2016. Between 1991 and 2016, 49.7% of all public (central and local government) permits issued each year were located in Auckland, on average. Between 2017 and 2022, 71.4% were issued in Auckland.

[9] This subsection borrows heavily from Greenaway-McGrevy and Jones (2023) and Greenaway-McGrevy (2023a).

[10] *The Local Government (Auckland Council) Act 2009.* https://www.legislation.govt.nz/act/public/2009/0032/latest/DLM2044909.html [accessed 14/03/2023]

[11] *The Local Government (Auckland Transitional Provisions) Act 2010.* https://www.legislation.govt.nz/act/public/2010/0037/latest/DLM3016607.html [accessed 22/03/2023]

open for submissions. After several rounds of reviews and consultation, the plan was functionally operationalized in November 2016. A detailed timeline of key events leading up to the reform can be found in the Appendix.

Approximately three-quarters of residential land was upzoned under the final version of the plan, in the sense that the FAR restrictions implied by height and site coverage limits on housing development were relaxed (Greenaway-McGrevy and Jones, 2023). Figure 3 illustrates the spatial distribution of upzoned and non-upzoned residential areas of the city, with the upzoned residential areas decomposed into zones that differ in permissible site development. For additional details on the implementation of the plan and information on the spatial distribution of upzoning, see Greenaway-McGrevy and Jones (2023).

The AUP introduced four new residential zones to the city. Listed in declining levels of permissible site development, these were: Terrace Housing and Apartment Buildings (THA); Mixed Housing Urban (MHU); Mixed Housing Suburban (MHS); and Single House (SH).[12] Table 3 in the Appendix summarizes the various land use regulations (LURs) that apply in each zone, including site coverage ratios, height restrictions, setbacks, and building envelopes, among others. For example, five to seven storeys and a maximum site coverage of 50% is allowed in THA, whereas only two storeys and 35% site coverage is allowed in SH. Prior to the AUP, the planning rules for the Auckland region were governed by the seven different city and district councils that were amalgamated to form the single jurisdiction in 2010. Although most of the seven different plans allocated some residential land to medium density housing, the aggregate area covered was severely limited. Over 95% of residential land in the Auckland region was zoned for site development that was similar to what the SH zone now allows (Greenaway-McGrevy and Jones, 2023). Under the AUP, the Single House zone only covers about twenty five percent of residential land, mainly at the periphery and the inner suburbs (with the latter often under character neighborhood protection).

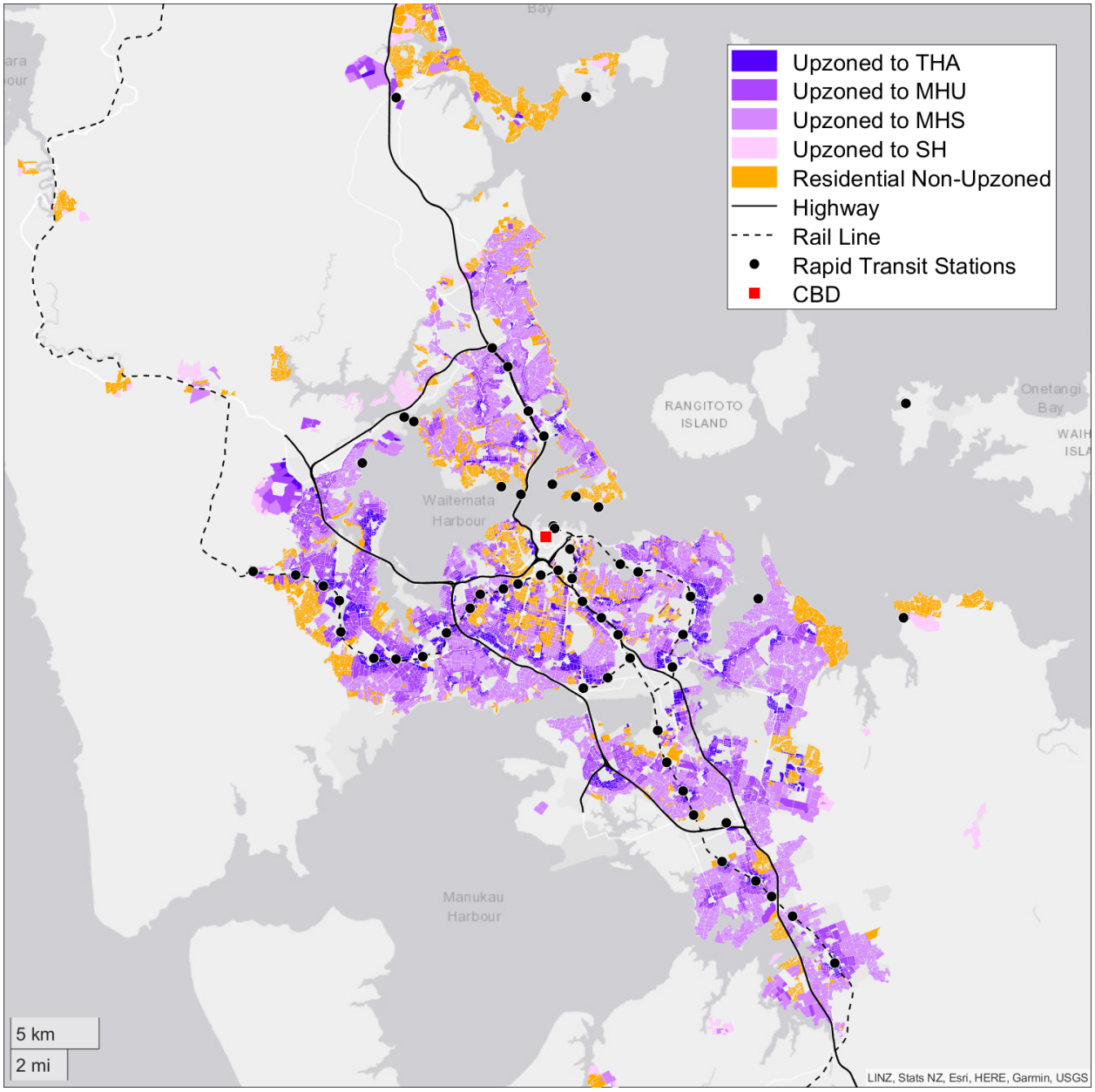
Although the AUP was operative from November 2016, an interim agreement between the Auckland Council and the central government allowed developers to build to the rules of the Proposed Auckland Unitary Plan (PAUP), as notified in September 2013.[13] This agreement modified a national inclusionary zoning program called "Special Housing Areas" (SpHAs, also launched in September 2013) that offered developers an accelerated permitting process in exchange for a ten percent affordable housing provision in the development.[14] Many state developments met the affordability provision. The program ended once the AUP was implemented. Thus, while the AUP was formally operationalized in November 2016, it began to have a limited effect from September 2013 onwards because SpHA developments fell under the more relaxed LURs of the PAUP. Outside of Auckland, the SpHA program operated until November 2019, and was not implemented in conjunction with zoning reform.

[12]There are two additional zones in the AUP that are classified as "Residential": "Large Lot" and "Rural and Coastal Settlement". These areas are an intermediate, semi-rural zone between outright rural and urban housing areas. Residential land on inhabited islands have their own unique zoning.

[13]The Auckland Housing Accord (AHA). See https://www.beehive.govt.nz/sites/default/files/Auckland_Housing_Accord.pdf

[14]The "Housing Accords and Special Housing Areas Act 2013" (HASHAA). See https://www.legislation.govt.nz/act/public/2013/0072/latest/DLM5369001.html

Figure 3: Upzoned and non-upzoned residential areas in Auckland



Source: Greenaway-McGrevy and Jones (2023). Notes: Rapid Transit stations include heavy rail stations, dedicated busway stations, and ferry terminals. The CBD marker is centered on Auckland's iconic 'Sky Tower' skyscraper. Water in grey. Business and rural areas not depicted, including business areas rezoned from residential or rural. Areas upzoned to Single House (SH) were previously zoned as rural or semi-rural. THA is Terrace Housing and Apartments, MHU is Mixed Housing Urban, and MHS is Mixed Housing Suburban.

Data on new dwelling permits suggests that housing supply quickly responded to the reform. Figure 4 exhibits annual permits issued per year, decomposed into permits issued in upzoned and non-upzoned areas (including business and rural areas). Unfortunately the individual permit data underlying the figure does not allow us to separately identify permits issued to government-controlled institutions, so we cannot decompose the data into public and private dwelling permits.

For the purposes of the synthetic control exercise, we use 2013 as the date of the policy intervention. We choose this date because state housing developers took advantage of the SpHA program and could access the upzoned land use regulations under the PAUP.[15]

2.3 The State Developer's Position on Zoning Reform

In a variety of policy documents, New Zealand's primary state housing developer credits the AUP with enabling it to meet housing demand in Auckland. For example, in its 2016 briefing to the incoming Minister of Housing and Urban Development, Housing New Zealand (a predecessor of Kāinga Ora) stated that the development capacity of its land holdings increased from 3,000 additional homes under the previous district plans to close to 30,000 under the Unitary Plan.[16] Meanwhile, its 2017 briefing stated that "Our input into the Auckland Unitary plan has enabled significant intensification of our land in Auckland. [...] We are in a strong position to [...] contribute to the demand for increased housing in Auckland."[17] The 2017 briefing also notes that intensification of land use eases the gaps between revenue and costs,[18] supporting the proposition that upzoning enables public budgets to stretch further.

More recently, the successor of Housing New Zealand, Kāinga Ora, has submitted evidence to numerous councils in favor of zoning reform to enable housing intensification in response to nationwide directives and legislation from the central government.

The sixth Labour government (2017–2023) implemented two major nationwide zoning reforms. In June 2020, it released the National Policy Statement on Urban Development (NPS-UD), which required large cities to zone for residential structures of up to six stories within walking distance of rapid transit stations, and prevented councils from requiring developers to provide car parking. In December 2021, the government passed the Medium Density Residential Standard (MDRS), which required the most populous "tier one" metropolitan areas (Auckland, Hamilton, Tauranga, Wellington and Christchurch) to allow up to three dwellings and three storeys on residential parcels

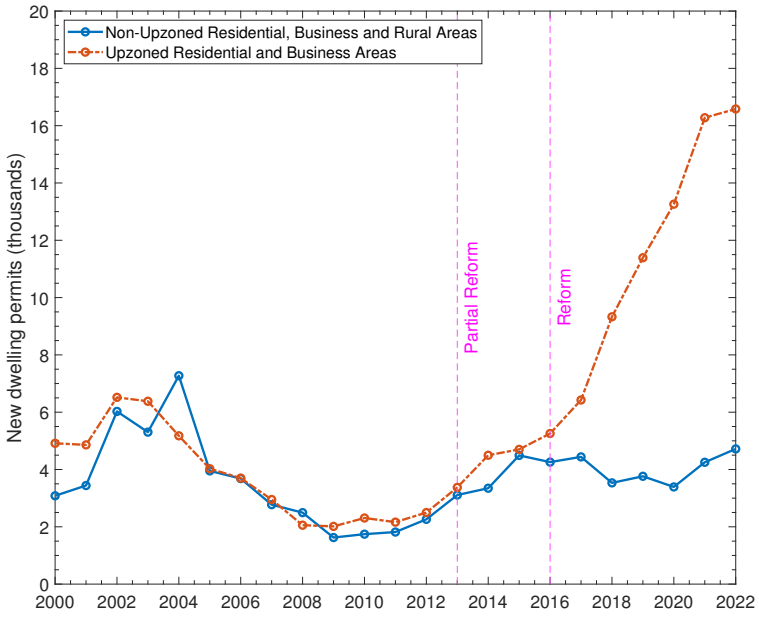
[15] An exhaustive list of SpHAs in Auckland, including both private and state developments, is available at https://infocouncil.aucklandcouncil.govt.nz/Open/2017/10/PLA_20171010_AGN_6726_AT_files/PLA_20171010_AGN_6726_AT_Attachment_55947_1.PDF. Many of the state SpHA developments had permits issued after September 2013 but prior to November 2016, including (but not limited to) the New Lynn, Northcote, and Ōtāhuhu Coast Strategic Areas; the Tāmaki Regeneration Area; the Meadowbank, Mt Roskill, New Windsor, and Waterview clusters; and the Hobsonville Point and Northern Tamaki developments.

[16] See page 30 here https://kaingaora.govt.nz/assets/Publications/Briefing-to-the-Incoming-Minister/briefing-for-the-incoming-minister-2016.pdf

[17] See page 5, paragraph 5 here: hhttps://kaingaora.govt.nz/assets/Publications/Briefing-to-the-Incoming-Minister/briefing-for-the-incoming-minister-2017.pdf [accessed 22/02/2024].

[18] Page 9, paragraph 1.

Figure 4: New dwelling permits in Auckland region by 2016 zoning change



Source: Greenaway-McGrevy (2023a). Notes: New dwelling permits issued to private and government-controlled institutions in areas that were upzoned and not upzoned in 2016 under the AUP. Upzoning classification is based on comparing floor-to-area (FAR) ratios implied by height and site coverage restrictions before and after the policy change. See Greenaway-McGrevy and Jones (2023) for additional details. "Reform" refers to when Auckland Unitary Plan was made operative in November 2016. "Partial Reform" refers to notification of the Proposed AUP in September 2013.

unless specific circumstances prevent it. Both reforms required councils to implement changes to their city or district plans to comply with these directives. This process includes soliciting feedback from the public.

Kāinga Ora's submissions to various city councils on their plans to implement the NPS-UD and MDRS frequently supported the zoning reform and requested further relaxation of restrictions.[19] In its submission to Auckland Council on "Plan Change 78", Kāinga Ora sought the deletion of the "Single House", "Low Density" and "Mixed Housing Suburban" zones in their entirety from the plan.[20] These zones allowed for less development than the "Mixed Housing Urban" zone, which meets the MDRS requirement of three storeys and three dwellings per parcel. Kāinga Ora's submission to Hutt City Council on "Plan Change 56" supported the introduction of the "Medium Density Residential Activity Area" and the "High Density Residential Activity Area", but requested further simplifications to the regulations applying to the zones.[21] Its submission to Wellington City Council on the Proposed District Plan sought to expand design flexibility, recognize the planned urban built form, simplify provisions, alter reference to multi-unit housing and design guides, and increase height limits close to business zones. It also sought to increase the area of the high density zone, and remove qualifying matter character protections from the medium density zone.[22]

3 Data

We obtain permits for new dwellings by sector of control from Statistics New Zealand. Sector of control includes local government and central government, allowing us to identify housing starts issued to all government-controlled institutions, although local government accounts for only a very small fraction of permits. We refer to the sum of new dwellings permits issued to local and central government as "state dwelling permits". These data do not allow us to identify the intended purpose of the new dwelling, be it tenanted social housing, affordable housing, or market housing.

Our outcome of interest is state dwelling permits per thousand residents, which we refer to as the "state permitting rate". Normalizing the flow variable (permits) by a measure of stock (population) facilitates comparability between different urban areas.

We use Functional Urban Areas (FUAs) as the geographic units of analysis. These areas are delineated by Statistics New Zealand on the basis of commuting patterns, and are analogous to com-

[19] For a full list of recent submissions, see https://kaingaora.govt.nz/en_NZ/urban-development-and-public-housing/urban-development/kainga-ora-submissions-on-district-plans/ [accessed 22/12/2023]

[20] See paragraph 4: https://kaingaora.govt.nz/assets/Developments-and-Programmes/Submissions/Auckland-Northland/Auckland-Northland-Kainga-Ora-Submission-Auckland-Council-PC78-2022-Sept.pdf [accessed 22/12/2023]

[21] See paragraph 4: https://kaingaora.govt.nz/assets/Developments-and-Programmes/Submissions/Central/Central-Kainga-Ora-Submission-Hutt-City-Council-Plan-Change-56-2022-Sept.pdf [accessed 22/12/2023]

[22] See paragraph 4: https://kaingaora.govt.nz/assets/Developments-and-Programmes/Submissions/Central/Central-Kainga-Ora-Submission-Wellington-City-Council-Proposed-District-Plan-2023-Apr.pdf [accessed 22/12/2023]

muting zones as defined by the OECD.[23] There are 53 FUAs in New Zealand, including Auckland. For clarity, we henceforth drop the "functional" descriptor and refer to "urban areas" (UAs).

To construct the state permitting rate by UA, we obtained new residential dwelling permits issued to central and local government-controlled institutions, and estimated resident population, by UA from Statistics New Zealand. Permit data begin in 1991 and end in 2022. While permits issued to central government can be separately identified from all permits from 1974 onwards, permits issued to local government can only be separately identified from 1991 onwards. Prior to 1991, permits cannot be decomposed by region. For these reasons, our sample begins in 1991. Population estimates are as of June in the reference year. Estimated population by region data begin in 1996. We backcast and linearly interpolate estimated population data using the growth rate in the resident population of the UAs between the 1991 and 1996 censuses.

Permits are not a measure of completed dwellings, but housing starts. Experimental estimates of completion rates from Statistics New Zealand for NZ as a whole exceed 91% based on "code of compliance" (CCC) issuance. Unfortunately these experimental estimates do not cover all regions of New Zealand, and, for the regions that are covered, are not available at a regional level. Analysis by Greenaway-McGrevy and Jones (2023) indicates the completion rates in Auckland after the AUP are similar to these aggregate experimental estimates.[24] CCC indicates that the dwelling has been inspected and constructed in accordance with building regulations. However, dwellings can be (and frequently are) inhabited without a CCC. Using the final inspection as a measure of completion results in a 93% completion rate over the same time frame.

3.1 Comparing State-Developed Housing in Auckland to Other Urban Areas

Figure 5 exhibits the state permitting rate (new dwelling permits issued to government-controlled institutions per thousand residents) in the Auckland urban area between 1991 and 2022. Because annual permits are highly volatile, we take a centered three year moving average of permits prior to dividing by the resident population. For comparative purposes, in the top panel of the figure we include the average and range of the permitting rates for all other "metropolitan" and "large" urban areas of the country.[25] As described below in section 4.1, this group of urban areas comprises the set of donors used to construct the synthetic control for Auckland. As such, we refer to it as the "donor pool".

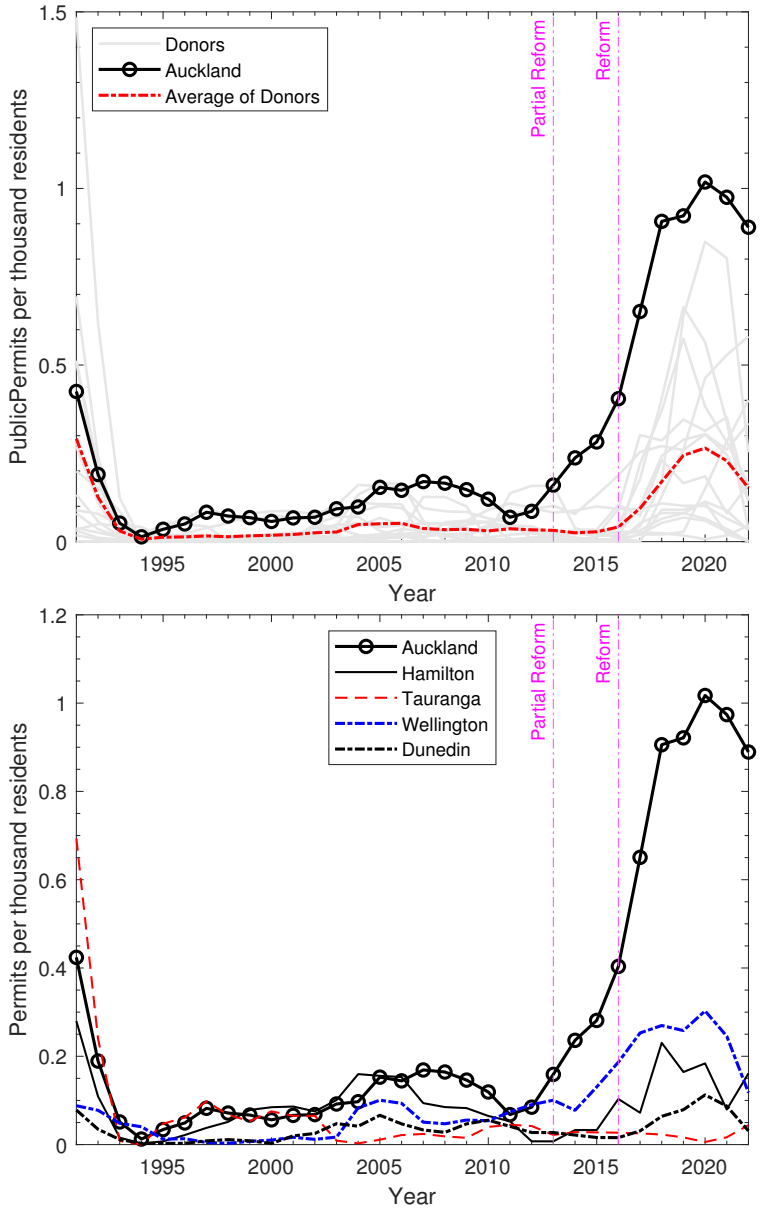
Auckland's (smoothed) state permitting rate falls from just over 0.4 permits per thousand resi-

[23] See https://www.stats.govt.nz/assets/Methods/Functional-urban-areas-methodology-and-classification.pdf [accessed 05/09/2023]

[24] Greenaway-McGrevy and Jones (2023) explain that matching CCC to building permits in Auckland only became feasible from July 2017 onwards. As of June 2023, 91.81% of permits issued in 2018 in Auckland had CCCs, while 89.17% of permits issued in 2019 had CCCs issued.

[25] See figure 14 in the Appendix for the location of these urban areas. Statistics NZ classifies FUAs as either "metropolitan", "large", "medium" or "small" according the population of the "urban core". FUAs that have more than 100,000 residents living in their urban core are known as metropolitan areas, while smaller FUAs are divided into large (core population 30,000–99,999), medium (core population 10,000–29,999), and small regional centers (core population 5,000–9,999). See https://www.stats.govt.nz/methods/functional-urban-areas-methodology-and-classification#appendix-3 [accessed 5 September 2023].

Figure 5: State dwelling permits per thousand residents, Auckland and other urban areas, 1991–2022



Source: Author's calculations based on Statistics New Zealand (SNZ) data. Notes: Permits for new dwellings issued to central and local government-controlled institutions per thousand residents. We take a centered three year centered moving average of annual permits to reduce year-on-year volatility. Urban areas are commuting zones as defined by Statistics New Zealand. Average of donors taken across all urban areas in the donor pool as described in section 4.1. Christchurch is excluded due to the 2011 earthquake and the subsequent rebuild of the housing stock. Shaded region denotes the range between the minimum and maximum permits per thousand residents among the donor pool. "Partial Reform" refers to the Proposed Auckland Unitary Plan (PAUP), notified in September 2013. Developments that qualified as "Special Housing Areas" could build to the regulations under the PAUP in exchange for ten percent of the development to qualify as affordable housing. "Reform" refers to the Auckland Unitary Plan, which became operative in November 2016.

dents in 1991 to effectively zero in 1993. There is a near-identical decline in the average permitting rate over the same period, suggesting that is a common trend across the country as the role of the state in building housing is dismantled. There is then a sustained but small increase until 2006, after which there is a sustained decrease until 2011. Auckland's permitting rate generally exceeds the average permitting rate over the 1990s and 2000s, but the differences are comparatively small.

There is a notable an sustained increase in Auckland's permitting rate from 2013 onwards, when PAUP-SpHA partial zoning reform comes into effect. From here, there is sustained divergence between Auckland and average of other urban areas. The divergence widens further after 2016, when the AUP becomes operative. Construction reaches a peak in 2020, when Auckland's smoothed permitting rate reaches 1.02 permits per thousand residents.[26] There is then a moderate decrease, with the smoothed permitting rate reaching 0.89 by 2022. Although there is an increase in the average permitting rate between 2017 and 2020, the increase in substantially smaller than that exhibited by Auckland. The average peaks at about 0.3 permits per thousand residents in 2020, thereafter declining to about 0.2 by 2022.

The bottom panel of figure 5 exhibits Auckland alongside the other metropolitan urban areas included in the donor pool, namely Hamilton, Tauranga and Wellington and Dunedin. (As explained below, Christchurch is excluded due to the effects of the 2011 earthquake and policy responses thereto.) These cities are selected purely for expositional purposes: In the analysis to follow we use the synthetic control method to select donors. Although there is a sustained increase in Wellington from 2014 through to 2020, its permitting rate remains far below that of Auckland. Tauranga remains consistently low over this period, while Hamilton exhibits a moderate increase. Dunedin exhibits a small sustained increase from 2016 through to 2020, thereafter declining.

3.2 Matching Variables

As we discuss in more detail in section 4.1, the synthetic control method selects comparable donors for the control by matching outcomes prior to the policy intervention. These outcomes can include the outcome of interest (in our application, state permits per thousand residents), but typically also include other outcomes related to the policy of interest. Here we describe the additional matching variables used in our application, all of which are related to housing market outcomes.

Population growth. This is the log difference of the urban area's estimated population in census years. Censuses occur in 1991, 1996, 2001, 2006, 2013 in the pre-reform period of the sample. There is also a census in 2018.

Dwellings per capita. This is the number of occupied dwellings in the urban area divided by the usually resident population of the urban area. Both measures are obtained from census data. The measure is obtained for the pre-reform census years (1991, 1996, 2001, 2006, 2013). We take the log of dwellings per capita.

[26] The unsmoothed permitting rate peaks at 1.3 in 2021.

Personal income. We obtain the average personal income (from all sources) for the census years of 2001, 2006 and 2013 by urban area from Statistics New Zealand. Personal income data for earlier census years is unavailable. We take the log of personal income.

Developable land. We calculate the proportion of the area within 25 kilometers of the center of the urban area that is land under a 10 degree slope. We take the location of the local council office as the center. This variable acts as an exogenous restriction on housing supply. Saiz (2010) uses land under a 15% slope as an exogenous instrument for housing supply as such land can be easily developed. Ten degrees corresponds to 17.6% slope. We take the log of developable land.

We also include the outcome of interest, state dwelling permits per thousand residents, in the census years prior to treatment (1991, 1996, 2001, 2006, and 2013).

4 Synthetic Control Method and Results

This section outlines the synthetic control (SC) method, including details on the selection of comparable donors for Auckland. It then presents results.

4.1 Synthetic Control Method

We have time series data on an outcome of interest for $N+1$ units (or cross sections) indexed by $i = 1, ..., N+1$, where $i = 1$ corresponds to the unit receiving the policy intervention (or "treatment"), and $i = 2, ..., N+1$ indexes the "donor pool", a collection of untreated units that is unaffected by the intervention.[27] Observations on the outcome of interest span $t = 1, ..., T$, where the observations prior to intervention span $t = 1, ..., T_0$ and $T_0 < T - 1$. Outcomes and matching variables are logged prior to analysis.

$y_{i,t}$ denotes the observed outcome of interest for unit i in period t. A synthetic control is defined as a weighted average of the units in the donor pool. Given a set of weights $\boldsymbol{w} = (w_2, ..., w_{N+1})$, the synthetic control estimator of $y^N_{1,t}$ is $\hat{y}^N_{1,t} = \sum_{i=2}^{N+1} w_i y_{i,t}$. Let $y^N_{i,t}$ be the outcome without intervention for each i, while $y^I_{1,t}$ is the outcome under the intervention for the affected unit in period $t > T_0$. The effect of the intervention is then $y^I_{1,t} - \hat{y}^N_{1,t}$.

Abadie and Gardeazabal (2003) and Abadie et al. (2010) choose $\boldsymbol{w}$ so that the resulting synthetic control best resembles a set of pre-intervention "predictors" for the treated unit. (In section 3.2 we referred to these as "matching variables".) For each i, there is a set of k observed predictors of $y_{i,t}$ contained in the vector $X_i = (x_{1,i}, ..., x_{k,i})$, which can include pre-intervention values of $y_{i,t}$ unaffected by the intervention. The $k \times N$ matrix $\boldsymbol{X}_0 = [X_2 \cdots X_{N+1}]$ collects the values of the predictors for the N untreated units. Abadie and Gardeazabal (2003) and Abadie et al. (2010) select weights $\boldsymbol{w}^* = (w^*_2, ..., w^*_{N+1})$ that minimize

[27] This subsection borrows heavily from Greenaway-McGrevy (2023a), which also applies the synthetic control approach to (public and private) housing starts in Auckland.

$$\|X_1 - \boldsymbol{X}_0 \boldsymbol{w}\|_{\boldsymbol{v}} = \left(\sum_{h=1}^{k} v_h \left(x_{h,1} - w_2 x_{h,2} - ... - w_{N+1} x_{h,N+1} \right)^2 \right)^{1/2} \tag{1}$$

subject to the restrictions $w_i \in [0,1]$ and $\sum_{i=2}^{N+1} w_i = 1$, and where $\boldsymbol{v} = (v_1, ..., v_k)$ is a set of non-negative constants. Following Abadie et al. (2010), we choose $\boldsymbol{v}$ to assign weights to linear combinations of the variables in $\boldsymbol{X}_0$ and X_1 that minimize the root mean square error (RMSE) between the synthetic control and the outcomes of the treated unit over the pre-treatment period. This helps ensure that the synthetic control time series tracks outcomes in the outcome variable prior to the intervention. Then, the estimated treatment effect for the treated unit at time $t = T_0 \ldots, T$ is $\hat{y}_{1,t}^N = \sum_{i=2}^{N+1} w_i^* y_{i,t}$.

Weights $\boldsymbol{w}$ that minimize (1) can found using standard quadratic programming solvers. To select $\boldsymbol{v}$ in the nested RMSE-minimization problem, we use Evolution Strategy with Covariance Matrix Adaptation (CMA-ES), which is a stochastic optimization algorithm for solving difficult optimization problems (Hansen, 2016).

As noted previously, annual permits are highly volatile. We therefore take a centered three year moving average of permits prior to dividing by the resident population. This smoothing should enhance the performance of the SC method. Abadie (2021) notes that the performance of SC can be hindered by volatile time series, and suggests filtering as a potential solution.

Abadie (2021) emphasizes that the validity of the synthetic control hinges on its ability to replicate the treated unit's outcome prior to the intervention. Following Ferman and Pinto (2021), we subtract the pre-treatment average from the time series of outcomes prior to implementation. De-meaning resulted in substantial improvements in the pre-treatment fit for the time series of outcomes.

We omit Christchurch from the donor set due to the effects of the 2011 Christchurch earthquake, which generated a substantial idiosyncratic shock to the housing market as a substantial proportion of the housing stock was demolished and subsequently rebuilt. State development contributed to the rebuild, with state dwelling permits per thousand residents increasing from approximately 0.1 in 2011 to reach 0.5 by 2014 (source: Author's calculations). As noted by Abadie (2021), donor units subjected to large idiosyncratic shocks to the outcome variable during the study period should be omitted (p. 409).[28]

We also exclude the "medium" and "small" UAs from Auckland's donor set. Statistics New Zealand categorizes urban areas as either "metropolitan", "large", "medium" or "small", depending on size. "Metropolitan" consists of six urban areas; "large" consists of eleven; and "medium" a further fourteen. The remainder are "small". Many of the medium and small FUAs have no permits

[28] Lower Hutt, which is a city council that sits within the Wellington urban area, upzoned under "district plan change 43", which became operative in part on 9 April 2020, and fully operative from 23 February 2021. See https://www.huttcity.govt.nz/council/district-plan/district-plan-changes/completed-district-plan-changes/residential-and-suburban-mixed-use [accessed 5 September 2023]. We keep Wellington in the donor pool because Lower Hutt constitutes a small proportion of the greater Wellington region, and the zoning reform occurs rather late in the sample period. In future updates of this work it may become important to remove Wellington from the donor pool.

issued for extended periods, and many have a few permits issued only in one or two years over the entire 1991 to 2022 period. In contrast, Auckland and the other metropolitan UAs have state dwelling permits issued almost every year. This means that Auckland's donor pool incorporates the four other metropolitan areas (Hamilton, Tauranga, Wellington and Dunedin, as Christchurch is excluded), as well as nearby large urban areas such as Whangārei and Rotorua. Figure 14 in the Appendix presents the location of the metropolitan and large urban areas, while Table 4 presents their key statistics. Under the displacement effects exercise (see section 4.3), we run an auxiliary synthetic control method on each of the donor units. Under this procedure, large urban areas have their donor pool restricted to metropolitan, large and medium urban areas.

Finally, as discussed earlier in Section 2, we set 2013 as the treatment date T_0, which is when the PAUP-SpHA program begins. Thus our post-treatment period spans 2014 to 2022.

4.2 Results and Policy Impacts

Table 1 exhibits the selected weights for the donor units. The synthetic control draws from four of the sixteen donors. The "metropolitan" urban areas of Wellington and Hamilton collectively receive just over 50% of the weighting. Hamilton is 120 km south of Auckland (as the crow flies) with an estimated population of 210,000 within the urban area as of the 2018 census. Wellington is located 600 km south of Auckland with a population of 422,000 in the urban area, and contains the capital of the nation, Wellington City. The remaining donors are the "large" urban areas of Gisborne, with a weight of 0.458, and Whangārei, with a very small weight of 0.030. Gisborne is located on the east coast of the North Island, and has a population of 50,000, while Whangārei lies about 150km north of Auckland and has a population of 87,000.

Figure 6 exhibits the state permitting rate (i.e., state dwelling permits per thousand residents) of the selected donors, alongside that of Auckland. All four donors exhibit permitting rates similar to Auckland between the mid-90s and 2013. The metropolitan UAs (Hamilton and Wellington) then exhibit a moderate increase from 2014 through to 2020, before decreasing. The large urban

Table 1: Selected weights

Urban Area	Weight	Urban Area	Weight
Hamilton	0.183	Napier	0
Tauranga	0	Hastings	0
Wellington	0.328	Whanganui	0
Dunedin	0	Palmerston North	0
Whangārei	0.030	Kāpiti Coast	0
Rotorua	0	Nelson	0
Gisborne	0.458	Invercargill	0
New Plymouth	0		

centers (Gisborne and Whangārei) exhibit very little construction from 2014 until 2017 and 2019, respectively, after which their permitting rates increase substantially. These urban areas are much smaller than Auckland, raising potential concerns about their suitability as donors. However, their rapid increase in the permitting rate from 2017 onwards would result in a lower synthetic permitting rate over this period if large UA donors were removed from the donor pool. By the end of the sample period, the permitting rates of Gisborne and Whangārei exceed those of Wellington and Hamilton by a substantial margin.

The marked increase in state-developed housing in Gisborne and Whangārei likely reflects policy directives from the central government. In 2017, Housing New Zealand (HNZ) was asked to increase housing development in regions previously considered to have low demand, including the Far North, Whangārei, Hamilton, Rotorua, Whakatāne, Gisborne, Hastings, Napier, Palmerston North, Marlborough and Dunedin.[29] There are subsequently clear increases in Gisborne and Whangārei, with a smaller increase (in per capita terms) in Hamilton. Meanwhile, HNZ already had plans to increase development in Wellington under the "Wellington Programme".

Figure 7 exhibits the actual and synthetic state permitting rate for Auckland over the 1991 to 2022 period. The synthetic unit generally fits well until the treatment date. Form this point on, the actual permitting rate diverges from and exceeds the synthetic rate. The divergence becomes even more stark from 2016 onwards, when the AUP becomes operational. The permitting rate in synthetic Auckland peaks at 0.40 in 2020. At this point in time, the actual permitting rate is more than two-and-a-half times as large, at 1.02 permits per thousand residents.[30]

Next we consider the impact of the policy on new dwelling permits (as opposed to permits per thousand residents). To calculate the counterfactual change in permits, we multiply the synthetic permits per capita by population implied by synthetic population growth after the policy intervention. That is, synthetic permits are

$$\hat{c}^N_{1,t} = \hat{y}^N_{1,t} + \hat{\mu}_1 - \hat{p}^N_{1,t} \tag{2}$$

where c denotes (log) permits, p denotes (log) population, $\hat{\mu}_1$ is the pre-treatment mean of outcomes (permits per thousand residents) for the treated unit, and

$$\hat{p}^N_{1,t} = \hat{p}^N_{1,t} - \hat{p}^N_{1,T_0} + p^N_{1,T_0}$$

where $\hat{p}^N_{1,t} = \sum_{i=2}^N w_i p_{i,t}$ for $t > T_0$ and $\hat{p}^N_{1,t} = p_{1,t}$ for $t \leq T_0$.[31]

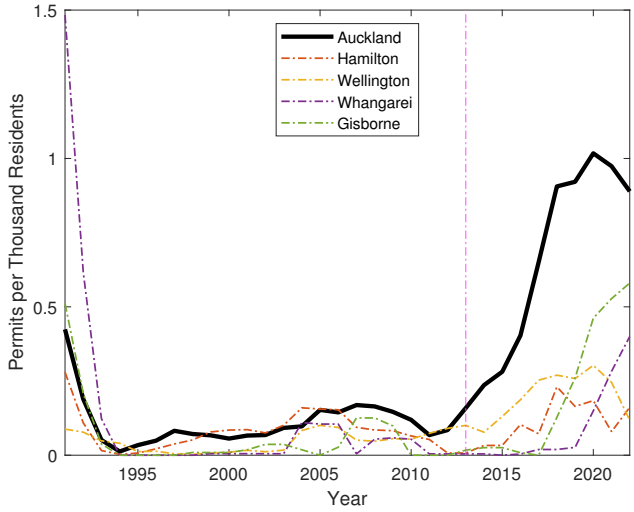
Figure 8 exhibits actual and synthetic permits. (Actual permits are not smoothed.) The

[29] See page 11 of the "Briefing to the Incoming Minister of Housing and Urban Development", available at hhttps://kaingaora.govt.nz/assets/Publications/Briefing-to-the-Incoming-Minister/briefing-for-the-incoming-minister-2017.pdf [accessed 22/02/2024]

[30] The limited number of cross sectional units (sixteen) impairs our ability to conduct inference using the conventional in-space placebo rank permutation test. Auckland's positive-error root mean square error ranks first among the 16 placebos, corresponding to a p-value of 0.0625. Auckland's positive-error root mean square error ratio ranks third, corresponding to a p-value of 0.1875. However, the two higher ranking donors have zero permits for extended periods over the pre-treatment era, resulting in tiny RMSEs prior to intervention via the optimized weights.

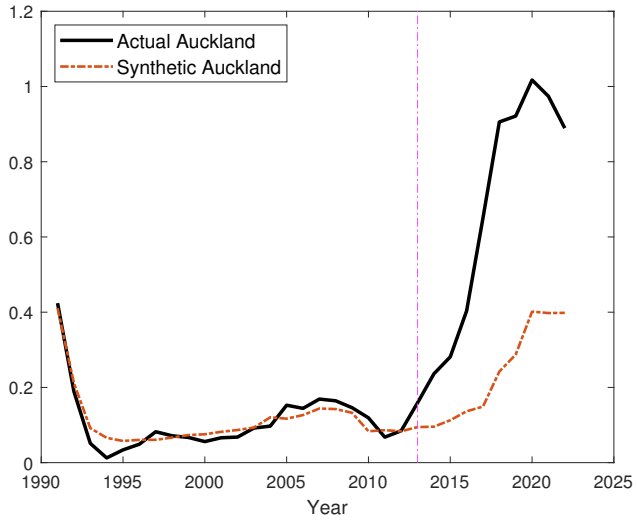
[31] We obtain very similar time series of synthetic permits when actual population $p_{1,t}$ is used in place of $\hat{p}^N_{1,t}$ in (2).

Figure 6: State dwelling permits per thousand residents, Auckland and donors, 1991–2022



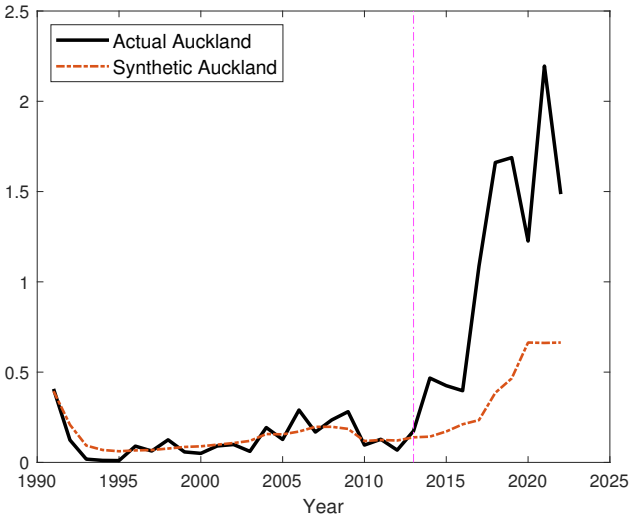
Notes: New dwelling permits issued to publicly-controlled institutions per thousand residents. The permits time series have been smoothed using a three-year centered moving average prior to dividing by the resident population (in 000s). The vertical dashed line denotes the treatment timing.

Figure 7: Synthetic and actual state dwelling permits per thousand residents



Notes: New dwelling permits issued to government-controlled institutions per thousand residents. The permits time series have been smoothed using a three-year centered moving average prior to dividing by the resident population (in 000s). The vertical dashed line denotes the treatment timing.

Figure 8: Synthetic and actual state dwelling permits (thousands)



Notes: New dwelling permits issued to government-controlled institutions. The actual permits times series has not been smoothed. The vertical dashed line denotes the treatment timing.

synthetic control implies 3600 permits were issued between 2014 and 2022. 10,632 permits were actually issued between 2014 and 2022, meaning that 7,032 permits are attributed to the policy. These estimates imply that the policy generated a near threefold increase ($3 \simeq 2.95 = 10{,}632/3{,}600$) in the number of new dwelling permits issued to government-controlled institutions over the nine years since notification of the PAUP in 2013.

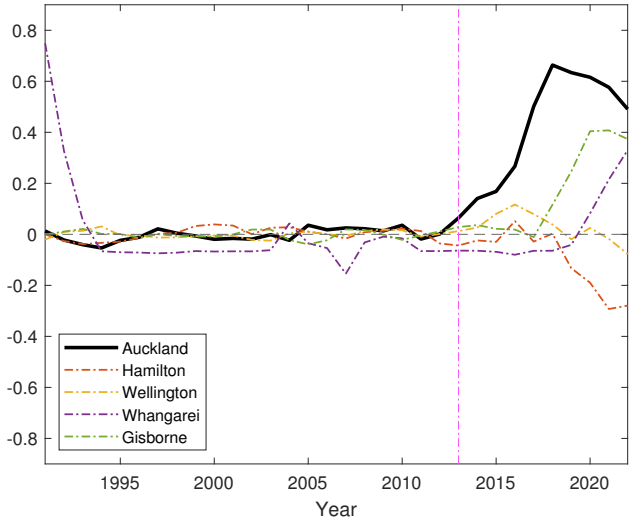
4.3 Displacement Effects

Estimated policy impacts will be overstated if construction enabled in Auckland by the reform displaced state housing construction in the donor units, causing fewer state dwelling permits to be issued in these cities than as would have otherwise occurred had Auckland not upzoned. Displacement effects would generate a downward bias in the counterfactual, and a corresponding upward bias in estimated policy impacts.

Displacement is perhaps a significant concern if the primary state developer (Housing New Zealand and later, Kāinga Ora) has a centralized budget that is rationed between potential projects in different cities. However, as discussed in the previous section, policy directives called for increased state development in regions outside Auckland, including the four selected donor units. Moreover, consistent with this directive, there are subsequent increases in the state permitting rate in the donors. Nonetheless, it remains prudent to explore potential displacement effects due to the associated risk of overstating policy impacts.

We repeat the synthetic control exercise for each donor unit, using the Auckland zoning reform as the intervention, and excluding Auckland from the set of donors in the auxiliary synthetic control exercises. The rationale is that if the intervention in Auckland had an impact on a donor unit, it will manifest as a persistent difference between synthetic and actual outcomes in the donor unit

Figure 9: Prediction Errors, Auckland and Donors



Notes: Difference between actual and synthetic outcomes. The vertical dashed line denotes the treatment timing.

after treatment.

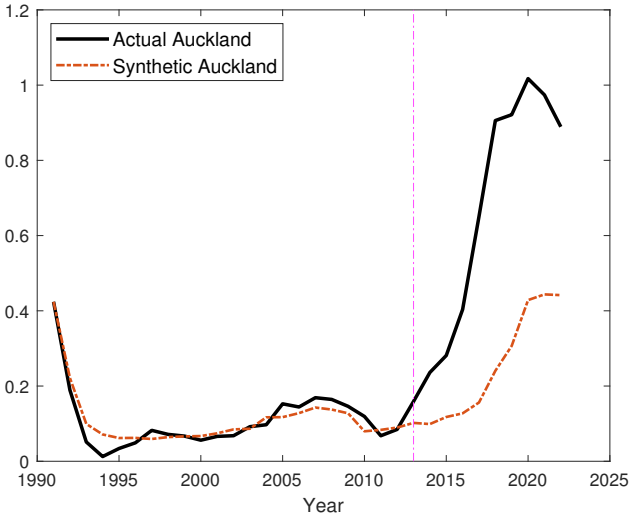
Figure 9 exhibits the prediction errors from this exercise. There is potentially some evidence of displacement from Hamilton. Hamilton's prediction error grows increasingly negative from 2019 onwards. Hamilton is relatively close to Auckland, and thus it is plausible that construction in Auckland displaced state-developed housing there. However, this persistent decrease does not begin until six years after notification of the PAUP, and three years after the AUP became operative, so it is not strong evidence of displacement. There is no evidence of displacement in the remaining donor units.

As a robustness check, we repeat the synthetic control procedure, omitting Hamilton from the donor pool to see if its omission makes a substantial difference. It does not. Table 16 exhibits the selected weights for the donor units. Hamilton is effectively replaced with Rotorua, a large urban

Table 2: Selected weights, Hamilton omitted from Donor Pool

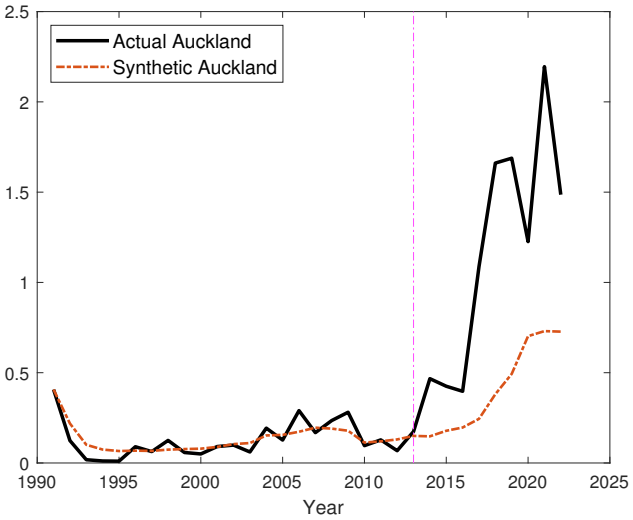
Urban Area	Weight	Urban Area	Weight
Hamilton	n/a	Napier	0
Tauranga	0	Hastings	0
Wellington	0.338	Whanganui	0
Dunedin	0	Palmerston North	0
Whangārei	0.059	Kāpiti Coast	0
Rotorua	0.120	Nelson	0
Gisborne	0.484	Invercargill	0
New Plymouth	0		

Figure 10: Synthetic and actual state dwelling permits per thousand residents, Hamilton omitted from Donor Pool



Notes: New dwelling permits issued to government-controlled institutions per thousand residents. The permits time series have been smoothed using a three-year centered moving average prior to dividing by the resident population (in 000s). The vertical dashed line denotes the treatment timing.

Figure 11: Synthetic and actual state dwelling permits (thousands), Hamilton omitted from Donor Pool



Notes: New dwelling permits issued to government-controlled institutions. The actual permits times series has not been smoothed. The vertical dashed line denotes the treatment timing.

area 200 km south east of Auckland with a population of 74,000. As discussed in the previous subsection, Rotorua was one of the regions targeted for more state development, and there is a persistent increase in its state permitting rate from 2017 onwards (see 15 in the Appendix). Figure 16 in the Appendix illustrates that there is no evidence of displacement from Rotorua.

Figure 10 exhibits the actual and synthetic state permitting rate (i.e., state dwelling permits per thousand residents) with Hamilton excluded. Notably the synthetic permitting rate is similar over the post treatment period compared to when Hamilton is included in the donor pool (see Figure 7 above). The synthetic permitting rate is 0.43 in 2020, at which point the actual permitting rate is slightly less than 2.5 times higher than the synthetic rate, at 1.02 permits per thousand residents.

The synthetic control implies 3,801 permits were issued between 2014 and 2022. This specification therefore results in slightly fewer permits (200 units over nine years) being attributed to the policy compared to when Hamilton is included. Because 10,632 permits were actually issued between 2014 and 2022, 6,831 additional permits are attributed to the policy. Thus, even after accounting for displacement effects, the synthetic control exercise still indicates that the policy generated a near threefold increase in the number of new dwelling permits issued to government-controlled institutions ($3 \simeq 2.80 = 10{,}631/3{,}801$).

5 Concluding Remarks

Zoning reform is frequently characterized as a market-led or market enabling policy response to housing shortages and unaffordable housing. However, this framing belies the potential for zoning reform to enable state developers to construct housing, as restrictive land use regulations constrain development regardless of whether the developer is public or private.

This point is not merely theoretical. Auckland demonstrates how zoning reform moderates the capacity of the state to construct new housing. Using a synthetic control to specify the policy counterfactual, we find that the large-scale zoning reform in Auckland generated a near threefold increase in new dwelling permits issued to public institutions. This is larger than estimated policy impacts of the zoning reform on all housing construction. Greenaway-McGrevy (2023a) also uses the synthetic control method and finds that the reform increased all dwellings (public and private) by about 80%. State developers now account for almost ten percent of housing starts in the city: 9.9% of all new dwelling permits issued in Auckland after its zoning reform became operative have been to government-controlled institutions. In New Zealand, proportions as high as this were last seen in the 1970s, prior to the neoliberal reforms of the 1980s that reduced the role of the state in the economy.

Advocates of state and market intervention often disagree about the causes of undersupply of housing. Whereas proponents of zoning reform point to overly-restrictive land use regulations (Glaeser and Gyourko, 2003; Been, 2018), advocates of state intervention often attribute undersupply to the declining role of the state, rather than more restrictive land use regulations (Gurran and Bramley, 2017). While they may disagree about the causes of housing shortages, advocates of

state- and market-led responses should share zoning reform as a common goal:[32] Upzoning allows the state to produce more housing on the land it either already owns or acquires. While advocates of state intervention may also want to see public budgets increased to enable state developers to increase capacity, such budget increases do not compete for fiscal resources with zoning reform, which is a regulatory change that does not affect fiscal policy.

[32]Public and private developers may compete for resources to provide housing, such as land, labor and materials. Constraints on labor and materials are a short-run phenomenon, and can be eased by coordinating education, immigration, and trade policies with housing supply goals. Meanwhile, potential competition between private and public developers for land necessitates widespread upzoning to ensure that development rights are abundant.

6 Appendix

6.1 Auckland Unitary Plan Timeline

Prior to 2010, the greater Auckland metropolitan region comprised seven city and district councils: Auckland City Council, North Shore City Council, Waitākere City Council, Manukau City Council, Rodney District Council, Papakura District Council, and Franklin District Council.[33] On 1 November 2010, Auckland Council (AC) was formed when the eight previous governing bodies in the region were amalgamated. Legislation was also passed by the central government requiring AC to develop a consistent set of planning rules for the whole region under the Local Government Act 2010. This set of planning rules is embodied in the Auckland Unitary Plan (AUP).

Key dates in the development and implementation of the AUP are as follows:

- 15 March 2013: AC releases the draft AUP. The next 11 weeks comprised a period of public consultation, during which AC held 249 public meetings and received 21,000 items of written feedback.
- 13 September 2013: Housing Accords and Special Housing Areas Act passed, offering developers accelerated permitting process in exchange for limited affordable housing in the development.
- 30 September 2013: AC released the Proposed AUP (PAUP) and notified the public that the PAUP was open for submissions. More than 13,000 submissions (from the public, government, and community groups) were made, with over 1.4 million separate points of submission.
- 3 October 2013: Mayor of Auckland and Minister of Housing sign the Auckland Housing Accord, allowing Special Housing Area developments to use the LURs from the PAUP. The agreement is stipulated to expire once the AUP becomes operational.
- April 2014 to May 2016: an Independent Hearings Panel (IHP) was appointed by the central government, which subsequently held 249 days of hearings across 60 topics and received more than 10,000 items of evidence.
- 22 July 2016: the IHP set out recommended changes to the PAUP. One of the primary recommendations was the abolition of minimum lot sizes for existing parcels. The AC considered and voted on the IHP recommendations over the next 20 working days. On 27 July the public could access and view the IHP's recommendations.
- 19 August 2016: AC released the 'decisions version' of the AUP, including the new zoning maps. Several of the IHP's recommendations were voted down, including a IHP recommendation to abolish minimum floor sizes on apartments. However, the abolition of minimum lot sizes for existing parcels was maintained. This was followed by a 20-day period for the public to lodge appeals on the 'decisions version' in the Environment Court. Appeals to the High Court were only permitted if based on points of law.
- 8 November 2016: A public notice was placed in the media notifying that the AUP would become operational on 15 November 2016.

[33] This timeline is reproduced from Greenaway-McGrevy (2023a).

- 15 November 2016: AUP becomes operational. There were two elements of the AUP that were not fully operational at this time: (i) any parts that remain subject to the Environment Court and High Court under the Local Government Act 2010; and (ii) the regional coastal plan of the PAUP that required Minister of Conservation approval.

All versions of the AUP ('draft', 'proposed', 'decisions' and 'final') could be viewed online.

6.2 Land Use Regulations under the AUP

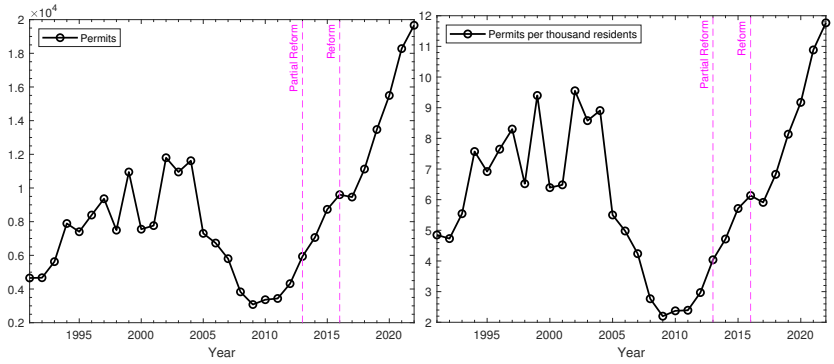
Table 3: Summary of land use regulations by residential zone under the Auckland Unitary Plan

Regulation	Terraced Housing Apartments	Mixed Housing Urban	Mixed Housing Suburban	Single House
Max. height	16m (five storeys)	11 to 12m (three storeys)	8 to 9m (two storeys)	8 to 9m (two storeys)
Height in relation to boundary	3m up + 45° recession plane	3m up + 45° recession plane	2.5m up + 45° recession plane	2.5m up + 45° recession plane
Setback (side and rear)	0m	1m	1m	1m
Setback (front)	1.5m	2.5m	3m	3m
Max. site coverage (%)	50%	45%	40%	35%
Max. impervious area (%)	70%	60%	60%	60%
Min. dwelling size (1 bedroom)	$45m^2$	$45m^2$	$45m^2$	n/a
Max. dwellings per site	does not apply	3	3	1
Min. Lot Size (subdivision)	$1200m^2$	$300m^2$	$400m^2$	$600m^2$

Notes: Restrictions are 'as of right' and can be exceeded through resource consent notification. Height in relation to boundary restrictions apply to side and rear boundaries. Less restrictive height in relation to boundary rules than those tabulated apply to side and rear boundaries within 20m of site frontage. Maximum dwellings per site are permitted as of right. Minimum lot sizes do not apply to extant residential parcels. Impervious area is the area under the dwelling and structures such as concrete driveways that prevent rainwater absorption into the soil.

6.3 Additional Tables and Figures

Figure 12: Dwelling Permits issued in Auckland to Private Sector, 1991 to 2022



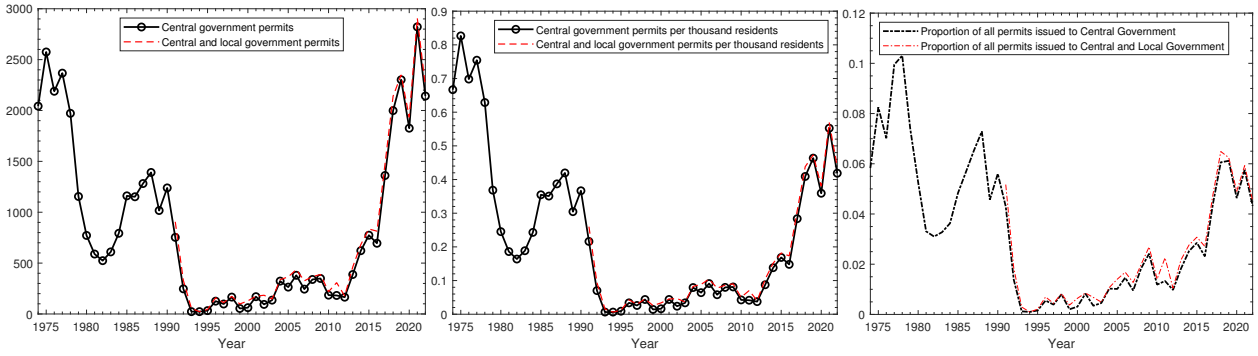
Notes: Permits for new dwellings issued to the private sector in the Auckland functional urban area. "Reform" refers to when Auckland Unitary Plan was made operative in November 2016. "Partial Reform" refers to notification of the Proposed AUP in September 2013. From this date, developers could build to the more relaxed LURs of the Proposed AUP in exchange for a ten percent affordable housing provision in the development. See section 2 for further details.

Table 4: Metropolitan and large urban areas

Urban Area	Population	Dwellings	Pers. Income ($)	Area (km^2)	Prop. develop. land	Dist. Auck. (km)
Auckland	1,567,038	490,695	36,000	3356.9	0.4532	-
Hamilton	209,970	70,596	33,700	1412.7	0.8217	114
Tauranga	156,666	57,690	33,300	789.9	0.3942	155
Wellington	422,427	149,820	39,700	1754.2	0.1212	493
Christchurch	482,088	177,135	35,400	2408.0	0.5797	764
Dunedin	132,006	49,533	27,400	1033.8	0.2278	1,064
Whangārei	86,538	31,407	29,000	1433.6	0.5402	131
Rotorua	74,028	24,795	29,100	649.2	0.5902	194
Gisborne	43,953	15,360	28,000	612.8	0.2432	350
Hastings	79,431	26,823	29,700	1160.4	0.5142	359
Napier	66,459	24,834	30,400	259.8	0.3496	348
New Plymouth	80,997	31,002	31,800	920.9	0.3967	253
Whanganui	45,747	18,249	25,400	598.1	0.3374	344
Palmerston North	96,552	34,737	32,000	978.3	0.7821	397
Kāpiti Coast	46,839	19,128	32,100	317.4	0.1705	452
Nelson	84,846	31,833	31,300	1177.2	0.1855	508
Invercargill	55,386	21,825	31,700	428.5	0.7148	1,188

Source: Author's calculations based on 2018 Census. Notes: Dwellings are occupied dwellings. Note that Christchurch is omitted form the donor pool due to the effect of the 2011 earthquakes on the housing stock and subsequent rebuild. Tabulated distance is Haversine.

Figure 13: New Building Permits issued to Central and Local Government Institutions in New Zealand



Source: Statistics New Zealand. Data on permits issued to general government institutions begin in 1974. Permits issued to local government begin in 1991.

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Figure 14: Metropolitan and Large Urban Areas of New Zealand

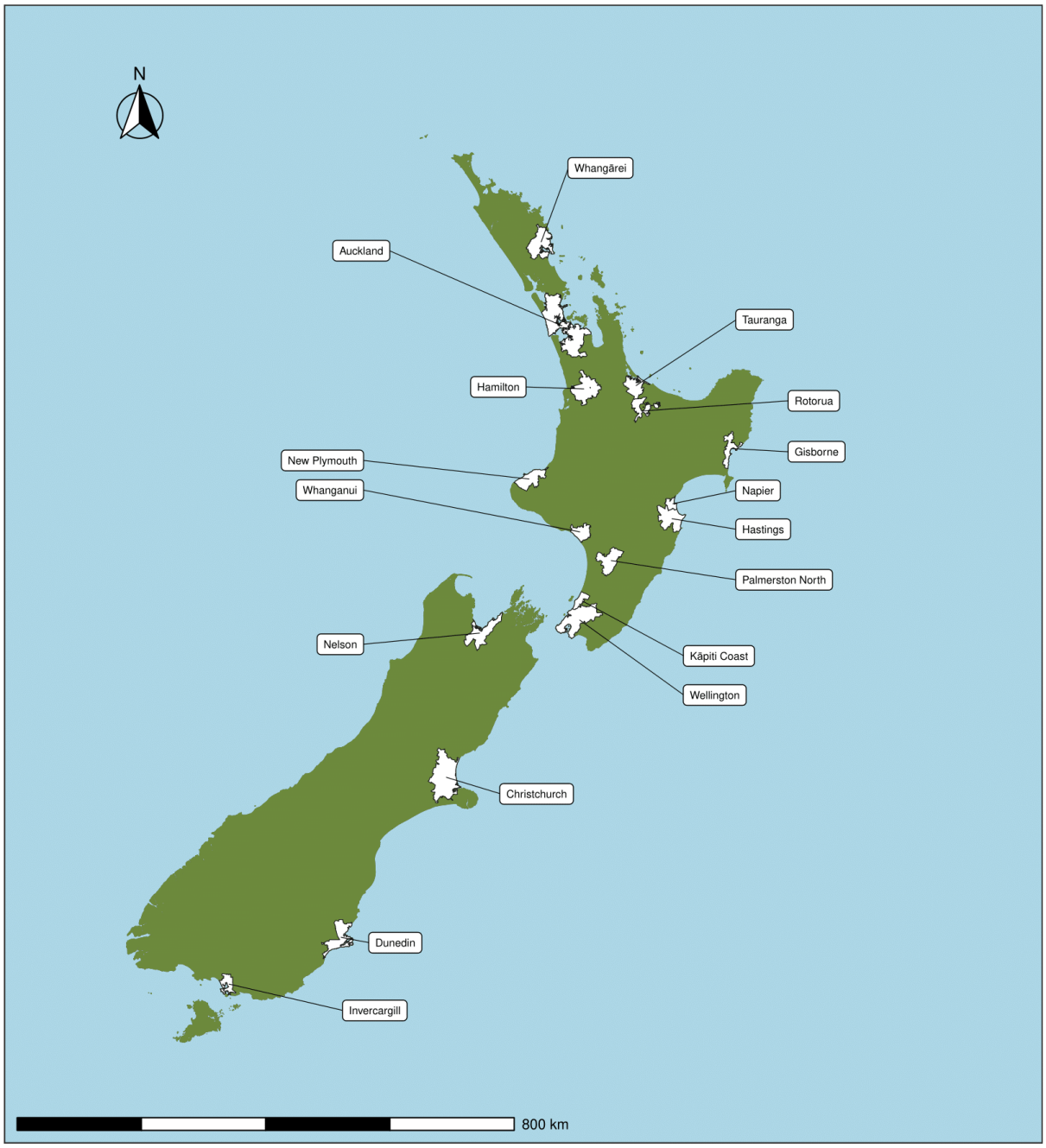
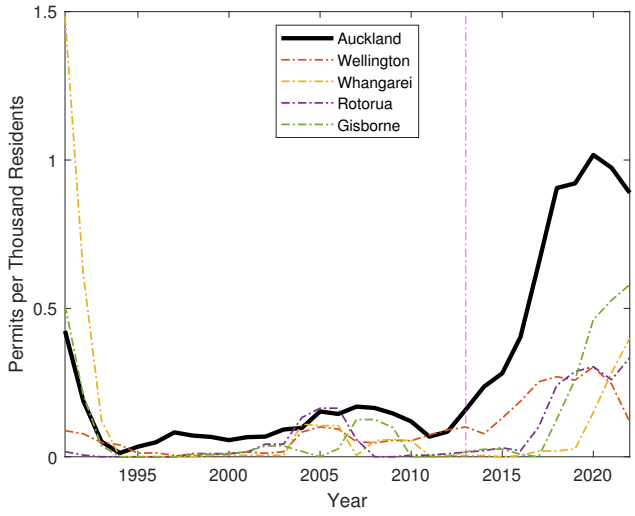
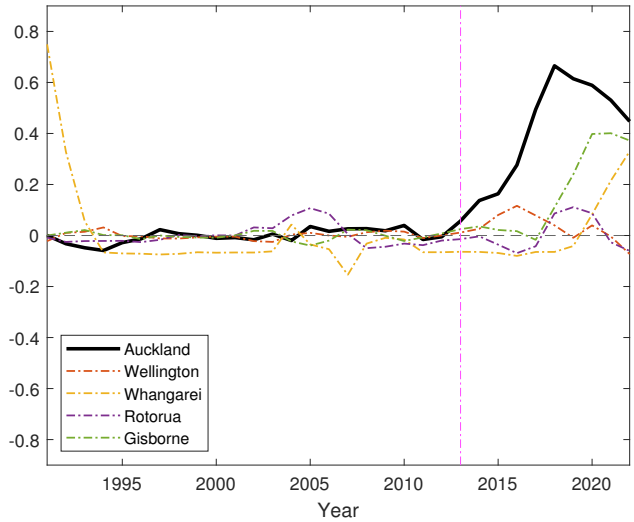


Figure 15: State dwelling permits per thousand residents, Auckland and Donors, Hamilton excluded from Donor Pool, 1991–2022



Notes: The vertical dashed line denotes the treatment timing.

Figure 16: Prediction Errors, Auckland and Donors, Hamilton Excluded from Donors



Notes: Difference between actual and synthetic outcomes. The vertical dashed line denotes the treatment timing.

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