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# Do Area-based Initiatives Contradict Social Democratic Welfare Goals?

Examining the Impact of Tøyenløftet on Long-term Residency. A synthetic control analysis.

Heine Handegard

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http://www.duo.uio.no/

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## Abstract

Over the past few decades, area-based initiatives have become a regularly employed means to tackle geographically concentrated deprivation. One such initiative is *Tøyenløftet*, which took place between 2014 and 2018 in the inner-eastern district of Tøyen in Oslo. A common criticism levied against area-based initiatives is that they have the potential to displace the residents that they are meant to help. The aim of this thesis is to investigate whether this was the case in Tøyen. To operationalize this notion, an empirically oriented research question is formulated, reading: "Did *Tøyenløftet* lead to a decrease in the proportion of long-term residents in Tøyen?".

Furthermore, area-based initiatives are thought of as part of the broader welfare policies in Norway. Accordingly, a theoretically oriented research question was formulated to investigate the role that area-based initiatives play in the conceptual frame of a social democratic welfare state. Welfare regime theory provides the conceptual principles that the area-based initiative is compared to, articulated by the terms universalism, (low) stratification and decommodification. The research question is formulated as follows: "To what extent do Norwegian area-based initiatives reflect the social democratic ideals of universalism, (low) stratification and decommodification?".

To investigate this, the thesis employs a synthetic control model. This is a comparative case study design that uses a combination of trends in comparable city sub-districts in Oslo. The argument for combining these trends is that a weighted combination of trends in comparable units produce a stronger comparison unit than might otherwise be empirically available. This method is useful in cases where there is only one or a few treated units. The models produced using this method outline what would have happened to the outcome of interest in *Tøyen* if *Tøyenløftet* was never implemented. Five models were constructed, four of which provided consistent results for the posttreatment trends, estimating that the proportion of long-term residents were lowered by a magnitude between 1,7 to 2,2 percent at the last year of measurement in 2020. In absolute terms, this constitutes a difference of 249 to 310 residents that had lived in Tøyen for 10 or more years. Models 3 and 4 pass all available significance tests, while models 1 and 2 come close. Overall, the consistent trends and significance testing suggests that the findings are reliable.

Two aspects are emphasized as possible explanations for these findings. The first relates directly to a decision made in *Tøyenløftet* of closing down two social housing blocks, due to what was deemed a too large concentration of social housing in the area. The residents were offered to buy their rental dwellings at 80% market value, but for many this was economically infeasible. The other aspect discussed is the relation area-based initiatives may have with the local housing market, serving as a significant "pull" for economic actors on the Oslo housing market.

A concluding remark is that area-based initiatives should be wary of the potential that such initiatives have on influencing local market structures, and consequently implement measures that exempt the most vulnerable residents from the rising housing costs that are an unintended consequence of area-based initiatives. Future synthetic control research designs investigating policy evaluations would be well served to include variables indicating housing stock and housing characteristics, as well as population group characteristics of the units in the data material.

# 1.0 Introduction

The aim of this thesis is to conduct a policy evaluation of "*Tøyen*løftet", an area-based initiative that was implemented in the period 2014-2018 in the inner eastern sub-district of *Tøyen* in Oslo. To investigate this, the chosen methodological approach is the synthetic control method, a comparative case study method. By a combination of comparison city districts, this method constructs a "counterfactual" *Tøyen* which represents what would have happened in the district, had *Tøyen*løftet not been implemented. The primary focus of analysis and discussion will be on identifying any discernible effects of *Tøyen*løftet on the "proportion of long-term residents" in *Tøyen*. Critics of the policy approach highlight the potential such policy packages have for leading to dislocation of the most vulnerable residents in areas deemed apt for receiving such initiatives (Holgersen 2020).

While area-based initiatives share common attributes as a policy platform, they must also adapt to the specific characteristics of the areas in which they are implemented. This compositional diversity makes it challenging to establish a standardized evaluation method applicable to all initiatives under this label. However, within Norway, there are national guidelines and principles that are part of every area-based initiative. The Norwegian Housing Bank plays a crucial role in establishing this overarching political foundation, emphasizing that these initiatives should be conceived with "welfare policy motives" (Husbanken 2013, 6). Although this formulation is somewhat vague, it implies that Norwegian area-based initiatives are considered part of the welfare policy framework. Consequently, the first research question is meant to enable a discussion of exactly what role area-based initiatives plays in the broader welfare state policy tool kit in Norway. To establish what is typically perceived as social democratic welfare policy, the ideal type of "social democratic" welfare regime in the tradition of Esping-Andersen (1990) will serve as a conceptual framework to evaluate various aspects of area-based initiatives against. Thus, the first research question is formulated as follows:

> *To what extent do Norwegian area-based initiatives reflect the social democratic ideals of universalism, (low) stratification and decommodification?*

There are certainly many possible avenues that can be taken to investigate the outcomes of such a wide net of policies. However, in this thesis I confine the main empirical research question to the aspects pertaining to the residential mobility dynamics of *Tøyenløftet*, a five-year area-based initiative in the sub-district of *Tøyen* in inner east Oslo. Merton (1936) wrote almost a century ago about the difficulty of a priori identifying what effects a given policy implementation will have. Consequently, policies such as *Tøyen*løftet may bear with it unintended consequences, potentially having opposite effects of the original intentions. This thesis will therefore investigate whether some such unintended consequences have been the result of *Tøyen*løftet. In addition to considerations in respect to welfare policy, The Norwegian Housing Bank states that area-based initiatives "shall stimulate positive development in a geographically determined residential area in a big city municipality". The population of a given city district or sub-district is not homogenous, and this is especially the case for the population in *Tøyen*. A pertinent question is then, which groups are the recipient of this "positive development", and does advantaging one group disadvantage the other? Other area-based initiatives in Oslo Municipality have been shown to raise housing prices (Aarland et al. 2017). For economically vulnerable populations, this might be the final push that makes them move to areas with lower associated housing costs. To operationalize this notion, the second research questions goes as follows:

*Did Tøyenløftet lead to a decrease in the proportion of long-term residents in Tøyen?*

Developing and conducting research with effective, reproducible policy evaluation tools provides those engaging in political discourse and policy formulation with a more solid academic foundation about the causal mechanisms behind the policies in question. Area-based initiatives have become a rather common policy platform in the Norwegian big cities. Between 2007 and 2015 there were 14 such initiatives instituted in the three largest cities. With the frequency of their implementation establishing whether such programs lead to the outcomes that they set out to achieve seems pertinent. To this end, this thesis will investigate the potential and merits of the synthetic control method for policy evaluation purposes, using register-based data provided by the research project *Criminal exposure in vulnerable areas*[1] at the University of Oslo. Gertler et al. (2016, 3) argue that policy makers and program managers traditionally evaluate programs based on budgetary inputs and short-term outputs. The goal of evidence-based policy making is to redirect the focus of evaluation to whether programs and policies meet their stated goals on relevant outcomes. For the purposes of this

[1] Project website: https://www.sv.uio.no/iss/english/research/projects/criminal-exposure/

thesis, we are interested in performing an *impact evaluation*, that is, the directly attributable impacts of an area-based policy program (Gertler et al. 2016, 8). While an area-based initiative focuses on improving outcomes on many dimensions, I am here interested in the impact that this policy program has had on moving patterns, specifically whether they have caused long-term residents to move out of the area.

Area-based initiatives are a policy platform with an interesting role within the welfare state policy tool box. Most often the political decision to enact an area-based initiative is based on statistics regarding quality of life and living standards in urban city districts or sub-districts. Organizationally, the agents involved consist of an interdisciplinary group, with actors from various academic fields, public, private and neighborhood backgrounds. The notion underlying the approach is that geographically concentrations of relative deprivation are multi-faceted issues and must therefore be treated as such from an institutional standpoint. While varied in approach, time and budgetary scale, they commonly involve physical upgrades in the area, such as common spaces, lighting of dark streets, and establishing new or rejuvenating existing parks. Social measures are also prevalent and may include measures such as youth recreational centers or programs targeted at youth at risk of dropping out of high school, employment, and public health. In light of the fact that Norwegian ABIs take place in a universalist welfare state, the policy platform is somewhat anomalous in terms of its targeted approach.

Now, on to the structure of the thesis. After the introductions and research questions, *chapter 2* begins by providing background information for the project, introducing *Tøyen* and the components and parameters of *Tøyenløftet*. In *chapter 3*, theory and previous research is discussed. First *3.1*, the characteristics of welfare regimes are highlighted, with particular attention to the social democratic regime, with the goal of distilling the core principles of this regime, to later discuss how area-based initiatives pertain to those principles. In *3.2*, we present insights from literature about area-based initiatives, describing their use cases, desired effects and arguments for and against the policy platform. In *3.3*, the dynamics of residential mobility, with particular focus on the urban context, are discussed. Furthermore, this section will highlight some of the discernible differences in residential mobility patterns between population groups in Oslo to assist in the analysis of our outcome variable "long-term residents". Because of its integral role in the structures of residential mobility, *3.4* will discuss some broad lines of housing markets and housing policy in Norway.

*Chapter 4* will discuss the data material, methods and methodological aspects of the thesis. In *4.1* we inspect the contents of the data material that will be used in the analysis to come and discuss the parameters and process of data preparation, informed by the requirements of the synthetic control method. The data contains units from Oslo municipality at the sub-district level, which is the second to lowest geographical level of administrative data in Norway. In the following section, *4.1.1*, the process of unit selection for our synthetic control model will be described. This selection will be conducted in a data-driven manner, by using balancing functions of a propensity score matching method. The synthetic control method uses a selection of comparison units that is referred to as the "donor pool". To reduce the risk of selection bias in unit selection, the propensity score method will help select the most comparable donor pool units for the subsequent synthetic control method. In section *4.2* we turn to describe and discuss the propensity score method. First its formal components, data requirements and important considerations. The aspects discussed prior are synthesized into a chronological, step-by-step recipe describing the most critical components of a synthetic control method. Model 1-5 have donor pool sizes of respectively 10, 15, 20, 33 and 6 units.

*Chapter 5* contains the empirical analysis. In *5.1*, the resulting respective model 1-5 donor pools will be discussed with the use of data describing the before and after balance of the data sets to be used in the subsequent synthetic control analysis in subsection *5.2*. This section will outline the analysis for the five models with the outcome "proportion of 10-year residents". Model 1 will be discussed with slightly more attention to detail to establish the method of analysis. With these parameters established, models 2-5 are presented and analyzed in parallel. In models 1-4, the estimated results suggest that *Tøyen*løftet has led to a decrease in the proportion of 10-year residents in the area by different magnitudes, depending on the model configuration. Model 5 is deemed to have an insufficient amount of donor pool units to estimate an effect.

*Chapter 6* is reserved for discussion of the findings in light of the theory and previous research from the third chapter. As the findings of the previous chapter to a certain extent already answers the empirically oriented research question, the discussion of area-based initaitives' role in the welfare policy tool kit of modern social democratic welfare regimes is central. Finally, *Chapter 7* summarizes the findings.

# 2.0 Context

## 2.1 Tøyen and Tøyenløftet

*Tøyen* is an area in Oslo municipality, located within walking distance from the city's central railway station. It is bordered to the east by the "Ring 2" highway, an important vein for the city's traffic. On the northern edge, we find the historical botanical garden and former Munch Museum. To the south-east the towering Grønland police station and the walls of Oslo Prison, the largest prison in Norway, encase the residents of *Tøyen*. The area owes its name to *Tøyen Hovedgård* (Tøyen Manor), which today serves as a museum within the botanical garden. The local subway station has stops for all five subway lines, with any gap in transport needs left filled by bus lines on *Ring 2* or from neighboring *Grønland*. Directly adjacent to the subway station, the local square houses small shops, bakeries, restaurants, a children's library, and offices that all draw in local and surrounding people of all ages. Socioculturally, *Tøyen* houses a broad range of actors, services and associations, from mosques, islamic interest organizations, churches, neighborhood associations to cultural institutions, cafés and pubs, mirroring its diverse population. The area is closely interwoven with its neighboring sub-districts *Grønland*, *Grünerløkka* and *Kampen*.

*Tøyen* is historically a working-class neighborhood located in the city district of *Gamle Oslo* (Old Oslo). As the name suggests, this part of the city was historically the city center, before it in 1624 was translocated closer to the military fortress *Akershus festning* for security reasons, demoting *Tøyen* and its neighbors to a suburb in the process. Contrary to local building tradition and custom, all new buildings were from then on to be made of brick. In a display of contemporary urban policy, this decree ultimately led to the local government in *Christiana* (now Oslo) to set the existing wooden building stock aflame, urging new buildings of brick to be built in their place (Aslaksby 1986, 20). However, construction of this nature demanded large amounts of paid labor, and the residents who remained in *Gamle Oslo* were not affluent. In exchange for valuable plots further west in the city, the nobility and affluent were obliged to build tenements, renting out rooms and apartments to the residents of *Gamle Oslo*. Very few of the buildings from this era remain today.

Today there are many characteristics that make *Tøyen* an attractive area for those seeking an urban lifestyle. However, the area has substantial social challenges. In the period from 2008 to 2010, approximately a third of households with children under 17 years lived in "relative deprivation" (Brattbakk 2015, 40), compared to the 10 per cent Oslo average. *Tøyen* also houses a proportionally large amount of the public housing stock, constituting 11 percent of the total housing stock in the area, while the average for Oslo is three percent. The Norwegian public housing sector is frequently criticized for its increasingly residualized structure, housing a smaller, more marginalized population than before (Brattbakk 2015, 74; Stamsø 2008). At the start of *Tøyenløftet* in 2014, there were 840 social housing units in *Tøyen*, constituting half of the total social housing in the city district *Gamle Oslo*. This amounts to 11 percent of the housing units in *Tøyen*, compared to the three percent average for Oslo. On the private housing market, housing prices doubled in *Tøyen* from 2004 to 2014, much higher than the Oslo average growth rate of 73.4 percent (Brattbakk et al. 2015). Prices have continued to grow at a similar relative pace in the subsequent years[2]. The *Tøyen* housing market is characterized by high dwelling turnover rates, and as many as a third of its residents move in or out of the area annually, much higher than the Oslo average.

Demographically, *Tøyen* is an area of significant contrasts. The area is very popular with the immigrants, with 49% of the population having immigrant backgrounds. Another sizable group in the area is the population of young people without children. A common pattern that has been observed for this group is that if they eventually have children, they move to more "established" and "child-friendly" neighborhoods in the years before the children reach school-age (Barlindhaug et al. 2018, 44). As will be discussed later, a large part of *Tøyenløftet* is to shift the image of *Tøyen* to be perceived as an area appropriate for raising children. Another discernible difference between the immigrant and non-immigrant population in the area is that the former is on average less educated, and the latter highly educated. Furthermore, the immigrant population in *Tøyen* has a lower average educational level than the average for immigrants in Oslo in total (Reichborn-Kjennerud et al. 2021, 120).

In terms of employment rates, the area is also similarly polarized. The immigrant population in the area has a rate of employment at approximately 50 percent. In contrast, the non-immigrant population is employed at a rate over 90 percent. The immigrant population in the area is predominantly young, with 68 percent under the age of 16. Having such differences within the population of the area makes articulating the goals of *Tøyenløftet* with precision a difficult job, as the measures taken may affect population groups differently. Arguably, it is

[2] Oslo Municipality housing price statistics, Nedre *Tøyen* and Oslo development: https://bit.ly/3MUH3xC

the immigrant population and the residents of the public housing blocks in the area that needs the initiative the most. A central difference of opinion in the early stages of the program formulation, was whether the area-based initiative was meant to target the living conditions for the individuals in the area or if it was meant to improve area-specific conditions such as material upgrades of parks and services. In the next subsection, I look at the origin and the contents of *Tøyenløftet*, and distill the goals and tools meant to reach these goals.

**Tøyenløftet**

Since 1963, the nationally important Munch Museum was located in *Tøyen*, drawing visitors from across the world. To accommodate modern expectations, the museum had for some time been looking for a new location for its exhibitions. Meanwhile, the plans for constructing a new city district along the shoreline south of *Tøyen*, made the minority-led city council argue that this was a suitable location for a new Munch Museum. The Socialist Left Party leveraged their decisive vote in this matter, arguing that *Tøyen* losing such an important cultural institution should be compensated for. Consequently, in exchange for the Munch Museum, *Tøyen* would receive an area-based initiative spanning five years from 2014 to 2018. The resulting agreement was called “The *Tøyen* Agreement”. In addition to the area-based initiative, national projects such as a new water park, a natural science center, and restructuring of the Ring two highway separating *Tøyen* Park in two, were to be implemented. Except for the water park, none of these larger projects seem to be in the works.

Since the decision to implement this area-based initiative in *Tøyen* in 2014, there have been many measures taken in and around *Tøyen*. Therefore, it is important to note that this thesis only pertains to the projects that are described as constituent of *Tøyenløftet*. In the coming paragraphs, the measures that make up *Tøyenløftet* will be presented as well as the overarching goals of the initiative, as described in government reports and documents regarding the area-based initaitive.

| År | Sub-project/Measures | Funding (NOK) | Sphere of influence |
|---|---|---|---|
| | **Safe living and upbringing environments** | | |
| 2014-2018 | Ung arena (formerly HeadSpace) | 2.022.245 | Tøyen |
| 2015-2018 | Individual housing follow up | 4.916.054 | Tøyen |
| 2015-2018 | Project living environment | 1.970.424 | Tøyen |
| 2016- | Living environment funds | 5.302.375 | Tøyen |
| 2016- | Pre-project Adequate housing for all | 359.203 | Research |
| 2015-2017 | Children that don't show for school | 2.838.439 | Tøyen + Grønland |
| 2015-2018 | The incredible years | 3.380.729 | Tøyen + surrounding |
| 2017-2018 | Pre-project droput prevention | 832.244 | Research |
| 2018 | Quality mapping of kindergartens | 571.405 | Research |
| 2015-2018 | Investigation and follow-up youth 18-30 | 2.661.386 | Tøyen |
| 2014-2018 | Strengthening of health centers and school health service | 9.265.476 | Tøyen |
| 2014-2018 | Big families with children | 3.344.559 | Tøyen |
| 2014-2018 | Effort towards youth dropping out of high school/young adults in the Tøyen-area | 3.404.658 | Tøyen |
| 2014-2018 | Strengthening of neighborhood contacts | 6.590.797 | Tøyen |
| 2014-2018 | Frontteam | 4.347.370 | Tøyen |
| | **Safe living and upbringing environments, total funding** | **51.807.364** | |
| | **Attraktive møteplasser for alle** | | |
| 2014 | A brighter Tøyen | 1.785.052 | Tøyen |
| 2015 | Furnishing Tøyen Torg | 500,000 | Tøyen |
| 2015-2018 | Tøyen outside gallery | 1.640.338 | Tøyen |
| 2014-2017 | Rebuilding K1 | 18.328.971 | Tøyen |
| 2015-2018 | Development and management of K1 | 25.995.382 | Tøyen |
| 2017-2018 | Lighting and treepruning Tøyen | 1.900.001 | Tøyen |
| 2014-2018 | Parks and locations - earmarked funds, central priority | 4.740.001 | Tøyen + surrounding |
| 2014-2018 | Sørli childrens park | 8.481.382 | Tøyen + surrounding |
| 2014- | Minor upgrades of parks and places | 5.812.567 | Tøyen + surrounding |
| | **Attractive meeting places for all, total funding** | **64.443.692** | |
| | **Activity, participation and engagement** | | |
| 2015 | The library as a learning arena and meeting place | 2.000.001 | Tøyen + surrounding |
| 2014-2018 | Free AKS (After-school program) | 26.300.001 | Tøyen + Grønland |
| 2015- | Childrens and youth activities at K1 | 8.533.925 | Tøyen |
| 2014-2018 | Integration measures for residents of Tøyen | 8.731.176 | Tøyen + Grønland |
| 2016-2018 | Method development LINK | 491.343 | Tøyen + research |
| 2015-2018 | Disabled population as active participants | 1.923.991 | Tøyen |
| 2018- | Fostering interaction between the norwegian-somali population and the city district services | 150.001 | Tøyen + Grønland |
| 2015-2018 | Individual follow-up drugs/mental health | 4.632.903 | Tøyen |
| 2017- | Green funds/participatory budgetting | 466.551 | Tøyen |
| 2016-2018 | New forms of volunteering | 1.655.176 | Tøyen |
| 2017- | Partnership agreements and co-creation | 735.001 | Tøyen |
| 2014-2018 | Outdoor events | 3.146.497 | Tøyen |
| 2016-2018 | Activity funds | 3.975.375 | Tøyen |
| 2015-2016 | The 5-year club | 38.278 | Tøyen |
| 2016- | Frigo Ø - at snow and at sea | 1.851.218 | Tøyen |
| 2015-2018 | Healthy lives center | 6.101.803 | Tøyen |
| 2016-2018 | Youth base | 1.378.595 | Tøyen |
| 2015-2017 | Tøyen patrol | 1.116.461 | Tøyen |
| 2017- | Tøyen timekred | 387.501 | Tøyen |
| 2016-2017 | Tøyen on foot and pedal | 73.907 | Tøyen |
| | **Activity, participation and engagement, total funds** | **73.689.689** | |
| | **Program and project management, participation and knowledge production** | | |
| 2014 | Area-based intervention Tøyen (main project, early) | 2.870.705 | Management |
| 2015-2017 | Project management | 9.925.650 | Management |
| 2017- | Program coordination and administration | 2.323.375 | Management |
| 2015- | Communication and dissemination | 3.424.177 | Tøyen |
| 2015-2016 | Knowledge collection and knowledge sharing | 916.149 | Management |
| 2014- | Program participation and resident involvement | 3.158.846 | Tøyen |
| 2018- | Knowledge basis for mobilizing residents | 200.001 | Management |
| 2015- | Social development work and entrepreneurship / Tøyen Unlimited | 3.578.876 | Tøyen |
| 2018- | Spreading of social entrepreneurship | 250.001 | Tøyen |
| 2015-2016 | Knowledge development, centrally (BYU) | 1.014.029 | Management |
| 2015-2018 | Execution capacity, centrally (BYU) | 3.914.609 | Management |
| 2017 | Seminars and interactive workshops | 500.001 | Tøyen |
| 2018 | Result magazine Tøyen | 360.825 | Communication |
| 2018- | Final report, Tøyen | 100.001 | Communication |
| 2018- | Evaluation of K1 | 250.001 | Management |
| | **Program and project management, participation and knowledge production, total funds** | **25.884.241** | |
| | Funds not allocated, per 31.12.2018 | 6.373.001 | |
| | | | |
| | **Tøyenløftet, total allocated funds** | **215.824.986** | |

**Table 1.** Sub-projects and constituent measures, funding and spheres of influence.

In 2016 the goals were revised and elaborated to make them clearer. Of particular interest to this project are the three goals pertaining to furthering *Tøyen* as an area to settle down in, as opposed to an area of transition. The first goal states that "*Tøyen*'s schools are the first choice among parents in the school district". Another related goal states "*Tøyen* has a stable living environment, especially among families with children". Third, and perhaps the most explicitly long-term residency targeted goal states that "*Tøyen* has a varied housing stock that facilitates local residential careers." (Bydel Gamle Oslo 2018, 12). These goals are illustrative that *Tøyenløftet* saw the high turnover rates in the local housing market as a trend that should be stifled. However, these goals don't make it explicit whether they are meant to facilitate for the current residents of *Tøyen* or the initiative is meant to make *Tøyen* an area with these attributes for future residents. Early feedback from inhabitants was clear that the ABI should not contribute to pushing people away from *Tøyen*. Another point made is that there is a limit to how many social housing blocks an area can handle (Bydel Gamle Oslo 2015, 8).

Table 1 presents all the constituent projects that make up *Tøyenløftet*, their budgets and anticipated spheres of influence. The initiative contained many sub-projects that were meant to facilitate a better living environment, closer ties to public services, qualities for families with children etc. Some aimed to affect area residents overall, some targeted specific population groups, and some measures focused on improving material characteristics within the area, such as parks.

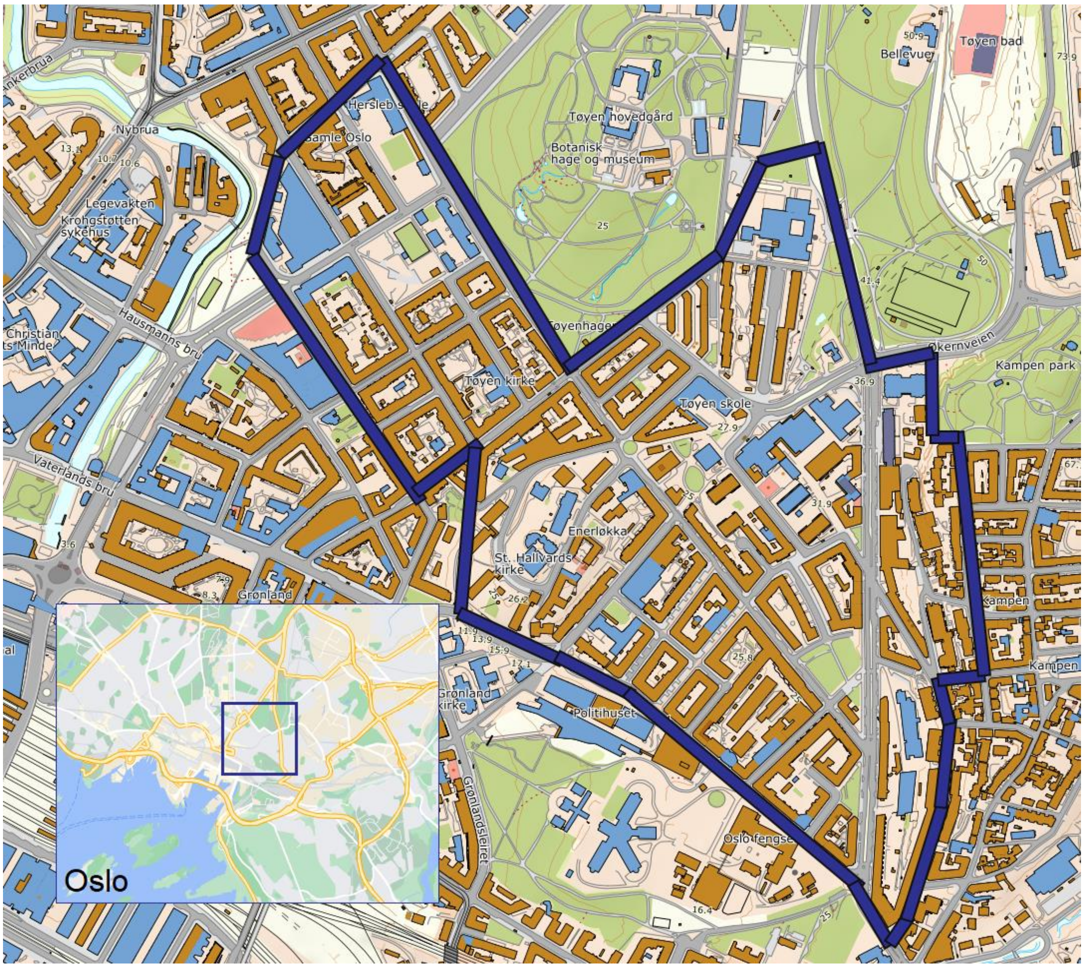


**Figure 1.** *Tøyen* with the delineated area of *Tøyen*løftet.

Discussing every measure individually is outside the scope of this project. However, in the interest of communicating the different areas of effort, I group the respective measures into six categories, 1) Health, 2) Families and children, 3) Area qualities, 4) Grants and capital, 5) Housing and 6) Administration and communication. First, there are two measures of considerable size dedicated to improving the health services in the area, one aimed at the health services in schools, and one directed at general health in the adult population. Secondly, we have the largest category which aims at improving conditions for children, teenagers, and families with children in the area, constituting 21 of the total 58 budgeted posts. This is not only the biggest category in number of measures, but also has the two biggest individual budget allocations in the project. Considering a key statistic motivating the implementation of this area-based initiative was the large proportion of children in families with persistently low incomes, this is no surprise.

In the third category, area qualities, we find measures that seek to improve the material and cultural environment of *Tøyen*, including furbishing *Tøyen* square and upgrades of streets and parks. In the fourth category are measures that made resources and grants for projects available to residents of *Tøyen*. In category five, we find measures that pertain to bettering individual and collective housing qualities, both by providing condominiums and housing cooperatives with funds, but also by "activating" residents in the social housing blocks in an attempt to facilitate better social cohesion. The last category includes posts relating to administrative and communication of the initiative. These are the measures taken directly attributable to *Tøyenløftet*. One would be remiss not to mention that organizational efforts were also prevalent during the implementation period. The *Tøyen* Initiative organized communal efforts parallel to *Tøyenløftet* and contributed to activating individuals and resources in the area. The 5-year club worked to strengthen the social bonds of pre-school aged children, with the goal of making the area more attractive for raising children.

While all the constituent measures in *Tøyenløftet* can be said to affect quality of life for its residents, which in turn affects the likelihood of inhabitants wanting to stay, I would like to highlight some of the subprojects that pertain to improving housing qualities. With the goal of further enabling discussion later in the thesis, specific attention will be given to the accompanying reasoning and goals of respective implementations. All the measures discussed are found in the final report of *Tøyenløftet*, published by the city district of *Gamle Oslo*.

The subproject "living environment funds" was targeted at condominiums, housing cooperatives, organizations, and others to facilitate and support work toward bettering the lived environment in their immediate common spaces. The funds were meant to compensate for lacking amenities such as spaces for recreation and meeting places, and gave partial funding to 68 projects since implementation in 2016, totalling a sum of 5,3 million NOK. An additional intention was to stimulate activity and social cohesion by requiring that the projects should involve as many of the residents as possible. "Individual housing follow-up and project living environment" were merged in 2017. Seemingly, they incorporated many of the measures taken in the "living environment funds", but were principally directed at the social housing blocks in the area. The stated goal was to better the standards of living and stimulate its residents to organize internally to manage their common affairs more effectively. In addition, the measure dealt with material aspects in the housing blocks, such as upgrading lighting and renovating hallways and back yards. The sub-project helped establish resident boards in five social housing blocks in cooperation with *Leieboerforeningen* (Renter's union). In total, 6,9 million NOK were allocated to this post between the years 2015 and 2018.

The final housing related project was research focused. "Preproject: Adequate housing for all" aimed to address some of the attributes of the *Tøyen* housing market that makes it infeasible for people to stay. This resulted in a report called "Pilot city district for good housing solutions, covering challenges posed by aspects such as the large proportion of social housing, the exceptionally growth rates of housing prices for both owner-occupation and rental tenures, as well as challenges faced by different population groups. The concluding recommendations pertained most acutely to the way in which the shutdowns of two social housing blocks should be carried out, by ensuring that the residents of these blocks don't end up with worsened housing conditions.

Another report by the municipal audit (Kommunerevisjonen 2018, 33) sheds light on some of the organizational issues *Tøyenløftet* experienced during the period of its implementation. From December 2016 to May 2017, the program stood without a leader to oversee its implementation, and the offices of the program directors were under three different leaders during 2017. Overall, there were many replacements in the later years of the initiative. The section leader for Health, social and local environment, posited that *Tøyenløftet* would have worked better if the basis of knowledge about area-based initiatives had been more solid among those responsible of implementing it.

### Media representations and criticism

*Tøyenløftet* has been the target of heated debate over the course of its implementation, both in the media and from an academic perspective. The aspect of the ABI most often criticized was its approach regarding the social housing measures in *Tøyenløftet*. Representatives of The *Tøyen* Initiative, an organization giving voice to activists and residents in the area, criticized the lack of oversight in the process of selling two social housing blocks (Renå, Hassan and Breiteig, 2018). These housing complexes had been used for social housing since their construction in the 1970s. They claimed that while the residents of these blocks were offered to buy their respective apartments at 80 percent of market value, for the economically vulnerable residents, this was not realistic. In effect, this meant that many had to move against their will. Instead, private developers stepped in and bought many of the apartments with the intent of renting them out, and in one instance even sectioning one dwelling into six small dorms.

During the implementation period, several politicians voiced concerns over the efficacy and intentions of the initiative. Representatives of the Labour party highlighted that the municipal approach to selling social housing blocks in *Tøyen* and consequent purchases of new social housing blocks did not sufficiently address the distributional problems of Oslo's social housing. This being as most of the new buildings were also located within the inner eastern part of Oslo (Juven and Skarra 2014). Accordingly, the "solution" to concentrations of poverty in social housing, was simply to move the residents to *Sagene*, a city district already housing 2000 of the city's 10.000 social housing units. Another oppositional politician from the Labour party pointed out that the conservative city council while implementing *Tøyenløftet*, made cuts in the ordinary budgets of *Gamle Oslo* city district (Viljugrein, 2019).

An episode in the documentary series "*Brennpunkt*", covered some of the changes made in *Tøyenløftet*. They highlighted that while there were many measures taken for children in middle school ages, there were few, if any, successful measures meant for teenagers and young adults living in the area, also citing statistics showing increases of criminal activity among youth and poverty among youth living in the area (Brennpunkt – Norske tilstander, 2017).

In conclusion, the measures that constitute *Tøyenløftet* focus most of their attention on aspects that would make the area suitable for families with children. For a neighborhood with such a high housing market turnover rate, families with children represent stable residents that have an interest in their immediate lived environments, and may prove resourceful in helping create long-lasting positive efforts toward social cohesion. Another significant focus was afforded to improving the material qualities within the area such as parks and green areas, ostensibly to make the area more attractive as a meeting place and facilitating recreation. Given enough time, these measures along with the work of organizations in the area working towards more social cohesion, one could reasonably expect these measures to positively affect the living conditions of children and families with children in the area. However, the challenges faced by *Tøyen*'s most vulnerable residents happen at a deeper structural level than these measures seem to engage with. There are few measures that seriously try to tackle the unemployment rates, for instance. And there are no measures attempting to tackle the fundamental challenges of the local housing market.

The media discourse around *Tøyen*løftet is highly contentious and points to aspects of the initiative that seemingly go against its stated goals of improving the living conditions of its residents. This is not to say that the project should be expected to solve every issue within the area, but it points to the seeming inability of area-based initiatives of this magnitude to meaningfully affect inequalities that are produced at a higher level of society. Ruud et al. (2020, 88) emphasizes that expectations of ABIs should be adjusted to be proportional to the economic and temporal limitations of a given initiative.

### 2.2 Norwegian urban policy and the role of area-based initiatives

To build a substantive backdrop upon which to discuss the role of area-based initiatives within the welfare state, a short review of overarching characteristics of Norwegian urban policy is fruitful. Policy principles within Norwegian big cities have undergone many developments in the last few decades. To illustrate part of this change, we will distill some of the general lines of urban policy in Norway, with primary attention to Oslo. Furthermore, Tunström (2019) notes that across the Nordic big cities, sustainability has become a key word in urban policy, to the point that it has become almost meaningless. She ties the importance of this term to its role in filling the gaps left by privatization and marketization processes of welfare provision. Andersen, Ander and Skrede (2022) point out power imbalances produced by the privileged positions held by corporate developers in the practice of urban development, and the correlating lack of control held by local politicians.

In the Norwegian context, there is not one ministry that has the sole responsibility for articulating the overarching themes for urban policy. However, the two ministries that fall the closest are the Ministry of Environment, and the Ministry of Local Government and Regional Development. Domestic guidelines for a sustainable urban policy were formulated in a government report from 2013 (Miljøverndepartementet 2013). One concurrent trend in the largest cities in Norway, is that they are growing in population. Especially Oslo, which is one the fastest growing capitals in Europe. In urban development, aspects such as proximity to public transport, stores, and public services is a guiding principle. In terms of road and street regulation, there has been a significant priority shift in public road regulation away from a car-centric approach. This in favor of providing safe and accessible roads for cyclists and pedestrians. This is happening concurrently with a greater investment in public transport. In the capital, this is part of the climate goals held by Oslo Municipality. One of these overarching goals is to reduce car traffic by a third from the 2015 amount by 2030 (Oslo Agency for Urban Environment 2020). Researchers Andersen and Skrede (2017) point out that implementation of many of the sustainability measures held dear by Oslo Municipality, are restricted due to institutional competitors with different interests than the public authorities, as well as aspects such a spatially and socially fragmented population.

There are several overlapping trends to be found in the general lines of urban policy in the Nordic region. Within countries with strong traditions for social planning, expectations for public institutions are high in the context of urban planning, despite increasing prevalence of public-private partnerships (Tunstrøm 2019). It is easy to assume that political institutions are the main drivers of urban development. As we have seen, an active use of regulatory powers within big cities is being employed to fulfill the many changes that are demanded by rapid urbanization and climate goals. However, there are many actors within the urban landscape outside formal political institutions that have financial incentives to direct this development in a way that is beneficial to their long-term goals. These goals are not always parallel to the goals set by politicians. Moreover, corporate developers have a privileged position in relation to urban planners (Mantysalo and Saglie 2010).

Andersen et al. (2022) have used *Torggata* (a centrally located, and now fully commercialized street in Oslo) as an example to show the strategies employed by certain commercial developers to impose changes to an area. A common sign of a coming change in an area is that commercial tenants, such as Starbucks, establish in the area. This acts as a “trigger”, allowing developers to charge more for their properties, while motivating other commercial tenants to establish in the area. Ideally, they establish in properties held by the same developer that initiated the “trigger” establishment. When developers engage in such strategies, they defer from renting out based solely on who is the highest bidder. Rather, these decisions are based on recruiting the “right” kinds of businesses that will draw the group “young and urban” to the area (Andersen et al. 2022, 706). This group is the main target for such deliberate gentrification processes.

The developer of Torggata has employed a similar strategy in Grønland, a neighboring sub-district to *Tøyen*. Many of the established businesses in this area serve the many ethnic minorities in the area with affordable groceries and services. A developer in the Oslo area stated that “We need to respect the businesses that have been there for many years, but we want to replace them” (Andersen et al. 2022, 706). Rising the overall rent prices in the area is instrumental to this strategy. A representative from the Oslo municipality’s Agency for Planning and Building Services, notes that these sorts of shops may be forced to shut down or relocate by housing market dynamics initiated by urban renewal programs and new regulations, stating that “Buildings of sub-standard quality may provide lower rents, making it possible for small firms to survive and who contribute to creating a great urban milieu” (Andersen et al. 2022, 707). Quite paradoxically, implementing policy meant to improve conditions in the area, may alter the competitive playing field to the extent that only corporate developers are left to engage with it. The implementation of area-based initiatives may unintentionally lay the foundation for economic actors, such as property developers, to engage in the tactics described above. In the meantime they potentially augment processes of cultural, social and commercial change in the area in a way that does not match the original residents’ preferences. Indeed, survey respondents over the age of 60 in *Tøyen*, stated that they felt alienated by the hip new cafés and pubs that have popped up in the area. Andersen et al (2022) note that this should not be interpreted exclusively in a negative light, as such development may lead to positive changes in an area and improve outcomes and opportunities for residents.

The overarching principles for area-based initiatives in Oslo is formulated in a city council document from 2017, articulated in cooperation with the Norwegian Housing Bank. While these were not articulated at the time that *Tøyenløftet* originated, they illustrate what place ABIs inhabit in the urban policy tool kit of Oslo and the lessons the municipality has taken from *Tøyenløftet*. Describing the content of ABIs, the resolution highlights that ABIs should be established as a mechanism to follow up on “vulnerable local areas”, which is understood as “areas with complex challenges, tied to both physical and social conditions.” (Byrådssak 176/17, 3). Of particular interest to this thesis, the resolution highlights high turnover rates and consequent unstable social networks as part of these challenges. Consequently, an explicit goal of ABIs in Oslo is to stabilize turnover rates in these vulnerable areas, in part to allow them to construct meaningful social networks within them. As we have seen in the measures in *Tøyenløftet*, it seems that their main operationalization of this notion is to make it more attractive for families with children to stay in the area. Intuitively, these two notions seem to be connected. Families that choose to raise their children in an area, will inevitably be in contact with their surrounding neighborhood, be that through schools, activities or similar. For residents just "passing through", this does not necessarily apply.

One key long-term strategy for the area-based policies in Oslo is to develop systems to monitor the development in every city district in the city. The resolution highlights indicators containing data on well-being, demographics, environmental burdens and housing prices. As will be discussed in 4.1, the section discussing the data material of this project, having indicators on all these aspects of an area would have added a great deal of confidence in analyzing the outcomes of *Tøyenløftet*.

# 3.0 Theoretical basis and previous research

This chapter includes insights from research fields relevant to the analysis to come. The first section begins by outlining the political foundations and challenges faced by the social democratic welfare regime model. After this, the theoretical and political underpinnings of implementing area-based initiatives are discussed. Furthermore, insights from the interdisciplinary research field of residential mobility are presented. Additionally, Oslo-specific residential mobility patterns are presented. Furthermore, due to the close tie between residential mobility and the housing market they take place in, we devote a section to discussing the Norwegian housing market and policy.

## 3.1 Political foundations of Nordic welfare states and contemporary challenges

The origin of the welfare state was famously described by sociologist T. H. Marshall in the post-war period. He documented the development of conceptualizations of citizenship and the consequent developments of the role of European states in relation to their citizens. He described how civil rights securing fundamental freedoms in the 1700s laid the foundation for the development of political rights in the 1800s which built the foundations for the social rights of the 1900s we in broad terms know today as welfare states (Marshall 2014). Another important scholar in early welfare state research was Titmuss. He identified that there were several channels through which welfare could be produced – social services, labor market based welfare and tax welfare. A central argument of his research was that welfare provision did not exclusively benefit the poor at the expense of other socio-economic groups. Additionally, he was the first to indicate that the internal structures of welfare provision could be very different, laying the groundwork for comparative analyses of welfare states and consequent welfare regime literature (Titmuss 1950; Titmuss 1958).

Decades later, Esping-Andersen authored the highly influential “Three Worlds of Welfare Capitalism” (1990). He argued there are three broad theoretical factors that are particularly relevant when determining the type of welfare regime cluster, a welfare state is placed within. These three clusters represent ideal types, theoretical constructions to which reality could be compared against. The first factor emphasized is decommodification. Decommodification is here understood as “the degree to which people have access to basic necessities by virtue of a social right, rather than as a function of their market income”. Importantly, one should not think of decommodification and commodification as dichotomous, rather as a continuum between the two (Tranøy 2009, 100). With the advent of capitalism came the marketization of labor, whereby individuals became dependent on selling their labor on the market to provide for themselves and their families. For the labor movement, decommodification has always been of high concern, as fellow workers are harder to mobilize when they are wholly dependent on the market for their incomes. Correspondingly, labor in more decommodified societies have stronger leverage in wage negotiations. Inversely, in countries where business owners historically have had more power, the welfare structures tend to be less decommodifying and in some cases even strengthening markets by allocating parts of welfare provision to the free market (Esping-Andersen 1990, 22).

The second factor refers to the type and degree of “stratification” the welfare regime promotes, which refers to “the difference in income and social status within a society” (Stamsø 2008, 198). The term emphasizes the role that legal and institutional structures of a welfare state play in constructing new structures of social class. Early iterations of means-tested welfare provision were constructed with the intention of stigmatizing poverty in a dualist system, whereby “outsiders” were socially punished for being welfare recipients (Esping-Andersen 1990, 24). Likewise, corporatist traditions privileged civil servants at the explicit expense of labor movements. In the earliest iterations, the labor movement prioritized self-sustaining fraternal structures organized in unions or parties. This proved problematic, as it produced “insider” and “outsider” dynamics, where the “weakest” labor groups were excluded. When labor eventually achieved power, they would for political reasons favor universalist approaches, espousing welfare structures that were meant for “the people”, rather than just workers.

The third factor refers to the degree of “universalism” in welfare provision. Mainly, there are two categories of universalist welfare states with respective consequences tied to tax arrangements. The first structure is financed by a flat tax, where citizens are taxed the same proportions of their income, no matter their salary levels. This system tends to end up with dualist characteristics, as the middle and upper classes tend to seek private insurance schemes that cater to their expectations. The other universalist structure incorporates middle-class expectations in welfare provision, securing broader support for the system. This obviously entails higher expenses, necessitating a progressive tax system, where wealthier individuals pay higher rates (Esping-Andersen 1990, 26).

By determining the degree to which welfare states inhabit these three aspects, three separate conceptual clusters are formed. The first cluster is labeled the “liberal” welfare regime, the second is called the “conservative” welfare regime, and lastly, the “social democratic” welfare regime. The latter is the most important for the purposes of this project and will consequently be given particular attention. However, to establish the frames of comparison, a short digression discussing the core tenets of the liberal and corporatist welfare regimes will be fruitful.

The liberal welfare regime provisions are of smaller scale, favoring either means-tested benefits, modest universal transfers or social-insurance plans (Esping-Andersen 1990, 26). Typically, such provisions are reserved for low-income citizens, and bear with them significant social stigma. For the better-off, welfare needs are provided by insurance-schemes in the market, in some cases partly subsidized by the state. The result is highly commodified welfare provision for those not receiving benefits, and an equal level of poverty for those who do, producing a stratification with dualist tendencies. Needless to say, liberal regimes do not score highly on universalism. The conservative welfare regime is characterized by a “preservation of status differentials” (Esping-Andersen 1990, 27). Accordingly, rights are based on social standing, and redistributive measures have marginal outcomes on stratification. Many such regimes prioritize maintaining normative cultural characteristics, such as accentuating the role of the family as a core institution. Welfare institutions intervene only when the family does not provide for its members.

The third and final cluster is the social democratic welfare regime. The cluster favors institutional provision of welfare over market or family allocation. To maintain support among the populace and outcompeting market alternatives, this necessitates welfare provision of high quality. In terms of decommodification, the regime encompasses the whole population in an insurance system. Meanwhile, the generous and high-quality provisions means that the regime is dependent on having low unemployment rates. This is both to finance welfare, but also to have as few as possible need to receive social benefits. Turning to aspects of stratification, the system aspires to produce egalitarian outcomes. Market incomes, social status or family background do not affect access to welfare provision, although benefits are scaled by previous income. In contrast to the conservative welfare regime, the social democratic regime puts high value on individual rights-based provision, promoting independence from family backgrounds. However, when it comes to housing, which is traditionally considered one of four sectors of welfare (Torgersen 1987), having financial support from "the bank of mom and dad" is increasingly important for first-time buyers on the housing market (Tranøy et al. 2020). Similarly, the egalitarian ambitions of this welfare regime necessitate a universal approach to welfare provision.

While the theory on welfare regimes and their differences has had substantial discursive influence in many academic fields, not everyone vows for their accuracy. Haarstad et al. (2021) note that the differences between the Nordic countries are significant and argue that the similarities alone are not enough to constitute one model. Meanwhile, the internal structures of social democratic welfare models countries have undergone major respective overhauls in decades past, liberalizing and favoring entrepreneurial approaches to public policy. In some cases, privatizing welfare provision entirely (Haarstad et al. 2021, 8).

The original objective of providing a safety net for its citizens, regardless of economic standing, still stands imperative in contemporary social democratic welfare states. However, they face significant challenges of both exogenous and endogenous characters. Some argue that exogenous processes of globalization fundamentally alter the conditions upon which modern welfare states were founded. This presents challenges to state autonomy and has in many cases led to marketization and residualization of welfare provision (Yeates 1999).

Another concern raised is the financialization of inner-city districts, leading to a partial disconnect of the human, social and economic capital from its previous domestic anchoring (Sassen 2001). Meanwhile, the processes of globalization affect welfare regimes differently. While liberal and conservative welfare states are only marginally affected, the Nordic welfare model seems more vulnerable to the processes of globalization (Kim and Zurlo 2009). Furthermore, endogenous characteristics such as demographic transformation and growing citizen expectations put significant pressures on existing welfare structures. The high-quality provision that the system must provide to compete with private alternatives, means that the system must be able to keep up as technology develops. The health care sector in particular has undergone significant technological advancements over the last few decades, and expectations are growing in parallel. Notably, Norway saw its expenditure for social and health services double over the period 1996 to 2007 (Kjølsrød 2010, 216). One strategy to combat this seemingly autonomous growth in expenditure is devolution. The 356 municipalities in Norway are responsible for large parts of welfare provision. School, pre-schools, primary health and social services are all under municipal responsibility. Devolution is beneficial both for the effect it has on distributing public sector jobs outside the major cities, and for distributing institutional power, arguably furthering democratic values. Relatedly, a common argument made in support of area-based initiatives is that the lower levels of government have place-specific knowledge that national governments don't.

Much has changed in the decades since Esping-Andersen authored his theory of welfare regimes. It can be argued that discussing contemporary policies in light of a theory based on the historical development and components of Nordic welfare states from before the 1990s, is an outdated approach. Whatever the severity of the Nordic countries' welfare regime transformations, they are nonetheless path-dependent, meaning the historical paths the welfare regimes have taken will inevitably affect the make-up of contemporary policies. Nonetheless, the principles underlying the Nordic welfare model are still ostensibly present rhetorically in the arguments supporting policy implementation today. This is also true regarding the arguments for implementing area-based initiatives, which we discuss in the coming section. Holding policies accountable to these principles is suitable to determine whether their outcomes are in line with the rhetoric used to argue for their implementation. To conclude, social democratic ideals are here understood as policies furthering decommodification, (low) stratification and universalism.

### 3.2 Area-based initiatives

Area-based interventions have over the past decades become a widely used tool for urban regeneration in areas of relative deprivation in contemporary urban politics, particularly in Europe and USA (Husbanken 2017, 13). Commonly, they have the goal of strengthening aspects such as well-being and living conditions in an area. Some ABIs of a larger scale take it upon themselves to change the structural, spatial logic of the area in question, which entails rerouting road networks or redistributing the amount of space given to private, semi-private, and public use. Administered at the municipal level, most often with partial national funding, these policy packages target urban areas of relative deprivation where the common welfare provision structures alone do not suffice in curtailing negative trends. Typically, they involve an interdisciplinary approach with actors from public, private and neighborhood backgrounds. Their fundamental notion is that geographical concentrations of relative deprivation are multi-faceted issues and must therefore be treated as such from an institutional standpoint. Andersen (2002) argues that vulnerable areas in cities are not just “pockets of poverty”, but rather “excluded places”.

While varied in approach, time and budgetary scale, there are five categories of area-qualities that ABIs may influence and change. The first pertains to physical environment. This may entail adding or improving parks, green areas, and outside recreational facilities. They may also change road regulations to lessen the impact of car traffic in the area. The second category deals with housing conditions. This may include changes in the types of dwellings available in the area, types of tenure, price interventions and regulatory changes to favor certain dwelling sizes over others. The third category concerns local area service and business availability. Access to and improved quality of public and private services, in addition to supportive measures for local entrepreneurs are examples of measures of this kind. The fourth category relates to social conditions in the area. Visible social issues and criminal activity may be a priority here. The category may entail organizing channels for neighborhood conflicts to be solved, as well as organizing political and social activity. The fifth and last category refers to cultural characteristics in the areas. This may include campaigns to better the status and “image” of the area, or to increase feelings of “belonging” in the area (Barstad 2008).

Predominantly, there are three groups of factors motivating the use of ABIs. Firstly, some social problems tend to be geographically concentrated. Socio-economic problems grow more intensely in certain areas than in others due to differential population growth and urbanization. Moreover, many argue that traditional political tools have not been able to deal with spatially concentrated inequality effectively and adequately. The spatially focused nature of ABIs enables policy makers to target vulnerable populations in need of attention, arguably in a more cost-efficient way than may be possible through universal welfare policies. Additionally, ABIs allow for so called "integrated policies", where instruments usually applied in separate national, or city policy spheres can be applied concurrently in a place-specific concentrated manner. The combination of public- and private-sector agents in the area being invited to participate, is intended to help to facilitate the intended transformation process through activating the resources and agents within the area. A common criticism of the geographical focus of ABIs is that they contribute to the further neglect of deprived populations outside of ABI-areas (Andersson and Musterd 2005, 378).

The second motivating factor pertains to the political issues posed to politicians surrounding immigrants. Spatial concentrations of relative deprivation and/or immigrant communities makes poverty visible and regularly leads to questions around general integration policy. Accordingly, ABIs often include a goal that populations with immigrant backgrounds broadly follow the same development patterns in living quality indicators as the rest of society. This dynamic is especially prevalent in social democratic welfare regimes, particularly in Sweden. Many Swedish ABIs have explicit goals of curtailing the increasing segregation between majority and immigrant citizens (Andersson & Musterd 2005, 378; Husbanken 2017, 13). This aspect is not explicitly highlighted as a central goal in the *Tøyenløftet* implementations or mission statements, even though 49% of *Tøyen* residents have immigrant backgrounds.

The third motivator underlying implementation of ABIs is notions from social mix theory and the related neighborhood effects theory. In essence, the neighborhood effects theory posits that the composition and characteristics of a population in a neighborhood affect life chances and decision making for its residents (Andersson & Musterd, 2005; Durlauf 2004). A related theory prevalent in the formation of ABIs is the social mix theory. While there are different strands of neighborhood effects and social mix research, its core tenets are fundamental to the logic underlying ABIs. A full discussion of this field is outside the scope of this thesis, but it merits a summary of its main arguments.

Social mix theory argues, in the context of adolescent social mix, that the internal social relations of an age cohort have effects on conditions for learning and socialization. It assumes a connection between concentrations of like-minded youths and the strength of the "normative climate". This normative climate may inhabit positive or negative characteristics and is thought to contribute to enhancing or mitigating poverty. Within this theoretical framework, role models play an important role in providing individuals with inspiration to open the borders of imagination outside of what the given normative climate may provide as aspirations (Brattbakk and Wessel 2013, 394). Related is the importance placed on social networks. While this helps to understand the theoretical underpinnings of many ABIs, *Tøyenløftet* in particular. A weakness of the synthetic control models of this thesis is that it will not be able to investigate these issues at this level of detail.

Andersson & Muster (2005) argue the growth of policy programs such as ABIs are linked to changing power structures within cities. Giving voice to lower levels of governance is deemed appropriate due to their place-specific knowledge and for its inherent democratic value. The clearly defined scale of ABIs make them manageable projects for smaller entities of local government. Many actors are involved in ABIs. Politicians, policymakers, professional practitioners, housing associations and neighborhood organizations all play their part. A frequently cited upside to this form of policy is its ability to accommodate citizen input, further enhancing the place-specific competency of such projects. The reality of the degree of implementation of this aspect is however disputed by some researchers (Andersen and Skrede 2021).

There are many perspectives and arguments regarding whether ABIs are an effective method to transform area-concentrated negative trends into long-lasting positive outcomes. In the following paragraphs I present some common arguments for and against the policy platform. The arguments in favor of ABIs pertain predominantly to the perceived lack of ability of mainstream policies to handle these issues on their own, arguing that ABIs can help fill the gaps of this disparity. For one, geographically concentrated disproportionate deprivation puts a lot of pressure on the broader policies, ultimately making them less effective in achieving their goals. Secondly, when issues overlap in a concentrated area, these issues may be intensified by each other. For example, if an area has issues with drug crime and worklessness at the same time, both may be exacerbated by the presence of the other. The third argument aims at problems of increasing stratification. In cities or regions with growing social and economic polarization, extra action may be needed to help the areas lagging behind. Fourthly, when poverty is concentrated, an area-focused distribution of resources can have a positive impact for more deprived people than if they are spread in a universalist manner. The fifth argument posits that contrary to national policy, ABIs can be characterized by a 'bottom-up' approach. Which may contribute to more accurate problem identifications and solutions. Additionally, such programs may raise the collective morale and confidence of the area and widen the avenues of participation in the neighborhood. Lastly, ABIs may serve as pilot projects, potentially providing knowledge and insight to inform policy implementation at the national policy level (Smith 1999, 4-5).

While the pro-arguments emphasize the lacking efficacy mainstream policies have had on tackling the issues of geographically concentrated relative deprivation, the arguments levied against the use of ABIs question the efficacy of the model overall as well as its political feasibility. Some of the arguments can be summed up in a sentence, while others merit a more thorough attention. Firstly, it is argued that the majority of deprived people do not reside within areas of concentrated deprivation, but rather live more spread out than what is assumed by the ABI platform. Accordingly, the argument holds that individuals should be targeted rather than areas. Related to the first, the second argument states that delimiting interventions to specific areas is unfair to those with similar levels of deprivation living in more affluent neighborhoods. The third argument is closely linked to the empirical research question of this thesis, stating that ABIs may lead to the disadvantaged people they are meant to help being displaced. Thereby not solving anything, but rather moving "the problem" to another area. Statistically, the ABI-treated area may show improvements on key outcome indicators, which could be caused by more affluent residents taking the place that was once inhabited by the intended recipients of the ABI.

Furthermore, the fourth argument is a methodological critique of the decision basis of ABIs. This concern claims that the lower-level data on deprivation and surrounding indicators is not of adequate quality to substantiate decisions of where to implement area-based interventions. Lastly, a recurring argument against ABIs in the literature posits that the (re)production and geographical concentration of deprivation are generated at the national level and should consequently have national solutions. An illustrative image of this is that ABIs are "swimming against the tide" (Barstad 2008). Moreover, putting part of the responsibility of solving the issues of geographically concentrated deprivation on ABIs, it is argued, depreciates the role of national mainstream politics in curtailing these issues (Smith 1999, 5).

Due to this argument's prevalence, it merits further discussion. Paired with the area-focus of ABIs arguably misdiagnosing the level of policy at which inequality can or should be tackled, they frequently focus their efforts on individuals (Grander et al. 2022). While on its own terms, improving circumstances for individuals is a good thing, this focus may suggest that the individual is at least partially responsible for their disadvantaged position, potentially blurring the responsibilities around inequality. Additionally, as it is inevitable that not all residents of areas in focus can be reached in this manner, some residents will receive disproportionate benefit from ABIs. Similarly, the underlying assumptions of neighborhood effects puts part of the blame for an area's deprivation on the attributes of the neighborhood. Once again diminishing the role higher level structures plays in producing inequality (Muscat 2010).

The evidence for the effectiveness of these policy measures is varied. As previously discussed, the term area-based initiative bears with it no political prescriptions outside of the area focus. Meaning it is difficult to formalize a uniform research method to evaluate such programs. At the same time, the implementation of ABIs take place in parallel with a wide range of political and social developments, oftentimes of a much larger scale (Barstad et al. 2006, 21). Another complicating factor is that ABIs are usually implemented over rather long periods of time, while their effects may not manifest until after the period of implementation. All this points to the fact that the consequences of ABIs are difficult to measure, particularly when trying to establish causal connections. That being said, such evaluations are not impossible, and many evaluations have been produced in relation to ABI projects. In the following paragraphs I will present some of the empirical evidence that can be distilled from the literature about ABIs.

As mentioned, area-based initiatives take many forms. In the following section, I will present some empirical findings from different implementations of area-based initiatives. Denmark has implemented many area-based initiatives over the years. To broaden the evidence basis for the policy platform, Copenhagen Municipality and The Danish Association of Architects (2014) conducted a meta study of ABIs based on 27 effect studies from nine countries across the world. They distinguish between non-structural and structural ABIs. While the former encompasses ABIs with a focus on simpler upgrades of the already existing physical environment, the latter focuses on structural (in architectural terms) ABIs, which involve measures reconstructing the physical and spatial logic of the city district. As *Tøyenløftet* concerns itself mainly with small-scale upgrades, it falls within the former of these two categories. Their findings can be summarized in five points.

Firstly, they find that physical interventions in combination with social efforts promote beneficial social attributes, both for individuals and the area. Secondly, the study upholds that in order to see significant social effects, the ABI needs to include structural measures, such as redistribution of public, private and semi-private spaces. Thirdly, non-structural area-based interventions in combination with social efforts improves life quality, safety, and contentment of residents, yet fails to change the degree of social hazard in the area. Fourthly, the authors emphasize that structurally and socially directed ABIs come with positive effects to employment, education and wage levels, crime, levels of welfare benefits in the area, safety, trust, community engagement and satisfaction with living in the area. In addition, the study identifies that specifically original residents of the area are lifted in terms of wages, safety, trust, pride, and life quality. Lastly, the study discusses a correlation that in some cases is speculated during the formation of ABIs, namely between "proportion of minority background residents" and "poor living conditions". In such cases, there may be a stated goal to lower the proportion of residents with a minority background, expecting it to be positively correlated with living condition issues. On the contrary, the results speak against this thought process, pointing out that several ABIs achieved social change in disadvantaged areas without changing the proportion of minority background residents.

### 3.3 Residential mobility

Making residential moves is for many a core element of developing one's life course. It often happens in concurrence with other life events, like moving to academic opportunities, finding new work, or starting a family, and is as such potentially interwoven with some of life's biggest personal events. Despite the integral part residential moves and housing play in many of our lives, the opportunities to find adequate dwellings is not equally distributed across housing submarkets (Turner and Wessel, 2019). This section will explore the state of the academic field of residential mobility. Consequently, relevant terms and concepts will be extracted to construct a foundation for further discussion in later chapters. Since Rosi's 1955 study noting the links between residential mobility and the housing market they take place in, many scholars have started to include insights from housing policy and housing market research in studies on residential mobility. The close tie between housing policy, housing market and residential mobility therefore merits a subsection to investigate housing policy and housing market dynamics. Therefore, the second part of this subsection will investigate different aspects of housing markets and policies, and their potential impacts on residential mobility.

Residential mobility is an interdisciplinary research field studied from several academic angles. While sociologists may emphasize individual or household characteristics that predict or explain moving, geographers commonly focus on spatial characteristics and distribution in an area (Dieleman 2001, 249). The economic approach often explains residential mobility in terms of rational choice theory. Here moving is framed within a "push and pull" framework, where the former concerns influences on the decision to move *from* an apartment or area, while the latter concerns characteristics that influence *where* movers decide to move (Barlindhaug et al 2018, 39). Area-based initiatives can arguably be a significant pull-factor, showing that political action is being taken in the area in question. Lastly, psychological perspectives may highlight statistically discernible behavioral patterns behind choices, preferences and satisfaction underlying moving patterns (Brown 1983, 1532; Dieleman 2001, 255). Yet, as with many interdisciplinary fields in the social sciences, none of the fields are confined exclusively to their respective overarching fields, and there is significant overlap in both thematic focus and methodological approaches. Accordingly, this section will draw insights from the residential mobility literature based on thematic relevance rather than their academic origins.

Residential mobility research took its modern form as a field of study with the addition of Rossi's (1955) "Why families move: a study in the social psychology of urban residential mobility", a pioneering study that looked at the role residential mobility plays in the US from the perspective of a family's life cycle. He understands residential mobility as "the mechanism which adjusts housing to housing needs" (180). Rossi emphasizes that housing needs take different forms, the most important being dwelling size. Early years of family formation are characterized by rapid growth of family size and consequently influence housing size needs in an urgent manner. After the initial burst of growth, the size aspect of housing needs tends to stabilize. At the other end of the life cycle, however, when children have moved out and dwelling size needs are lower, there is not as much urgency to move from a large dwelling to a smaller one. Rossi notes other needs that influence mobility and decisions of where to establish a household such as considerations of the social and schooling opportunities for children, and type of tenure (178-179). Rossi made an observation that is omnipotent in today's research on residential mobility: That it cannot be studied without taking into account the characteristics and conditions of the housing market that they take place in.

Brown and Moore's (1970) "Mobility as a two stage process" argue that the stages of residential relocation are first triggered when people become dissatisfied with their present housing situation, due to changes in household environment or its composition. Stress arises and eventually leads the household to stage two: the search for a vacancy in the housing stock and the decision either to relocate or to stay in the present dwelling. If the housing market cannot satisfy the needs, relative to the mover's capacities, a process of either adjusting their needs or restructuring the present dwelling to better accommodate their needs is undertaken.

The dynamics of residential mobility on the individual and household scale take place on a minimum of three geographical levels (Dieleman 2001, 252). Firstly, at the international level, the differences in national housing policy, domestic wealth compositions and tenure structure will have significant effects on the frames wherein residential mobility occurs. These aspects can be very different across borders and are closely tied to how the welfare state conceptualizes the state's responsibilities regarding housing. Secondly, on the national level, domestic economic and demographic fluctuations will influence household and individual level residential mobility. Things such as inflation and mortgage interest rates have notable effects on housing markets and people's economic ability to move. And within-country differences in demographic growth will lead to higher magnitudes of pressure on some housing markets than others. Finally, at the metropolitan level, characteristics of the local housing stock and housing market like tenure composition, turnover rates and price levels influence the opportunities for persons and households to move to a desired dwelling. For instance, rental households have a higher turnover rate than owner-occupiers, constituting an average of 75% of all turnovers. Therefore, if the housing stock of a metropolitan area is mainly composed of rental dwellings, the turnover rates of that area will be higher. Furthermore, research of the US context shows that higher turnover rates do not simply come from having a larger proportion of renters. Cities with high turnover rates have higher rates both within and between rental and owner sectors. This shows that turnovers vary between locations, not only between submarkets.

With these geographical scales in mind, Dieleman (2001) highlights three processes at the household level that have received notable focus in the residential mobility field. The first investigates the observable relation between job changes and housing changes. Moves of this nature often happen in parallel with other life events. Acquiring work located far from one's current dwelling, without opportunities for commuting, often makes relocation a necessity. Yet, a change in jobs within the same relative location also affects residential behavior, with households undergoing job changes having a 2.4 times higher probability of relocating compared to households staying in the same jobs (Dieleman 2001, 253). However, there are some demographic nuances to these numbers. For one, owner-occupiers have a lower likelihood of changing dwellings when changing jobs than renters do. Moreover, younger people relocate more often than older households. In addition, single-earner households are less bound to their neighborhoods, making them more likely to accept job offers that require residential moves than dual-earner households.

The second area of research highlighted concerns the negotiation involved in making residential relocations. Oftentimes, multiple parties are involved in determining dwelling preferences for a household, and the resulting negotiation typically has two aspects. On the one hand there are the attributes of the dwelling (e.g. tenure, number of rooms and associated costs). On the other hand, aspects such as location, neighborhood and convenience of traveling to and from work, schools and other services are also central considerations when formulating preferences.

The third household level research direction focuses on the processes that occur when households navigate the housing market. Households employ different strategies when attempting to balance preferences and needs with the imposition of so-called “constrained residential choices” – the mismatch between preferences and what dwellings are actually available on the market. Other research has shown that “stated” housing preferences and resulting “revealed” housing choices rarely match (Dieleman 2001, 250), illustrating that housing markets regularly institute these constraints on households in relocation processes. However, despite not meeting their preferences, survey research has shown that people moving to less-preferred housing are more satisfied than their original preferences implied they would be when asked 6 to 12 months later. Some studies have investigated how the motivations underlying a move shape the attitudes and strategies when acquiring new dwellings. Some evidence suggests that the urgency of the move is a dimension with potential large impacts. In cases where the move is motivated by preferences and not urgent need, relocation can be put off when the market cannot satisfy those preferences at a given time. In urgent cases, households are more willing to adjust some of their preferences, potentially accepting smaller size dwellings or paying a higher price.

Turner and Wessel (2019) illustrate how local housing markets can provide vastly different outcomes and conditions in their constituent submarkets. Investigating dynamics of residential mobility within the Oslo housing market, they show how the Norwegian housing market structure can be detrimental to the most disadvantaged populations and newcomers to the city. Individuals who are economically disadvantaged, both in sense of income and assets, are largely forced to compete for dwellings on a dysfunctional rental market.

### 3.3.1 Mobility patterns for subpopulations in Oslo

A large share of the population growth in the big city municipalities in Norway consists of young people moving, motivated by education and job opportunities. However, this groups is also relatively bound to the place they grow up, despite living in other places in certain phases. In a 2009 survey, six out of ten people between 15-29 years answered that, if they were to move, they would relocate within 10 km from where they were resided (Ruud 2009, 12). One interpretation of this is that they are more bound to the area of residence than to the dwelling. However, the trend in recent years is that young people reside longer in big cities. This is partly due to longer educational careers, longer time spent acquiring jobs, and that family establishment comes later than previously (Ruud 2009, 5). While young people aim to become owner-occupiers, they take longer to get there, for similar reasons. In general, the first transition from renting to owner-occupation happens in tandem with establishing long-term relationships. The many implementations of *Tøyenløftet* aimed at children, and families with children, potentially makes *Tøyen* a more likely candidate when individuals in this group eventually settle down.

The group "families with children" is a somewhat coveted residential group, which can be seen in the implementations of *Tøyenløftet*. For many years, a trend has been observed where families with children leave the inner city in Oslo to live in the suburbs outside the city. Having family households in the inner city with the will and resources to invest in their local communities, is a key assumption of the neighborhood effects theory. Oslo municipality has a stated goal of making the inner city an attractive place for families with children to live too (Andersen and Skrede 2022, 4). This is also a clear priority of *Tøyenløftet*. The question is then, what are the preferences and motivations underlying the residential mobility patterns of this group?

As already discussed by Rossi (1955), Barlindhaug et al. (2018) confirms that the largest motivating factor for movers in the category "families with children" in Oslo, is indeed dwelling size. The report seeks to substantiate the statistical trends of families with children leaving the inner city for outer city suburbs or neighboring municipalities. By comparing families who choose to stay in inner city Oslo with the ones who move, they find that the ones who choose to stay most often already have dwellings of a suitable size for families, while the ones who move largely do not. If their current inner-city dwelling is not of sufficient size, this often leads to families moving outside of the inner city. Outer city districts tend to have more sizable single-family homes, and prices fall the further from the city center they are. As mentioned, families with children living centrally in Oslo tend to make the move to their more permanent family home right before their children are in school age (Barlindhaug et al. 2018, 44). This pattern has been noted in *Tøyen* as well. The group called "*Tøyen* 5-year club" was created to facilitate a more involved social environment for children in their pre-school years[3]. A goal of this organization is for families with children to want to raise their children in *Tøyen*.

Up to this point, our primary focus has been on the residential dynamics of age groups in their first few phases of adult life. While *Tøyen* is a sub-district with quite a young age profile, there are elderly residents in the area as well. Therefore, we will now turn to research of residential dynamics in the later portions of life. Sørvoll et al. (2020) find that during the last 20 years this age group has begun moving more frequently. Survey data shows that these moves are usually from single family homes to smaller apartments in block tenements. It also

[3] Organization website: https://www.toyeninitiativet.no/artikkel/toyen-5-arsklubb

shows that when moves are made after the age of 60, characteristics pertaining to availability and age appropriateness are prioritized more, compared to moves made by people in their 50's (Sørvoll et al. 2020, 7).

Generally, these findings show that this age group increasingly tackles residential moves in a strategic manner. As mentioned previously, Rossi pointed out the dynamic of people in later stages of life not being in a rush to make moves from larger dwellings to smaller dwellings when children move out and less space is needed. These findings seem to indicate that this dynamic is becoming less prevalent in Norway. However, this group is by no means homogenous, and the authors highlight both individual and societal characteristics that work as barriers or drivers of relocation among the older population. While many of the respondents between 60 and 75 years do not report experiencing economic barriers to moving, there is a significant portion that report not wanting to move for economic reasons. At the societal level, a takeaway is that the local housing market plays a big role in deciding whether to relocate (Sørvoll et al. 2020, 8). The older populations in rural areas have a less forgiving housing market, with fewer suitable dwellings available and a price difference that makes moving from rural to urban areas difficult.

Another group with discernible residential mobility patterns is immigrants. As of 2014, 49 percent of the *Tøyen* population had an immigrant background. Therefore, any discernible patterns that can be established for this group, will have benefits for the analysis of the empirical outcomes to come. About 15 percent of the total population of Norway has an immigrant background, and as a group they make 20 percent of all residential moves. However, immigrants as a group are not homogenous. One distinction that can be made is the mode of immigration. Some come to the country as refugees, some as labor migrants and some as educational migrants. Age can also be a relevant distinction, as the historical development of immigration to Norway has had several phases, and integration measures have varied across the years. As of 2021, the age cohort 40 and above is the largest group by age (Tønnesen 2022, 23), followed sequentially by the age cohorts 30-39, 19-29 and so on. Mobility rates by age show that children and youth under 20, and those between 30-39 relocate more frequently than the majority population. For young adults, relocation frequency is lower for immigrants than the majority population. Overall, however, immigrant mobility rates are higher than for the rest of the population. Moreover, about half of immigrants live in their initial municipality of residence five years after arrival.

The first municipality of residence for refugees is done by top-down decision, and the municipalities themselves decide how many refugees they will receive. The centrality of the municipalities has varied greatly over time, however. The years 2006 to 2016 saw a sharp increase in labor immigration and eventually in refugee immigration, and settlement was largely spread outside cities. From 2017 to 2019, refugee settlement practices have increasingly favored more central areas. Tønnesen and Andersen (2019) find that there are some systematic differences within the settlement practice. One example of this to highlight is that refugees with higher levels of education are more frequently settled in highly populated municipalities with higher educational and income levels.

Tenure is an aspect of housing that immigrants typically diverge from the majority population on. While 14 percent of the majority population on average rent their dwellings, immigrants from EU/EEA etc.[4] rent at a rate of 39,1 percent in 2020. For the immigrant population from Asia, Africa etc.[5], the proportion of renters is 42,9 percent in 2020 (Statistics Norway, 2020). The correlation between rental tenure and higher turnover rates may then explain why immigrants as a group make up a disproportionate amount of all residential relocations.

Overall, immigrants live more centrally than the majority population, and Norwegians with immigrant parents live even more centrally. However, this difference has decreased over the recent decades, due to the overall population living more centrally than before, and that immigrants increasingly settle outside the most central areas. Furthermore, educational immigrants settle most centrally out of all the three aforementioned groups (Tønnesen 2022, 38). Immigrants also rent dwellings at a much higher rate than the majority population. As we will discuss in the coming section, renting in a country of owner-occupants has various consequences that can affect both well-being and living standards.

The residential mobility patterns for different population groups described in this section will be important to supplement the analysis of the outcome variable of this thesis, long-term residents. The data material used to conduct the analysis is not able to describe group-specific

[4] EU/EFTA-countries, UK, USA, Canada, Australia and New Zealand. Categorized by Statistics Norway.
[5] Asia, Africa, Europe outside EU/EFTA and UK, America outside US and Canada, Oceania outside Australia and New Zealand. Categorized by Statistics Norway.

dynamics. Furthermore, as noted by Rossi in 1955, residential mobility cannot be decoupled from the housing market they take place in. The next section will therefore devote some attention to describing the Norwegian housing market.

### 3.3.2 Housing - policy, market and welfare

Housing plays a central role within the Norwegian economy. The Norwegian housing market has some of the highest rates of owner-occupancy in the world, with roughly 80% owning their dwellings in 2011 (Bengtsson et al. 2016), a proportion that has remained stable for some time. The cause of this priority has historical roots. Since the post-war period, the state has preferred for its citizens to be owner-occupiers and have accordingly formed housing policy to this end. In response to poor housing conditions, a long-standing cooperation between municipalities and housing associations formed during this time. Municipalities prepared plots for construction and sold them at a low cost to housing cooperatives and self-builders. Meanwhile, the Norwegian State Housing Bank provided loans with generous terms to fund housing cooperatives' construction projects, leading to roughly two thirds of all construction being funded by the state bank (Stamsø 2008, 207). Additionally, there was significant price regulation in both cooperative and rental sectors. However, during the 1980's and 90's, the cooperative nature of the housing market was transformed, and over time increasingly marketized. Regulations on cooperative structures were stripped, and apartments could be separated and sold as a single unit outside of the cooperative. The housing bank's dominant role in the housing economy was pulled back, and private banks took its place. The argument for this change was that housing needs were increasingly able to be met in the market (Sørvoll 2011, 115-116).

The support for the owner-occupation model has over the years had broad support by Norwegian politicians across the political spectrum. For the social democrats, owner-occupation meant freedom from the oppressive grip of landlords and the associated poor housing conditions. For the conservative side of politics, owner-occupation fostered a responsible citizenry (Sørvoll 2011, 198). Some researchers have noted the potential role of this turn to market-based housing policies in producing social division, also within countries with social democratic values and redistribution ingrained in their welfare policies and institutions (Turner and Wessel 2019, 484).

In the housing literature, housing is often labeled “the fourth, wobbly pillar of the welfare state”, owing to its position between market and welfare (Torgersen 1987). The other three areas of welfare state responsibility are health care, pensions and schooling. In the Nordic countries, these are predominantly decommodified. Housing however, functions in large part as a commodity, traded relatively freely on the market. Housing in modern capitalist economies has many attributes that make it unique compared to other commodities and welfare provisions. Depending on the housing regime, it can be characterized as a consumption good, an investment vehicle, or a social right (Schwartz and Seabrooke 2009, 7). Due to their place-bound nature, dwellings cannot be easily moved. Meanwhile, housing is a very important arena of people’s lives. Making residential relocations is a significant endeavor, and dwellings have social, cultural and emotional “attachment costs” associated with them, contributing to making the housing market rather stable (Bengtsson and Ruonavaara 2010, 193).

In a 2013 white paper (Ministry of Local Government and Regional Development 2013, 20), it is stated that Norwegian housing is in reality both an investment object and a welfare good. While the former is not elaborated on, they argue that the latter is provided by individually targeted efforts by municipalities, thereby referring to social housing, and indirectly by The Norwegian Housing bank, referring to their mandate to provide various economic support such as starting loans to those who are not able to acquire loans from private banks. Over the years, both housing institutions have been increasingly residualized, and their roles marginalized. The previous function of providing universal housing loans has since the 1980s been replaced by an approach of targeted, means-tested loans, only available to the most disadvantaged citizens (Stamsø 2008, 211). This constituted a shift from object subsidies to subject subsidies. In the period from 1994-2020, the population of Oslo grew by over 200,000. In the same period, the proportion of social housing stock available to vulnerable residents stayed the same. In 2001, Oslo Municipality had 12,300 social housing units at their disposal. In 2020, it had only increased to 12,962. It is important to note that Norwegian social housing follows a principle of market based pricing and selective financial support for housing costs (Sørvoll 2020). The implication made by this framing of the Norwegian housing market, is that for anyone not encompassed by these residualized structures, housing is an investment object to be obtained on the free market.

The Norwegian state's regulatory preference for owner-occupation has left the rental market in a precarious state. Regulation is scarce, and the public housing sector is characterized by increasing residualization. Kemeny (2006) labels the Norwegian rental market "dualist". Social housing is separated from the broader rental market, rather than competing against and providing an alternative to the for-profit market. Sweden, as a contrast, has an "integrated" market, where social housing aims to provide for all the housing needs citizens may have. Within this system, it is critical that a sufficient proportion of the rental housing stock is social housing in order to set norms and terms that the open rental market must abide by (Kemeny 2006, 2).

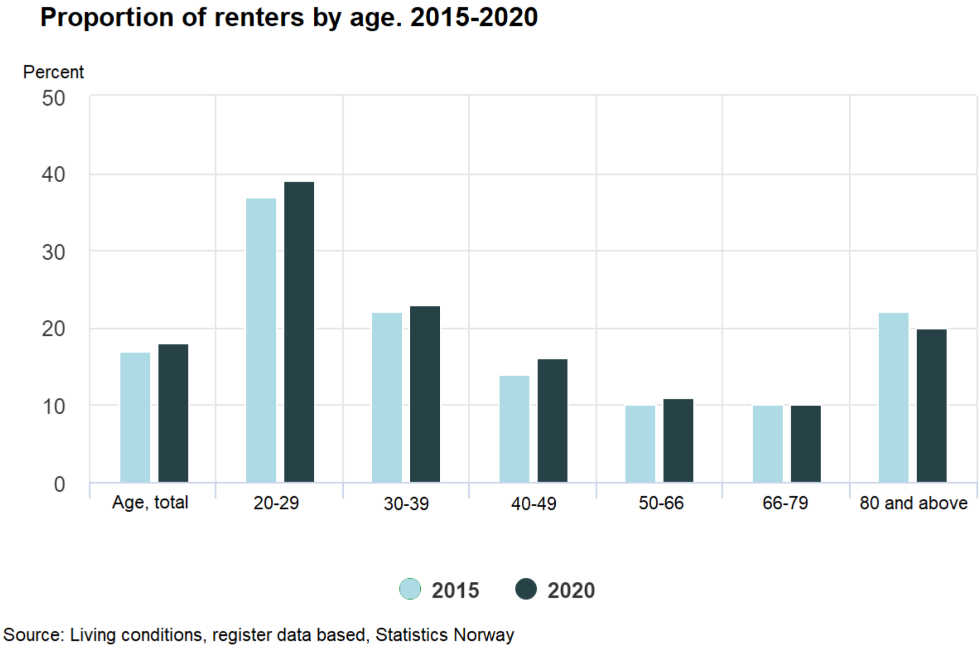


**Figure 2.** Proportion of renters by age group, Norway 2015 and 2020.

Figure 2.1 demonstrates the proportion of renters by age group for all of Norway. This proportion has increased overall from 2015 to 2020 by a margin of roughly 1 percent. This increase is largest among populations between 20-29 and 40-49. It can be argued that as long as people have decent dwellings to live in, their tenure form doesn't matter. However, cultural "insider" and "outsider" dynamics apply to the Norwegian housing context, relating to whether one is a homeowner or renter. Vassenden (2014) analyzes this within the framework of symbolic boundaries. Through interviewing renters of different disadvantaged groups and tenure forms, his research establishes that people who rent beyond their young, establishing years, tend to feel left out of the culturally constructed "worthy" life (Vassenden

2014, 766). For the interviewees, homeownership implies safety, predictability, freedom and belonging. It provides them with a stable core to build a home and a life for them and their family, without the looming possibility of being thrown into a hunt for a new dwelling at the whims of a landlord.

One of the interviewees, Dawad, a refugee and single father of five, underscores the central role he believes homeownership plays in Norway, saying: “You are not in Norway until you own your home” (Vassenden 2014, 775). This experience can be interpreted as homeownership being a symbolic boundary of full integration into the Norwegian society. Another interviewee, Lene, highlights the difficulty of being a renter in a largely owner-occupier neighborhood. She says that her neighbors call her house “the slum”, and elaborates by saying that “the guy who owns it, he hasn’t maintained the garden”, adding that “if this was my place, then I would have spent money on it, to make it look okay” (Vassenden 2014, 773). Without the certainty of a long-time contract, by spending her own money on a rental dwelling, Lene would essentially be investing in her landlord’s dwelling instead of investing in a lasting home for herself. Most of the renters in Norway are between 18-29. The “outsider” dynamics may most strongly apply to those in the age groups where it is “expected” of you to own a home.

Like most of the inner-city sub-districts in Oslo, *Tøyen* has a rather large proportion of rental dwellings. The area housing stock has a history of poor quality, and the local rental market is marked by a large share of owners not taking adequate responsibility for their dwellings and their residents (Oslo Municipality 2018, 19). Bø (2022) shows that about 20 percent of dwellings on the owner-occupant market in Oslo are bought as investment vehicles with the intention to rent them out. Furthermore, he shows a positive correlation between the proportion of buy-to-let share and increasing housing prices. Additionally, dynamics within housing markets with large turnover rates combined with a scarcity of available rental housing, causes an increase in these sorts of buy-to-let investment strategies This again causes additional demand in the housing market, driving up prices, both in the buyer’s market and rental market. It is then reasonable to assume that a portion of the disproportionate growth rates seen in *Tøyen* from 2004 to 2014 was made up of a significant portion of buy-to-let investors.

Discussing the somewhat depreciated position rental housing holds in the Norwegian housing market is important because of the housing market's potential for enhancing social inequality. The strong growth rates of housing prices have led to 70% of first-time buyers being assisted by "the bank of mom and dad" (Tranøy et al. 2020, 392), revealing that the perks of homeownership are mostly available to those with a resourceful family background. Thus, the housing market has a marked potential to be a producer of inequality. Together with the other Nordic countries, Norway has some of the highest debt-to-income ratios worldwide, predominantly tied to housing. While the housing market is largely unregulated, portions of the rents on debt payment are tax deductible, further enhancing the position of those already within the owner-occupier market. Additionally, the high debts are in part supported by welfare provisions in other sectors, such as income protections, that enable banks to lend money partly without risk of the loan-taker suddenly losing their income.

# 4.0 Methods and methodology

Both theme and methodology of this thesis are partly motivated by a development in the academic policy evaluation literature that goes under the umbrella term "evidence-based policy making". Using and developing effective, reproducible policy evaluation tools provides those engaging in political discourse and policy formulation with a more solid academic foundation about the causal mechanisms behind the policies in question. Gertler et al. (2016, 3) note that policy makers and program managers traditionally evaluate programs based on budgetary inputs and short-term outputs. The goal of evidence-based policy making is to redirect the focus of evaluation to whether programs and policies meet their stated goals on relevant outcomes. For the purposes of this thesis, I am interested in performing an *impact evaluation*, that is, the directly attributable impacts of, in our case, an area-based policy program (Gertler et al. 2016, 8). Evaluating impacts in the context of ABIs, is however a difficult task. As they are implemented at the same time as general welfare policies, most often of a much larger scale, proving causal connections is easier said than done. ABIs attempt to improve outcomes on many dimensions. This project is interested in the estimated impact that this policy program has had on moving patterns, specifically whether they have caused long-term residents to move out of the area. With the use of the synthetic control method, this is achieved by estimating the so-called "counterfactual", i.e. what would have taken place in the treatment area had the treatment not occurred, which is compared to the treated unit outcomes.

In section 4.1 the variables will be presented, as well as a discussion of which variables are to be included in the methods described later. The synthetic control method has strict data requirements and considerations to be made, so the chosen variables and donor pool units must be done with great care. As part of precluding potential selection bias from the units included in the resulting synthetic model, we first employ a “Propensity Score Matching” (PSM) to balance variables and select the most suitable comparison units. After discussing this step and presenting a balance table of the resulting donor pool units, section 4.3 will be dedicated to discussing the formal components of a synthetic control method and a step-by-step implementation scheme for the method.

### 4.1 Dataset and data wrangling

In this section I will discuss the available variables in the data set and elaborate on the reasoning behind which variables are to be included in the coming propensity score matching method, and followingly the synthetic control method.

The units are grouped by their respective constituent city sub-districts, as they are delineated in the national administrative data. It should be noted that Oslo municipality has a database with large quantities of statistics, where they group city sub-districts in smaller units, arguably in a way more representative of the de facto experienced neighborhoods in the city. For the project design of this thesis, however, the administrative grouping will suffice. As we covered earlier, *Tøyenløftet* was delimited to an area consisting of 11 basic statistical units, totaling an area and population of comparable size to the city sub-district groupings as delineated by *Statistics Norway*. The original data set spanned the years 2000-2020. However, as will be discussed in more detail later, this project uses data from 2008-2020.

| | Mean | Median | Std. deviaton | Min | Max |
|---|---|---|---|---|---|
| Median | 332,034 | 332,047 | 53,701 | 182,471 | 455,650 |

| | | | | | |
|---|---|---|---|---|---|
| income, total | | | | | |
| Median income, 18-30 | 263,479 | 272,661 | 66,460 | 114,376 | 448,419 |
| Median income, 18-67 | 411,378 | 403,107 | 56,212 | 294,826 | 585,174 |

**Table 2.** Median incomes, total and by age group. Measured in Norwegian Kroner (NOK). 2008-2020.

Three different variables indicating the median income within the sub-districts. The first shows us the total median income, the second for the working age population between 18 and 67, and the third shows us the values for young adults between 18 and 30. As all groups have overlapping constituent individuals, it is most feasible to apply only one of them as a predictor variable. For the purposes of the coming analysis, I have decided that the variable describing the whole population will serve the purposes of this project the best. Considering that many of the *Tøyenløftet* measures has an explicit focus on children, teenagers, and families with children, using variables that include as many of these groups as possible is the most appropriate. Therefore, median income (total) is part of both the propensity score matching step and synthetic control method in subsequent chapters.

It should also be noted that the only missing values from the original data set is in the income variables for the year 2020. Wherever these values are present, the year 2020 is omitted from the data. This is not a loss in terms of the synthetic control method, however, as it only uses the pretreatment data to estimate the posttreatment period outcomes.

| | Mean | Median | Std. deviation | Min | Max |
|---|---|---|---|---|---|
| Median age | 35 | 34 | 3.1 | 30 | 43 |
| Population, total | 12,963 | 11,051 | 7,614 | 1,710 | 32,344 |
| Population, 18-30 | 2,799 | 2,832 | 1,116 | 394 | 5.571 |

| | | | | | |
|---|---|---|---|---|---|
| Population, 18-67 | 9,308 | 8,270 | 4,714 | 1,353 | 21,603 |
| Proportion men | 49.9% | 49.7% | 1.9% | 44.6% | 58.7% |
| Proportion men, 18-30 | 47.4% | 47.5% | 2.4% | 39.5% | 53.7% |
| Proportion men, 18-67 | 50.7% | 50.3% | 1.9% | 45.3% | 59.4% |

**Table 3.** Demographic indicators Median age, population by age group, prop. men by age group. 2008-2020.

Like with the income variables, the population and proportion of men variables are grouped into three age groups. While these may be interesting for descriptive analysis or cohort analysis, they overlap a great deal and should therefore not be included in the same model. Meanwhile, the demographic variables will be important in the coming synthetic control, as they give a supplementary substantive description of populations that make up the units in the data set. The same arguments regarding which age cohort variable to choose, as made in the previous paragraph on the median income variables, also apply here. Therefore, median age, total population, and total proportion of men will be included in the propensity score and synthetic control methods.

| | 2008 | 2014 | 2020 | Mean, 2008-2020 |
|---|---|---|---|---|
| Population *Tøyen* | 12136 (100%) | 13610 (100%) | 14239 (100%) | 13568 (100%) |
| Population *Tøyen*, 18-67 | 9167 (75.5) | 10615 (78%) | 11176 (78,4%) | 10527 (77.5%) |
| Population *Tøyen* 18-30 | 3096 (25.6%) | 3563 (26.2%) | 3399 (23.9%) | 3480 (25.6%) |

**Table 4.** Additional population-data for *Tøyen*. Mean, 2008, 2014 and 2020. Percentage of total in parenthesis.

The three age groups provide an opportunity to describe the size of the two age groups in *Tøyen*, and their development over the period of study. Table 4.4 presents some values and their constituent percentage of the total population of that year, as well as mean values for the whole period.

| | Mean | Median | Std. deviation | Min | Max |
|---|---|---|---|---|---|
| Education, high | 51.28% | 54.23% | 7% | 20.14% | 69.73% |
| Education, low | 21.85% | 20.22% | 11.55% | 10.52% | 41.06% |

**Table 5.** Educational variables. High and low education levels. 2008-2020.

The educational variables are based on *Statistics Norway*'s standard for educational groups, which group levels of education by length from 1 to 9. Our variables include the three lowest groups and the three highest groups. That means our "low education" variable includes those with no formal education to those with middle school as their highest finished education. The "high education" contains the population with lower-level university and college degrees up to higher level university educations. While these do not necessarily correlate, including them both in the coming analysis will put a disproportionate emphasis on the educational aspects of the units in the donor pool when estimating outcomes for the counterfactual *Tøyen*. As we covered earlier, *Tøyen* has a somewhat polarized population on educational attainment. The choice between the two then comes down to two things: Their perceived predictive ability on the outcome of interest, long-term residency, and their importance in describing the characteristics of *Tøyen*. I have chosen to include the variable describing the proportion of highly educated people in the area.

| | Mean | Median | Std. deviation | Min | Max |
|---|---|---|---|---|---|
| Violence and abuse | 0.21% | 0.2% | 0.1% | 0 | 0.5% |
| Drug related | 0.45% | 0.4% | 0.2% | 0.1% | 1.1% |
| Property theft | 0.27% | 0.2% | 0.13% | 0 | 0.7% |
| Theft | 0.13% | 0.1% | 0.1% | 0 | 0.5% |

| | | | | | |
|---|---|---|---|---|---|
| Total crime | 1.4% | 1.4% | 0.47% | 0.4% | 3.2% |

**Table 6.** Crime variables. 2008-2020.

Our crime statistics describe the proportion of residents in a basic statistical unit that have been convicted in the judicial system. We have several subcategories of crime and a total crime variable that summarizes the total level of crime in the area. Of the subcategories described, drug related crimes are the most prevalent in the data set.

The total crime variable sums up the constituent subcategories. Thus, they are correlated and should not be used together in the same model configuration. For the coming PSM and SCM, with one exception, the subcategories of drug related crime, property theft, theft, and violence and abuse are to be used in models 1, 2, 3 and 4. The exception is for model 5, where the total crime variable will be used in place of the subcategories, due to data requirements regarding the relative amount of variables and donor pool units in a SCM-model. This is explained further in section 4.3.

| Time lived in sub-district | Mean | Median | Std. deviation | Min | Max |
|---|---|---|---|---|---|
| New | 18.6% | 20.5% | 6.8% | 7.2% | 33.5% |
| 1 year | 81.4% | 79.4% | 6.8% | 66.5% | 92.8% |
| 2 years | 68.7% | 65.2% | 10.5% | 44.3% | 86.6% |
| 3 years | 59.4% | 54.9% | 12.6% | 32.7% | 81% |
| 5 years | 46.8% | 41.1% | 14.3% | 18.4% | 71.7% |
| 10 years | 30.3% | 24.8% | 13.2% | 8.7% | 56.2% |

**Table 7.** Residential variables. 2008-2020.

In table 4.5 the residential mobility indicators are presented. The variable labeled “New” represents residents that are new to the sub-district as of the year measured. This is a useful indicator for turnover rates. In general, more central sub-districts have higher values, while suburban districts have lower values. Subsequently, there are variables expressing the proportion of the given sub-district’s population that have lived there for 1, 2, 3, 5 and 10 years. These variables are highly correlated, so more than one cannot be used in the same model at once. For instance, the 5-year variable will count residents who are already counted in the 1, 2 and 3-year variable. Correspondignly, if a new resident buys or starts renting a dwelling that someone had lived in for 5-years, the increase in proportion of new residents is also counted by the 5-year variable.

In the interest of clarity, the outcome of interest for this project represents “proportion of residents in sub-district who have lived there for 10-years or more”. Due to the reasons discussed above, this will be the only residential variable included in the method configurations to come. The reason for choosing the 10-year variable as opposed to, say, the 5-year variable is because the people measured in the 10-year variable will have lived in their areas for a period longer than can generally be characterized as a transient period. None of the other variables available would have been appropriate for measuring this kind of long-term residency, as even the 5-year period can include a significant proportion of students that don’t intend to keep living in the area after they are finished studying. Out of the available variables in the data set, the 10-year variable is the most appropriate as an operationalization of long-term residency.

To sum up, the variables that will be employed in propensity score matching and the synthetic control method are, for model 1-4: Total population, median age, proportion of men, median incomes, proportion of highly educated, proportion of convicted for; drug related crimes, theft, property theft and violence and abuse. That totals 10 variables, all in all describing to an adequate extent the characteristics of *Tøyen* in the pretreatment period in order for the synthetic control to meaningfully estimate the outcomes of the counterfactual *Tøyen* in the posttreatment period. For model 5, because the donor pool for this unit only consists of six units, the four crime indicators are replaced by the total crime variable, to avoid having too many variables in the configuration.

While the variables available are sufficient to conduct an analysis, there are several other indicators that could have aided in constructing a similar research design. For one, an indicator of the developments in the housing prices within each sub-district in the period of study would have enhanced the ability to analyze how the disproportionate growth in housing prices seen in *Tøyen* would have affected long-term residency compared to the weighted trends in non-treated units. Other housing characteristics could have provided a supplementary description of the living conditions in *Tøyen*, such as the average number of rooms in *Tøyen* dwellings, average size or exact proportions of owner-occupants and renters.

Additionally, the research design could have been quite different had variables describing residential careers been available. The ability to analyze patterns of where those moving in the pretreatment period go to or come from would have provided an analytical depth not possible with the variables simply describing the proportions of length-of-residency. Finally, a concern shared by many critics of the ABI approach is that such initiatives do not help the most vulnerable residents in the given area. This notion could have been investigated more in-depth had variables describing different population groups, perhaps grouped by income/wealth or other characteristics such as immigrant status been available in the data set. However, to reiterate, the variables at disposal in the data set provide this analysis with sufficient descriptions of the units in the data set. Next, trends for key variables over the period covered by the data set will be discussed.

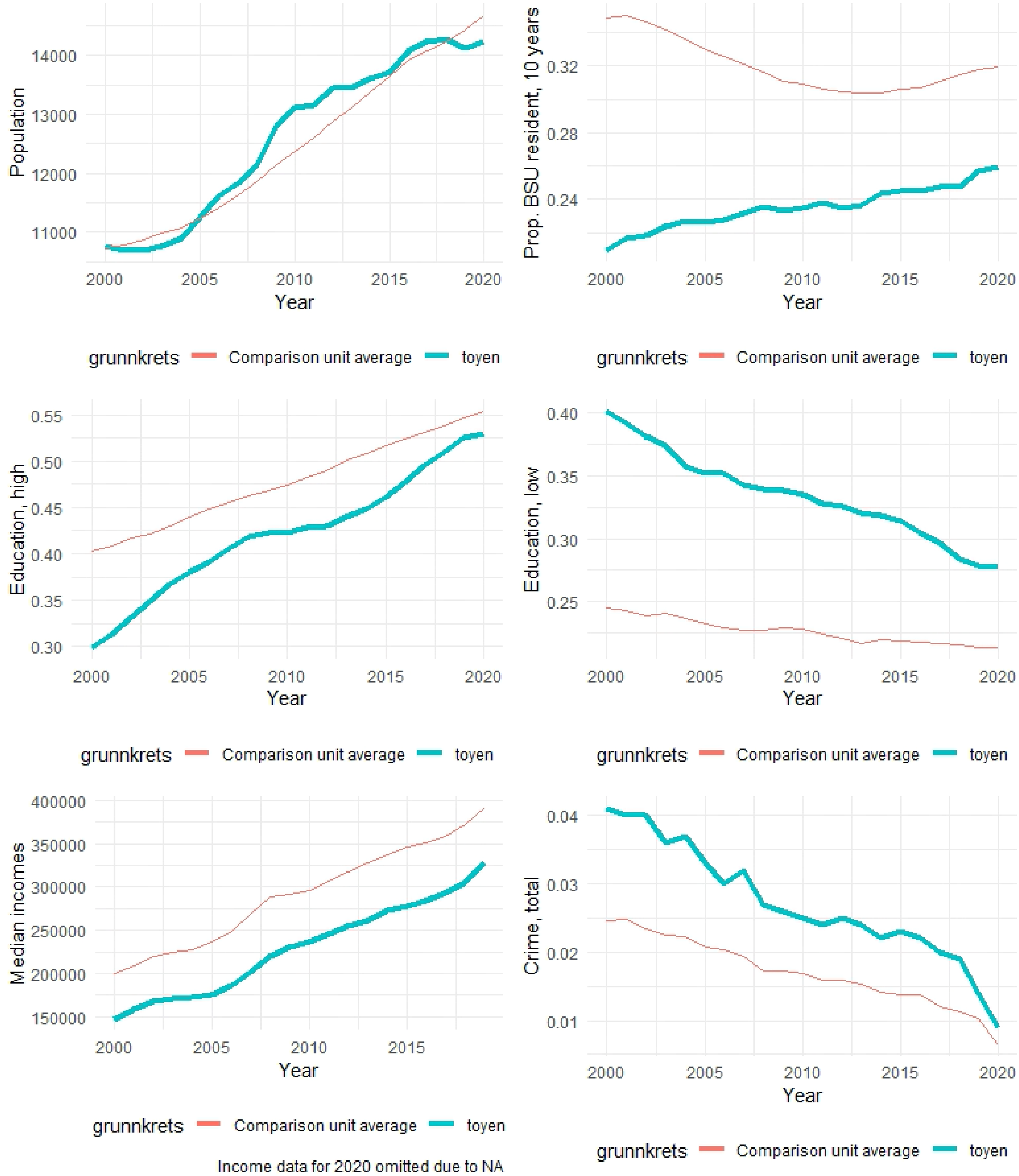


**Figure 3.** Descriptive trends for key variables. *Tøyen* and comparison unit average. 2000-2020.

In Figure 3 we see the trends for some of our key variables in the period 2000-2020. While our synthetic control will only use data from 2008 and onwards, the years prior are included here for descriptive purposes. The comparison group is constructed from the 33 city districts that pass the various requirements for analysis with the synthetic control method, which is discussed more in depth in section *4.2*. It is important to note that the comparison group averages are not weighted by population size, meaning the values for smaller units count for as much as the larger units, that are of potentially 5 times the size. They simply account for the averages of the respective variable values in our data set. They do however provide us with an appropriate glimpse at the approximate trends for the group that will serve as the comparison basis in the empirical analysis of this project.

Our first plot covers the population development over the period. Starting out at roughly the same population sizes, *Tøyen* follows the average population growth of our comparison districts quite closely, and hovers around the average for our comparison group's population size during the whole period. Starting out with a small decrease in population size, *Tøyen*'s population growth was stronger than the average between the period 2004-2010, after which the growth rate declined relative to the comparison average. There is a small spike in population growth between 2015 and 2017, but this growth rate declines in the following years.

The variable containing trends for our outcome of interest, proportion of residents who have lived in the sub-district for 10 or more years (henceforth I will refer to this variable colloquially as "long-term residents"), shows some interesting developments. From 2001 there was a steady decline in this proportion for our comparison units, until 2013 where the trends turned positive. The graph for *Tøyen* shows a steady increase in this same period, the growth only taking a slight dip in the growth rate in the years 2009, 2013 and 2018. This may be interpreted to mean that *Tøyen* has become increasingly attractive as a place of long term residence since 2000. Additionally, considering that *Tøyen* has a proportion of 49% residents with immigrant backgrounds, the low starting point and consistent growth pattern may be partly explained by immigrants marking their 10 year anniversary as residents of *Tøyen*.

Our educational indicators show a pattern of increasing levels of education on both accounts. While our variable for higher education shows that the starting point for *Tøyen* is 10 percentage points lower than the comparison average, the growth of this proportion in *Tøyen* is stronger relative to the comparison unit average. While the growth rate declined between 2008 and 2012, it increases again until 2020, ending up with a proportion of residents with higher education roughly 2,5 percentage points lower than the comparison average.

Continuing to our indicator for lower educational levels, the proportions for *Tøyen* start out much higher than the city average, with 40 percent of residents having low educational levels in 2000, 16 percentage points higher than the comparison average. The proportions decline steadily throughout our time period, reaching 2020 with a proportion of 27,7 percent with lower education, 6,4 percentage points higher than the comparison average.

Next, we turn to our income indicator, median incomes. It should be noted that this graph does not include data for the year 2020, due to missing values in the data set. Throughout the period, median income levels are consistently lower for *Tøyen* than the comparison average. However, on visual inspection the *Tøyen* trends follow the pattern for our comparison group average remarkably well. *Tøyen* starts out with a median income of 145,889 NOK in 2000, reaching 328,117 in 2019. Our comparison average starts with a median income of 199,282 NOK in 2000, and has a fairly linear growth until its average of 392,026 in 2019. The distance between *Tøyen* and the average is 53,393 NOK in 2000, and 63,909 in 2019, meaning that, in absolute terms, *Tøyen* is trailing behind in the income development seen in our comparison group. While the 2000 *Tøyen* median incomes is 73,21 percent of the average value, the 2019 median income is 83.7 percent of the comparison average. Thus, while still trailing behind in absolute numbers, the median incomes are slowly approaching a more balanced level between *Tøyen* and the comparison unit average. However, without conducting a comparison between *Tøyen* and individual city districts, we cannot make conclusions about spatial distributions of these incomes.

The sixth and final graph in Figure 5.1 presents the “total crime” variable in our data set. Important to note is that these numbers reflect the proportion of the population that have been convicted for criminality in the judicial system. Starting out in 2000, we see that the numbers for *Tøyen* are quite a bit higher than the comparison units average. However, both graphs show a decline in total crime, with the *Tøyen* numbers decreasing at a higher rate over the time period. Interestingly, from 2018 the *Tøyen* crime numbers see a notable drop in total convicted crime, almost reaching comparison unit average levels by the year 2020.

There are many questions left unanswered by an aggregated dataset such as this. For example, it leaves us with little flexibility when attempting to say anything substantial about different subpopulations. We know *Tøyen* has a quite high population of people with low education, but that seemingly does not affect its relatively high proportion of highly educated.

However, with aggregated data, we can't say how these groups interact with the other variables in a meaningful way. Perhaps most importantly, this same problem applies for our residential variables, leaving us unable to discern which subgroups are the most affected by potential population dynamics surrounding *Tøyenløftet*. Other than our three working-age variables, we have little ability to analyze things pertaining to generational differences. This gap will be substantiated using insights from theory and previous research, it will however inevitably affect the certainty with which we can interpret the data. When considering how to structure the research design for this project, geocoded data material was a recurring data structure in the research. With this type of data, one could ostensibly construct models with information regarding where people move into an area from, and where people move to. This level of detail would have allowed more detailed analysis regarding population groups. However, the aggregated data structure is required for the synthetic control mode.

This section will devote some space to discuss the considerations around choices and parameters that apply to unit selection. The initial data set contained aggregated data at the basic statistical unit level. In the political bill decreeing the ABI in *Tøyen*, the geographical area defined as *Tøyen* was made up of basic statistical units from four different sub-districts. Thus, to construct the treated unit, the data would have to be at the basic statistical unit level to delineate the area receiving the ABI accurately. As some of the measures, such as a free after-school program, were implemented in school districts outside of the initial politically decreed area of the intervention, one could argue for widening the area of study. Ultimately, I have decided against including these basic statistical units, as they are only partly affected by the ABI. The resulting combination of basic statistical units that make up our treated unit is of comparable size to the statistical unit of 'sub-districts', the level between city districts and basic statistical units.

Consequently, the next step involved reassembling the comparison unit data back into their respective sub-districts. At this point in the process, some of the sub-districts were excluded due to either being too socially and/or economically different from *Tøyen*. In a few cases, they were excluded because they were geographical neighbors of *Tøyen*, posing a risk of including spill-over effects from the initiative onto other sub-districts in the analysis, ultimately skewing the accuracy of the synthetic control unit. Most importantly, the geographical "*Tøyen*" as delineated by *Tøyenløftet*, does not exist as a statistical unit in the Statistics Norway city sub-district district divisions. Due to this, the sub-districts from which the politically delineated *Tøyenløftet*-area get its basic statistical units from, are removed. The resulting donor pool consists of 33 comparison units and our treated unit. In the following section, we conduct the propensity score matching step to determine which units are most similar to *Tøyen*.

### 4.1.1 Unit selection with propensity score matching

To ensure that the units in the donor pool are chosen in a reproducible and formalized manner, we employ a step with data-driven unit selection using propensity score. This also minimizes potential selection bias from the unit selection step. Propensity score matching is a method commonly used in the social sciences to assess the effect of a treatment. What makes it infeasible for our purposes, is that it usually necessitates data with many more observations than what is available to us. Additionally, it is commonly used on individual level data. However, a common step in propensity score methods is a matching step, where one matches each treated unit with an untreated unit with similar pretreatment characteristics. The method uses the observed characteristics of the units receiving treatment to estimate a propensity score, i.e. probability of receiving treatment based on observed characteristics. The untreated units are then assigned propensity scores and matched to a treated unit as similar to their characteristics as possible. Having units with similar pretreatment characteristics gives greater confidence to claims about the causal effects of treatment (Zhou and Xie 2016).

After the propensity scores are allocated to the units, the next step in the function is “matching” the units that are most similar. While there are many ways to configure the parameters of this matching, using a ‘nearest neighbor’ approach will suffice for our purposes. As we only have one treated unit, the propensity scores will not be based on multiple units’ characteristics, and will thus only represent the comparison units’ likeness to *Tøyen*’s characteristics. In the matching step the untreated units with the highest propensity scores are selected. In the case of this thesis, we want to have 10 units in the donor pool. For reasons that will be discussed further in the following section, it is recommended that the synthetic control does not have a variable amount that exceeds the amount of donor units. As there are nine variables chosen to be in the synthetic control method, the propensity score matching function is configured with a ratio setting set to 10, so that per treated unit, we will have 10 untreated units in the consequent data set. In an ordinary propensity score matching model, this would then be used to estimate the average treatment effect. In this project, the purpose of the PSM model is limited to construct the donor pool. This constitutes the data material for our main empirical model to draw from when constructing its counterfactual unit, which we discuss further in the following section.

As a test of the robustness of the results of the synthetic control method, we will also run the propensity score function with different ratio configurations, resulting in two larger donor pools with 15 and 20 units, and one smaller with 6 comparison units. Apart from our model with only 6 units[6], the synthetic control configurations for these models will be identical. To illustrate the outcome of the PSM-function on the balance of our data set, figure 3 shows the pre-matched data compared to the post-matched data. Because there is only one treated unit in this case, the data for *Tøyen* is represented by the black line, while the matched units are shown in the grey line. The eCDF plots for model 2-5 can be found in the Appendix. Because there is only one treated unit, and there is a finite amount of comparable non-treated sub-districts available, there are limits to the amount of balance that can be achieved by this process. However, looking at the after-balance data sets, there is a discernible difference for most variables. The biggest difference appears to be for the population variable, where the minimum and maximum values are much closer to the *Tøyen* numbers. There is not much change in the median incomes, neither in distribution or minimum and maximum values. All in all, the post-balance data set is closer to the characteristics of *Tøyen* in 2012.

[6] As it is not recommended to have more variables than units in a SCM, I replace the four crime variables with the total crime variable to ensure a comparable unit and variable amount. This only applies to Model 5.

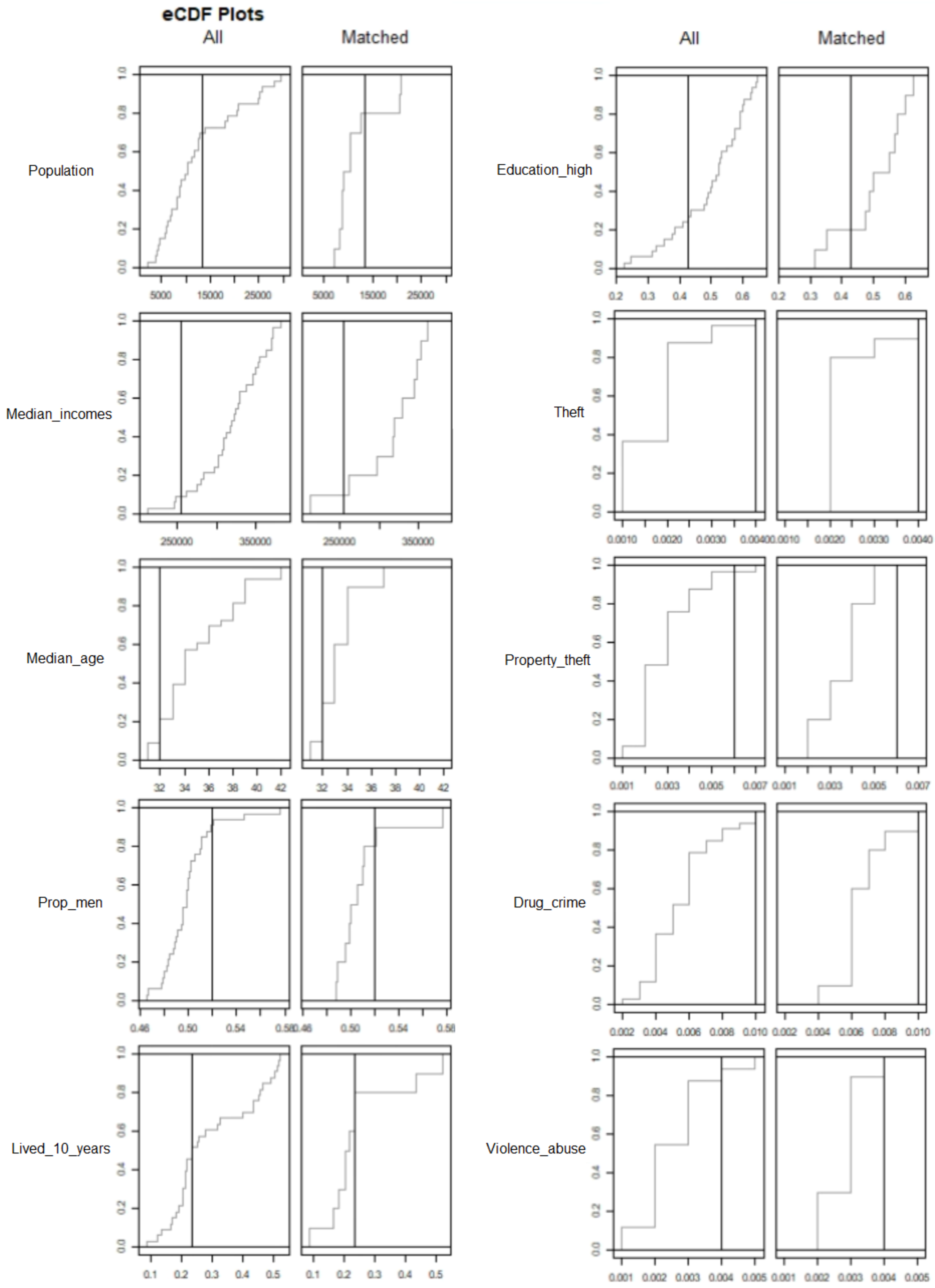


**Figure 4.** Model 1 eCDF plots. Shows pre- and post-balance of the data. Data from 2012.

## 4.2 Synthetic control method

In the following section, the synthetic control method (henceforth; SCM) will be presented and discussed; its formal components, its preferred use cases and a description of the steps of an SCM implementation and analysis. The synthetic control method is a somewhat recent addition to the arsenal of inferential statistical analysis. Athey and Imbens (2017, 9), researchers in the econometric tradition have called it "arguably the most important innovation in the policy evaluation literature in the last 15 years". While most widely used within econometrics, the method has seen frequent application in other social sciences, biomedical research and engineering. The approach was originally developed in a study of the effects of terrorist conflict on the Basque country's economy (Abadie and Gardeazabal 2003). It was further formalized in a study of the comparative effects of changes in Californian smoking sales regulation (Abadie, Diamond and Hainmueller 2010), while arguing that the method is well suited for large scale comparative case studies. In Abadie, Diamond and Hainmueller (2015), a similar argument was directed at the research field of comparative politics, citing its effectiveness at uncovering treatment effects at the country-level.

As evident, the method was built as a tool to gauge the effects of large-scale phenomena and policies present at an aggregate level, such as municipalities, cities, regions, or countries (Abadie 2021, 392). Sociological research has ostensibly not embraced the method as of yet, as examples from this discipline are hard to come by. Predominantly the method is employed by economists. Examples of this can be found in Sansyzbaueva et al. (2020), Born et al. (2019) and Pinotti (2015). Health researchers have also argued for the method's suitability for their research, with examples such as Pieters et al. (2016) and Bouttell et al. (2018).

Essentially, the SCM attempts to estimate the treatment effect on a few or a single 'treated' units by a combination of characteristics and variable trends in 'non-treated' units, ideally creating a synthetic combined unit with identical characteristics as the unit that received the treatment in the pre-treatment period. This combination of non-treated units constitutes what we label the 'counterfactual' unit, which represents what would happen to *Tøyen* if the treatment never occurred. As this counterfactual cannot exist in the real world, we have to estimate it by employing statistical methods. While traditional comparative case studies would find a number of similar non-treated units to compare the unit of interest against, the argument behind constructing a synthetic counterfactual unit is that a data-driven synthesis/combination of statistical trajectories from non-treated units produces a stronger comparison unit than might otherwise be available empirically (Abadie 2021, 393). As in other comparative case studies of this nature, the method builds on an assumption of common trends across units. In the following paragraphs, I will present the ideas underlying the synthetic control method, its formal data requirements, and critical considerations to make before conducting a synthetic control analysis. To exhibit these notions in a pragmatic way, the lessons from these sections will be summarized in a step-by-step manner.

There are a few meticulous steps to be taken in preparation for a SCM analysis. However, before discussing the necessary components of the data set, the synthetic control model should be presented. A 'synthetic control' is understood as "a weighted average of the units in the donor pool". Kaul et al. (2016, 4) describes the SCM process as having one outer layer of optimization, and one inner layer. First, the "outer" optimization aims to allocate weights to units and variables to minimize the mean square prediction error (MSPE) between the synthetic control predictor variables and the *Tøyen* predictor variables. Essentially, this is done to construct a synthetic unit with characteristics of similar statistical relation to the outcome of interest as *Tøyen* does. If the pretreatment fit of the synthetic control is good, we will see a low pretreatment MSPE. In other words, the trends of the counterfactual unit adequately following the observed outcomes of our unit of interest, gives increased confidence in the outcomes estimated in the posttreatment period. Secondly, the "inner" optimization refers to the synthetic control's process for assigning weights to donor pool units, also by choosing the model composition providing the lowest MSPE ratio between the counterfactual unit and the treated unit. We discuss the critical role that MSPE values play in significance testing synthetic control models later in this section. SCM places two restrictions on the construction of the weights. They must be nonnegative and sum to one. This is in order to avoid extrapolating beyond what the data is able to support (Abadie 2021, 405). Although the donor pool may include many units, the resulting weighted averages are 'sparse', meaning relatively few of the units in the donor pool contribute to the weighted values constituting the counterfactual unit. This can be seen in Abadie, Diamond and Hainmueller's (2015) analysis of the GPD per capita impact of West German reunification in 1990, where only five out of sixteen countries in the donor pool contributed to the counterfactual unit.

This sparsity provides a transparency to the analysis, allowing closer inspection of the weighted units.

Seeing as this project is interested in change over time, synthetic controls require longitudinal data. Both the treated unit and the “donor pool” – the units used in the construction of the synthetic unit – must have a sufficient amount of pre-intervention observations in order to predict the trajectory of the counterfactual, synthetic unit. The donor pool is made up of untreated, distinct units, whose weighted averages on relevant predictor variables from the pre-intervention period construct the aforementioned counterfactual unit. Essentially, this counterfactual outcome represents what would have happened to the particular outcome of interest in the treatment area, had it not received the treatment. Importantly, the SCM structure allows for the treatment effect to change over time, allowing analysis of the temporal dimensions of the intervention effect. Considering these effects may take a while to manifest or alternatively disperse over time, this aspect is crucial for understanding the impact of the interventions being studied (Abadie 2021, 394). In the case of *Tøyenløftet*, an area-based initiative with a broad range of measures implemented over a 5-year period, this is especially pertinent. In contrast, a policy changing cigarette tax levels from one day to the next, one would reasonably expect potential effects on consumer behavior to be promptly observable. For area-based initiatives however, it is more reasonable to expect the effects of *Tøyenløftet*, if there are any, to emerge over a longer period. Therefore, it is instrumental for this study to have data from a relatively long posttreatment period.

The two fundamental considerations to be made in the design process of the synthetic control method pertain to the selection of *units in the donor pool*, and the selection of *predictor variables* used to model the trajectory of the counterfactual outcome variable of interest. The former requires a few points of reflection. To start, having units in the donor pool with too large discrepancies compared to the treated unit may cause interpolation biases, meaning that the weighted averages will be disproportionately skewed due to the too dissimilar, ‘extreme’ unit, potentially resulting in an over-fitted model. Therefore, as in other comparative case studies, the donor pool should consist of similar units to the treated unit (Abadie 2021, 401). Conversely, units in geographical proximity to the treated unit may be affected by spillover effects and should be excluded from the donor pool. Their proximity may meaningfully affect variable measurements and therefore have the potential to produce biases in the counterfactual unit. Importantly, in a study at the city district level such as this, similar neighborhood characteristics may concentrate geographically. One should then keep both of these conditions in mind when selecting units. Units should not be too dissimilar, while at the same time, too similar units may introduce other issues, such as spillover effects. Alternatively, due to the transparency afforded by the accessible weight values and sparsity of contributors to the synthetic control, these issues may also be explored and interpreted analytically (Abadie 2021, 410). In addition, one should avoid including units that may have experienced sizable shocks to the outcome variable in the period of interest. As we have covered, the goal of a comparative case study is to estimate the effect of an intervention on an outcome of interest. Correspondingly, it is crucial to consider the volatility of the outcome variable.

If the variable is vulnerable to shocks from other developments in the intervention period, there is a possibility of misinterpreting the effects coming from these shocks as being the effect of the treatment. However, these challenges of volatility are most present when they are generated by unit-specific characteristics. In cases where the volatility is prevalent across treated and donor pool units, this issue can be solved by adjusting the settings of the synthetic control (Abadie 2021, 409). As shown in Figure 4.1, the long-term residency trends in *Tøyen* have had a stable growth rate since the year 2000. Ostensibly, the outcome variable is not very volatile. The average for the comparison units, shows a decline during the 2000s, which shifted to a growth rate in the 2010s. While they do not show individual unit trends, there does not appear to be volatile outcomes. On to the latter of the two considerations, predictor variable selection. This step is important because the synthetic control model derives its credibility from accurately tracking the trajectory of the outcome variable for the unit receiving treatment in the pre-intervention period. All observations of the units in the donor pool, including predictor and outcome variables, are used to simulate the characteristics of the treated unit. Accordingly, the predictor variables assist in assuring that the fit of the synthetic control unit is meaningfully constructed. Another consideration to keep in mind when analyzing the results of a synthetic control model is the possibility that the outcomes have been influenced by forward-looking economic actors (Abadie 2021, 410). This could be present in the case of *Tøyenløftet*. As all who participate in the owner-occupier, by partial omission of government reports, are investors on the

Now, how can we trust that the results of our synthetic control model are reflective of reality? All statistical models must have a way of telling if the results are reliable. Accordingly, there are a few methods of testing the significance of our results in a synthetic control model. The main mechanism is by analyzing the aforementioned MSPE ratios. The MSPE is a measure of the mean squared distance between the predicted counterfactual and the actual outcomes of *Tøyen*. Further, the MSPE for the posttreatment period tells us the mean squared distance from the posttreatment outcomes of *Tøyen*. The value of the posttreatment MSPE is then divided by the pretreatment MSPE to calculate the MSPE ratio, which tells us the size of the effect on the outcome. To conclude that the treatment has had a significant effect, the MSPE ratio for *Tøyen* should be higher than the MSPE ratio for the donor units. An additional significance testing step contains visually inspecting the trends for the synthetic control compared to the placebo units trends. Furthermore, p-values and z-scores are calculated as further tests of significance. The following section will take the insights from this discussion and lay out the chronological steps of a SCM analysis.

### 4.2.1 Practical steps of implementing a synthetic control method

We have discussed the merits and use cases, as well as the components and considerations that go into conducting a synthetic control method. Now, I would like to turn to a more practical approach to explaining the implementation of synthetic control methods, inspired by a procedural framework by McClelland and Mucciolo (2022). In a step-by-step structure, I will explain the considerations that are of most importance to this thesis' synthetic control model.

The *first step* is to determine how many pretreatment periods are appropriate for the analysis. This is obviously influenced by the amount of data at our disposal. In our case, the data available spans the years 2000-2020. *Tøyenløftet* took place in a 5-year period between 2014-2018. One priority is to provide the synthetic control function with enough years to estimate connections between predictor variables and the outcome of interest. In essence, this should be as long as possible. On the other hand, it is important that the period does not contain influences from similar area-based initiatives. The city district *Tøyen* is a constituent of, was part of an ABI spanning the whole of inner eastern Oslo from the year 1997 to 2006. Therefore, I mark the starting point of our pretreatment period in the year 2008. This is a compromise between two considerations. One, to give the potential after effects of the inner eastern ABI to simmer down, and two, to give our synthetic control model enough years to establish connections between the predictor variables and the outcome variable. In conclusion, our pretreatment period is from 2008-2014.

Many synthetic control models presuppose that the time of intervention is at one point in time. An area-based initiative like *Tøyenløftet*, however, is implemented over the course of several years. While some of the subprojects of this ABI can be expected to have effects from the day they are implemented, like the free after-school programs, others will necessarily take a long time before their potential effect is manifested, such as some of the non-material measures in the project. The latter point can support the argument for setting the intervention time at a later time. It may not be realistic to expect policy effects from day 1 of the ABI, and many of the policies have a long-term perspective. Meanwhile, for our outcome variable, just knowing that there is dedicated policy attention to *Tøyen*, may spark some mobility dynamics. Therefore, I have elected to maintain the original time of intervention, being the year 2014.

The *second step* is to determine which variables in our data set will serve as predictors of the outcome variable. As discussed in the section outlining the PSM step of our model, the variables in our analysis will, where available, be isolated to the working age population (median incomes, gender distribution and total population). Furthermore, crime indicators are included, opting for the more substantial variables that are grouped by type of crime (theft, property theft, drug crime, and violence and abuse). Finally, I include a variable describing the median age in the sub-district. Out of the variables available in our empirical material, these are considered to be the most predictive of movement patterns based on insights from the literature discussing residential mobility.

The *third step* deals with choosing units for the donor pool. Usually, this consideration is done manually with thorough qualitative consideration of the potential comparison units. In this project I have opted to employ a propensity score matching step to eliminate potential elements of selection bias from the model. Preceding the propensity score step, however, some of the units in the raw data set were removed based on the set of requirements discussed earlier in this section. The first requirement considers whether spill-over effects from the treatment may be present in units geographically close to *Tøyen*. This led to the removal of geographical neighbors of *Tøyen*. Secondly, we put a requirement on the population sizes of the units, requiring them to have a minimum of 5000 residents in at least one year to be included. Thirdly, the units whose values introduced too large discrepancies are removed to avoid the potential of interpolation bias by overfitting to the trends of the unit of interest in the pretreatment period. This process led to a data set of 34 comparison units including *Tøyen*.

To construct the donor pools for our respective models, the following stage puts this data set through a propensity score matching, configuring it to return the 10 closest matches to *Tøyen* in the year 2012. I chose the cross-section from 2012, as it most likely would be this year's statistics that were being used to substantiate arguments during the debates surrounding the implementation of *Tøyenløftet*, which took place in years prior to its implementation in 2014. The main synthetic control model contains 10 donor pool units. To further investigate the potential effects of *Tøyenløftet*, I construct four additional model configurations. Three of these are picked through the propensity score method described above, with ratio configurations being the only difference. This results in three donor pools containing respectively 15, 20 and 6 units. The fourth model contains all the units after the requirements-step, resulting in a donor pool with 33 units.

In the *fourth step* the configuration for the synthetic control model is executed. The models in this thesis are constructed using the *tidysynth*[7] package in Rstudios. (See the Appendix for full R-script). The time window for the optimization of units and variables is set to 2008-2014, meaning that any trends that are calculated in the synthetic control after the time of intervention, are based on data from the pretreatment period.

*The fifth step* includes the initial analysis of the outcomes of the synthetic control method. As the main finding is presented in graph format, visual inspection is the initial tool of analysis. For the the goodness of fit in the pretreatment period is

In *step six* further analysis of the findings is conducted by inspecting the data for weight allocation. Ideally, the weights should be distributed among several units and variables so that the estimated outcomes don't solely rely on one characteristic of *Tøyen* or a characteristic of the constituent donor pool units.

[7] Due to a dependent package being removed from CRAN, the *tidysynth* package was archived on April the 14th in 2023. The functions used in this thesis were done with an archived *tidysynth*, version 0.1.0.

*Step seven* contains significance testing of the results. There are several avenues to conduct these. First, a combination of placebo tests and posttreatment differences between the treated unit and its synthetic control is employed to determine whether the treatment had an effect that stands out from our placebo cases. The placebo units are constructed by running the same synthetic control configuration on every donor pool unit that did not receive treatment. If the graph for the synthetic control clearly stands out among the placebo units, it supports the claim that the treatment had an effect (Abadie et al. 2015, 501). Secondly, the MSPE ratios of treated and untreated units help determine the significance of the findings. The ratios for each unit are calculated by dividing the posttreatment MSPE by the pretreatment MSPE. The treated unit having a higher ratio than the units in the donor pool supports that the treatment has had a significant effect. A third significance test is done by analyzing the synthetic control p-values. Lastly, the function calculates Z-scores, providing an additional method of significance testing.

# 5.0 Results

In the following section the results from both the unit selection done with Propensity Score Matching (PSM) and consequent synthetic control models will be discussed.

### 5.1 Propensity score matching

The resulting donor pool contains ten comparison units, presented in Table 5.1. The units are arranged by their respective register based sub-district codes, which in descending order roughly corresponds to distance from the city center. Seven of our units can be labeled inner city districts. *Åsen, Sinsen* and *Torshov* are located in the inner east, while Homansbyen, Majorstuen and Ila are in the inner west. *Sentrum 2* stands alone as the only unit located in the very city center. The three remaining units in our data frame represent the outer eastern districts, Ljansbyen, *Rudene* and Hasle. The latter of which is closer to the city than the two former, which are located south-east of the city, bordering the neighboring municipalities Ski and Oppegård. Of the units in the inner city, *Tøyen* is the sub-district with the lowest median incomes, roughly 54,000 lower than the average for the model 1 donor pool. When it comes to the outcome of interest, 10-year residency, *Tøyen* is rather close to the donor pool mean. Disregarding the outer eastern sub-districts, *Tøyen* also has the lowest proportion of highly educated residents, with 42,9 percent.

Donor pool results

Selected using propensity scores, data from 2012

| City subdistrict | Population | Proportion men | Median incomes | Median age | BSU, lived 10 years | Education, high | Theft[1] | Property theft[1] | Narcotics[1] | Violence, abuse[1] |
|---|---|---|---|---|---|---|---|---|---|---|
| Sentrum 2 | 9,129 | 0.577 | 297,995 | 31 | 0.089 | 0.485 | 0.003 | 0.005 | 0.010 | 0.004 |
| Homansbyen | 8,744 | 0.499 | 348,912 | 32 | 0.206 | 0.575 | 0.002 | 0.002 | 0.006 | 0.002 |
| Majorstuen | 12,564 | 0.488 | 362,543 | 34 | 0.237 | 0.603 | 0.002 | 0.002 | 0.006 | 0.002 |
| Ila | 7,040 | 0.489 | 345,614 | 32 | 0.183 | 0.627 | 0.002 | 0.004 | 0.006 | 0.003 |
| Aasen | 8,877 | 0.500 | 329,370 | 34 | 0.236 | 0.551 | 0.002 | 0.005 | 0.006 | 0.003 |
| Torshov | 10,473 | 0.510 | 352,615 | 33 | 0.204 | 0.569 | 0.002 | 0.003 | 0.008 | 0.003 |
| Sinsen | 8,273 | 0.521 | 317,055 | 33 | 0.165 | 0.477 | 0.004 | 0.004 | 0.007 | 0.003 |
| Ljansbyen | 20,812 | 0.495 | 261,775 | 37 | 0.524 | 0.352 | 0.002 | 0.003 | 0.006 | 0.003 |
| Rudene | 20,544 | 0.506 | 213,208 | 33 | 0.435 | 0.312 | 0.002 | 0.004 | 0.004 | 0.002 |
| Hasle | 10,507 | 0.511 | 319,850 | 34 | 0.218 | 0.500 | 0.002 | 0.004 | 0.007 | 0.003 |
| Toyen[2] | 13,459 | 0.520 | 255,261 | 32 | 0.235 | 0.429 | 0.004 | 0.006 | 0.010 | 0.004 |
| Mean, all units | **11,857** | **0.511** | **309,472** | **33** | **0.248** | **0.498** | **0.002** | **0.004** | **0.007** | **0.003** |

[1] Only convictions are included

[2] Treated unit

Dataset is provided by the ISS project **Criminal exposure in vulnerable areas**

**Table 8.** Donor pool results, model 1.

There are no units from the outer western sub-districts. Yet, this is not necessarily a bad thing. Due to considerations around discrepancies in characteristics between the affluent western districts and poorer eastern districts potentially producing interpolation biases, some of the most affluent sub-districts were removed from the pre-PSM data set. The resulting units are the product of the variable balancing process done by the PSM functions.

Also present in Table 5.1 are values for the variables that will act as predictor variables for the coming synthetic control function, as well as the main outcome variable, BSU-resident, 10 years. Models 1, 2, 3 and 4 will use the variables presented

### 5.2 Synthetic control method

In the coming section, the findings of the quantitative analysis will be presented. Model 1 is constructed using the donor pool with 10 units discussed in the previous section. The structure of analysis for model 1 will have four steps, with each step of analysis corresponding to a figure presenting the results. First, the estimated trends for the synthetic control will be discussed. Emphasis is put on how well the pretreatment estimates fit, as this is instrumental for the confidence which the posttreatment estimates can be interpreted. This step includes analysis of the differences between the synthetic control and the actual *Tøyen* outcomes. Secondly, inspection of the constituent weights allocated to construct the synthetic control are analyzed. Thirdly, as an initial inspection of statistical significance, the placebo units trends and MSPE ratios relative to the placebo unit MSPE ratios are analyzed. Fourthly, additional significance testing is conducted to further determine the strength of the findings.

Subsequently, models 2, 3, 4, and 5 are analyzed in much the same manner as described above. As the parameters of analysis are established in the preceding models, these are grouped together to give grounds for a more immediate comparison between the models. The steps of analysis described above are the same, yet do not go into the same amount of detail as the analysis of model 1.

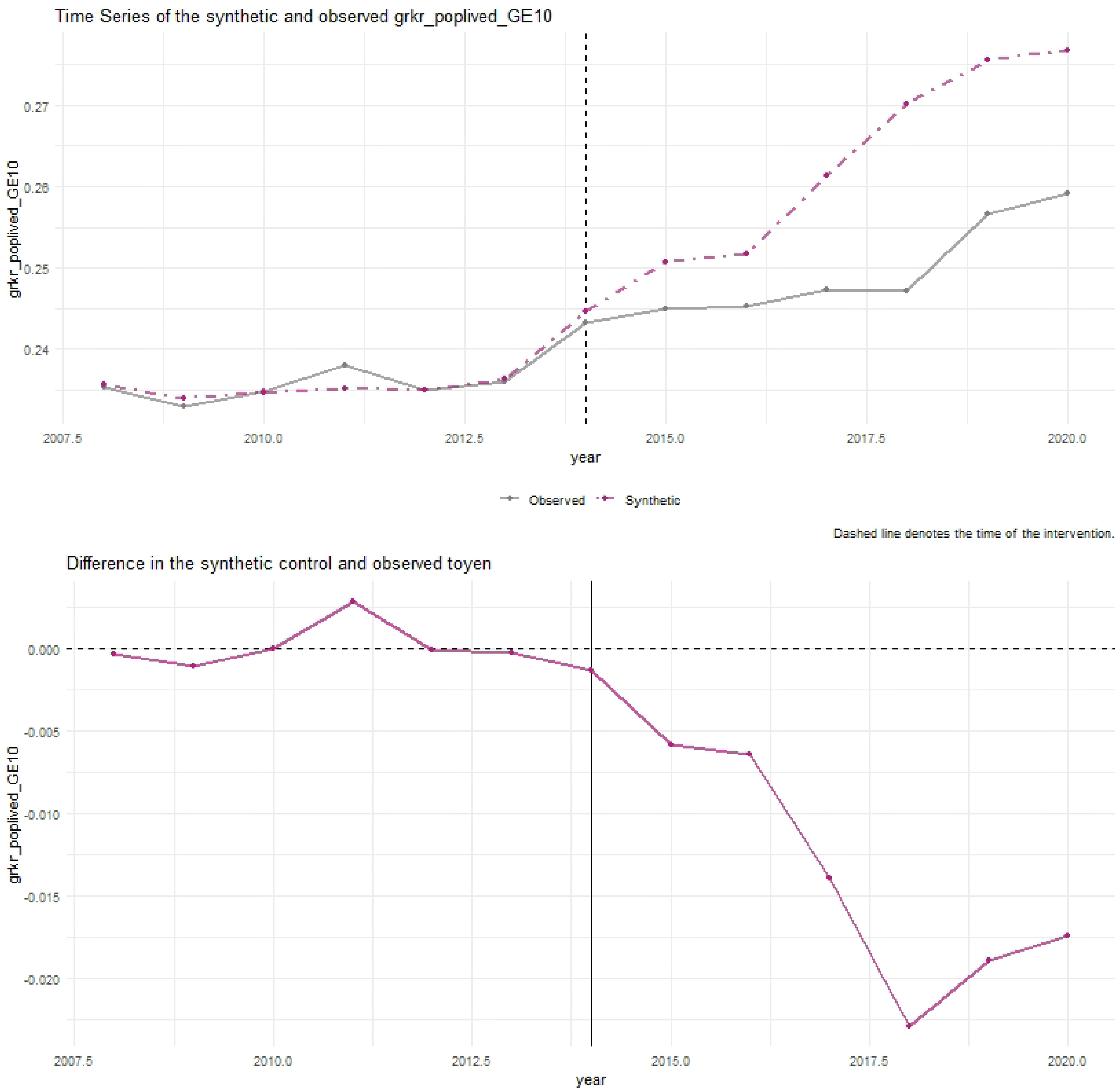


**Figure 5**. Model 1 trends for *Tøyen* and synthetic control unit and difference between *Tøyen* and the synthetic control. Outcome variable "Proportion lived in the sub-district for 10 or more years".

Figure 4 presents the results for the first synthetic control model. The first graph presents the trends of the outcome "proportion of 10 year residents" for the synthetic control unit and *Tøyen*. The second graph shows the difference of the synthetic outcomes to the *Tøyen* outcomes. As discussed, the period of interest is 2008-2020. Upon visual inspection, it is evident that the pretreatment fit is hovering back and forth around the *Tøyen* outcomes. However, it never strays too far from the *Tøyen* outcomes for our outcome of interest. Meanwhile, it shows some variation, which suggests that the pretreatment synthetic control trends are not overfit. Now, the second graph shows us exactly how big this difference is. In the pretreatment period, the largest deviation from the *Tøyen* outcomes is 0,3% in 2011. Overall, the pretreatment fit is good. After the deviation in 2011, the trends converge again, and are very close until the point of intervention. In the posttreatment period, interestingly, the synthetic control continues to rise while the growth rate in *Tøyen* outcomes flattens. Similarly, 2015 values for the synthetic control also flatten, but in 2016 the synthetic outcome gains momentum and increases until 2020, ending up with a proportion of long-term residents of 27,7%. In the same time frame, the *Tøyen* outcome remains relatively stable before having its proportion of long-term residents increase from 2018 to 2020, ending with a value of 25,9% long-term residents. The difference between the 2020 values for *Tøyen* and the synthetic control unit is roughly 1,7%, in absolute terms constituting a difference of 249 people. The largest difference between the two units is 2,2% in 2018. However, before any discussion that assume these results are significant, we must investigate the model further. The credibility of a synthetic control model presupposes a well-fitting pretreatment synthetic control. Relating to this aspect, we can say that the model looks promising. To look under the hood of the model and consider the components of the trends pictured above, the next step is to analyze the unit and variable weights, shown in Figure 5.

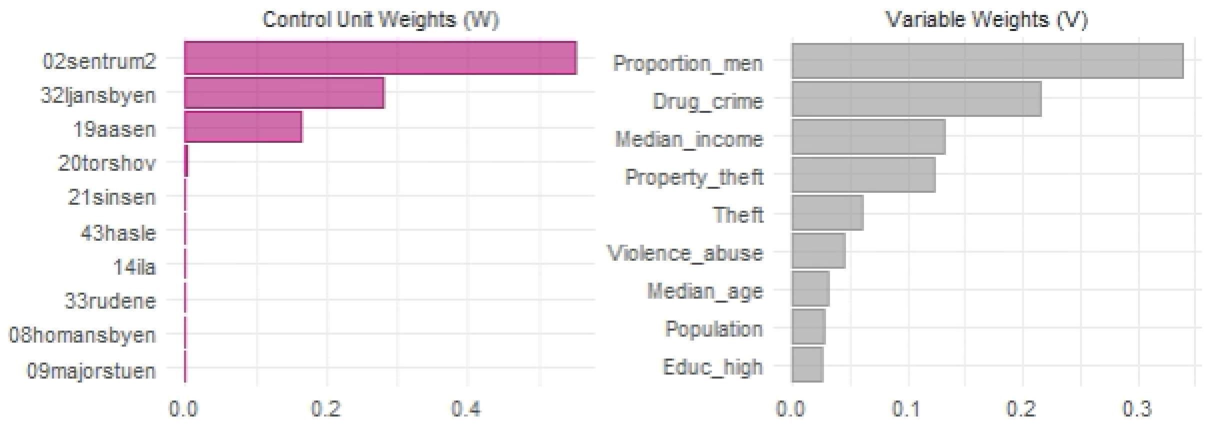


**Figure 6.** Unit and variable weights.

The trends discussed above are compiled from a combination of unit and variable weights, where the function prioritizes the composition that returns the lowest MSPE values in what is known as the inner and outer layer of optimization. Before commenting on the MSPE values and how model 1 synthetic *Tøyen* relates to our placebo cases, we turn to discuss the weights allocated to donor pool units and variables. This model uses data from *Sentrum 2*, *Åsen* and *Ljansbyen*. In terms of geographical locations, these selections are quite balanced. *Sentrum 2* is in the city center, *Åsen* is a semi-central neighborhood and *Rudene* is a suburban sub-district at the very southern edge of Oslo municipality. *Sentrum 2* constitutes 55,3% of the contribution to the synthetic control unit, *Rudene* 27,9% and *Åsen* 16,5%.

Next, the variables within these three units build a synthetic control trend based on the respective variables' prediction accuracy for our outcome of interest. Of the variables included in the model, all except "Theft" contribute to predicting the synthetic control outcomes. The biggest contribution comes from the proportion of men with 33,9%, followed by drug crime with 21,6% and median incomes with a contribution of 13,2%. Interestingly, our educational and population indicators contribute the lowest, meaning that they, in this model composition, did not have a reliably strong statistical connection to the outcome of interest. The proportion of men having such a large part in predicting the outcome of long-term residency, is however not very convincing. As mentioned, before making any conclusions about the effects described in this model, the outcomes of our significance tests should be inspected. MSPE ratios and visual comparisons between the synthetic control and donor pool placebo outcomes are presented in Figure 6.3 Table 7. shows the overall significance values for model 1.

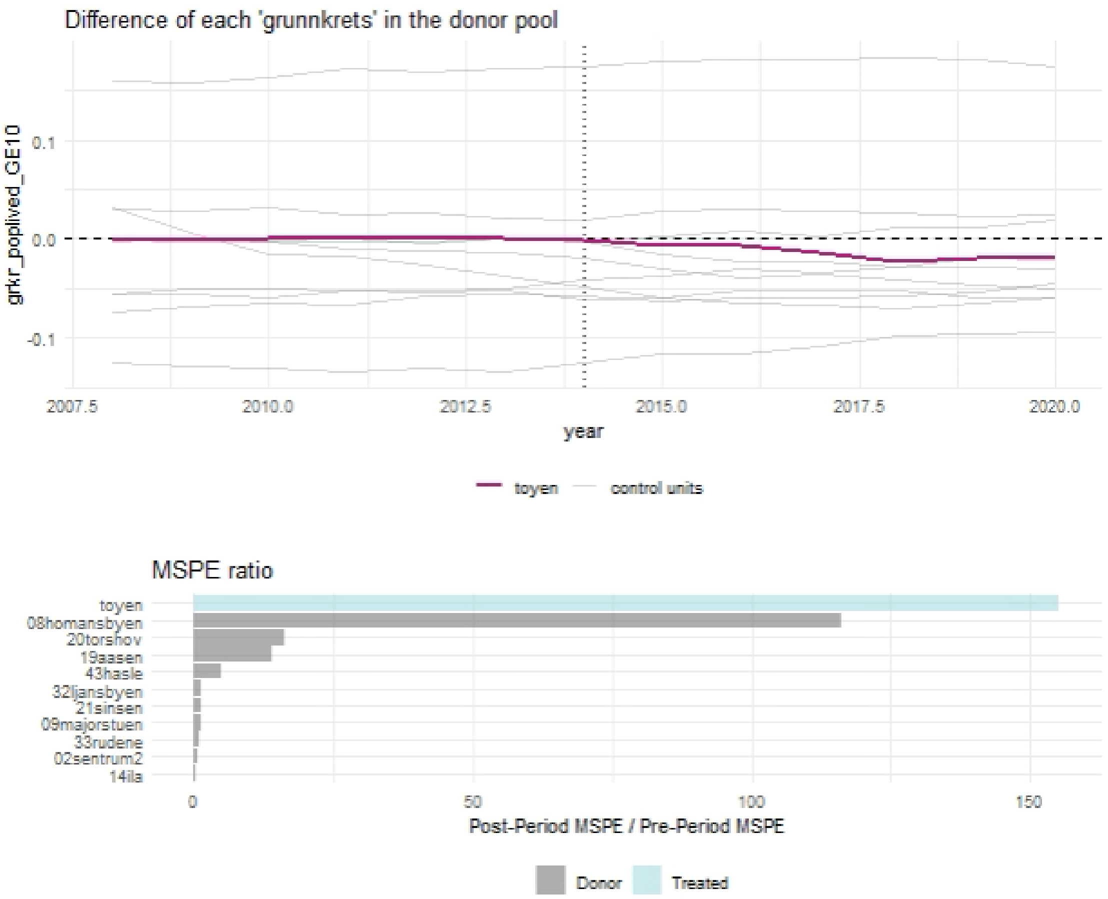


**Figure 7.** Significance tests: Pre/postintervention MSPE ratio of treated and donor pool units and placebo trends.

To investigate the statistical significance of these findings, we employ four separate evaluations of our model. The first significance test is done by visually comparing our counterfactual outcomes with placebo trends for our donor pool units. Secondly, the MSPE ratio tells us the impact of the treatment on our outcome of interest for *Tøyen* relative to the units in the donor pool. Thirdly, fisher's exact P-values will test the null hypothesis of our model. Lastly, Z-scores provide us with an additional avenue of reviewing the significance of our results.

Upon visual inspection of the graph plot in Figure 5.3 the differences between actual outcomes in *Tøyen*, and the synthetic control and our placebo units, it is evident that the *Tøyen* unit, highlighted in purple, represents a decently convincing deviation from *Tøyen* outcomes in the posttreatment period, compared to the placebo units. In order for this to be deemed significant, the counterfactual unit should show a noticeable shift in trends at the time of intervention. The overall change in trends in the posttreatment period is substantial enough to suggest that the effect is statistically significant. However, the graph is quite skewed due to two significant outliers, making visual inspection quite difficult. The MSPE ratio will provide us with a complementary measurement of significance.

As mentioned, the MSPE ratio is calculated by dividing the postintervention MSPE with the preintervention MSPE. Similar to the placebo test, this step tells us whether the treatment has had a significant effect that clearly separates it from trends of our placebo units. To suggest that *Tøyenløftet* has had a significant effect on our outcome of interest, the MSPE ratio for *Tøyen*, highlighted in blue, should be higher than those of the units in the donor pool. Immediately apparent when looking at the bar chart in Figure 6.2.2, The MSPE ratio for *Tøyen* is, with a value of 155, much higher than the placebo cases of the donor pool units. the closest donor pool MSPE ratio is for Homansbyen, with a ratio of 116. The third highest MSPE ratio in the model is Torshov at 16. Overall, this suggests that the findings are statistically significant. Exact numbers for MSPE ratios are presented in table 5.2.

A third avenue to determine the significance of our model is the P-value null hypothesis test and Z-score. The former is a measure of whether one can reject the null hypothesis of no effect. In the social sciences, the commonly accepted threshold is at a p-value of 0.05. Normally, having p-values below this threshold means that the model can reject the null hypothesis of no effect. Looking at Table 5.2, no units in this model meet this threshold. The fisher's p-value is the lowest for our synthetic control at 0.09. The z-score is 2.346, which when compared to a z score table suggests significant findings. In the context of the synthetic control method, McClelland and Gault (2017, 12) notes that evidence of significance should not be treated as proof of an effect, rather it should be treated as suggestive of an effect.

Significance data

| Subdistrict | Type | MSPE Ratio | Fishers P | Z-score |
|---|---|---|---|---|
| toyen | Treated | 155.243 | 0.09090909 | 2.346 |
| 08homansbyen | Donor | 116.189 | 0.18181818 | 1.624 |
| 20torshov | Donor | 16.273 | 0.27272727 | −0.223 |
| 19aasen | Donor | 13.979 | 0.36363636 | −0.265 |
| 43hasle | Donor | 4.790 | 0.45454545 | −0.435 |
| 32ljansbyen | Donor | 1.166 | 0.54545455 | −0.502 |
| 21sinsen | Donor | 1.100 | 0.63636364 | −0.503 |
| 09majorstuen | Donor | 1.037 | 0.72727273 | −0.504 |
| 33rudene | Donor | 0.789 | 0.81818182 | −0.509 |
| 02sentrum2 | Donor | 0.653 | 0.90909091 | −0.511 |
| 14ila | Donor | 0.304 | 1.00000000 | −0.518 |

**Table 9.** Model 1 significance data.

In conclusion, the model 1 synthetic control function based on our donor pool sample with 10 comparison units suggests there are some mixed findings. MSPE ratios show a significant effect compared to the donor pool placebo units, except for the sub-district Homansbyen which also had high MSPE scores. On the other hand, the p-value for our synthetic control is the lowest compared to the donor pool units, however it does not meet the threshold of 0.05 for statistical significance. Consequently, we cannot reliably conclude that this model shows a statistically significant difference in contrast to the donor pool group. The Z-scores do not inspire confidence in making any conclusive comments. Model 1 is not entirely convincing as to the statistical significance of its measured effect, yet is quite close. To investigate whether the donor pool size is a factor, the following section will configure four additional models with differing donor pool sizes. Other than their donor pool sizes, the variable and time configuration for the SCM function remains the same. The models will have 15, 20, 33 and 6 comparison units respectively. As with model 1, they have been selected using the propensity score method, except for the 33-unit model, which simply has all available units in the data set as its donor pool. While model 1 received a section to allow for a thorough inspection of the outcome of the synthetic control, the forthcoming analysis will be done with the four models presented in parallel.

### Additional models

As mentioned in the previous section, the structure of the following analysis will be slightly different compared to model 1. Now that we have established the parameters of analysis and significance testing for the SCM, the analysis of the following models will be done in tandem, and each figure will present the relevant data points in the models together. Remember, models 2, 3, 4 and 5 that will be discussed in this section, have donor pool sizes with 15, 20, 33 and 6 units respectively. It is important to note that no other configurations have been changed between these models and the first model. The goal of this section is to determine which model provides the most convincing results, expressed both in the plotted trends, as well as by statistical significance.

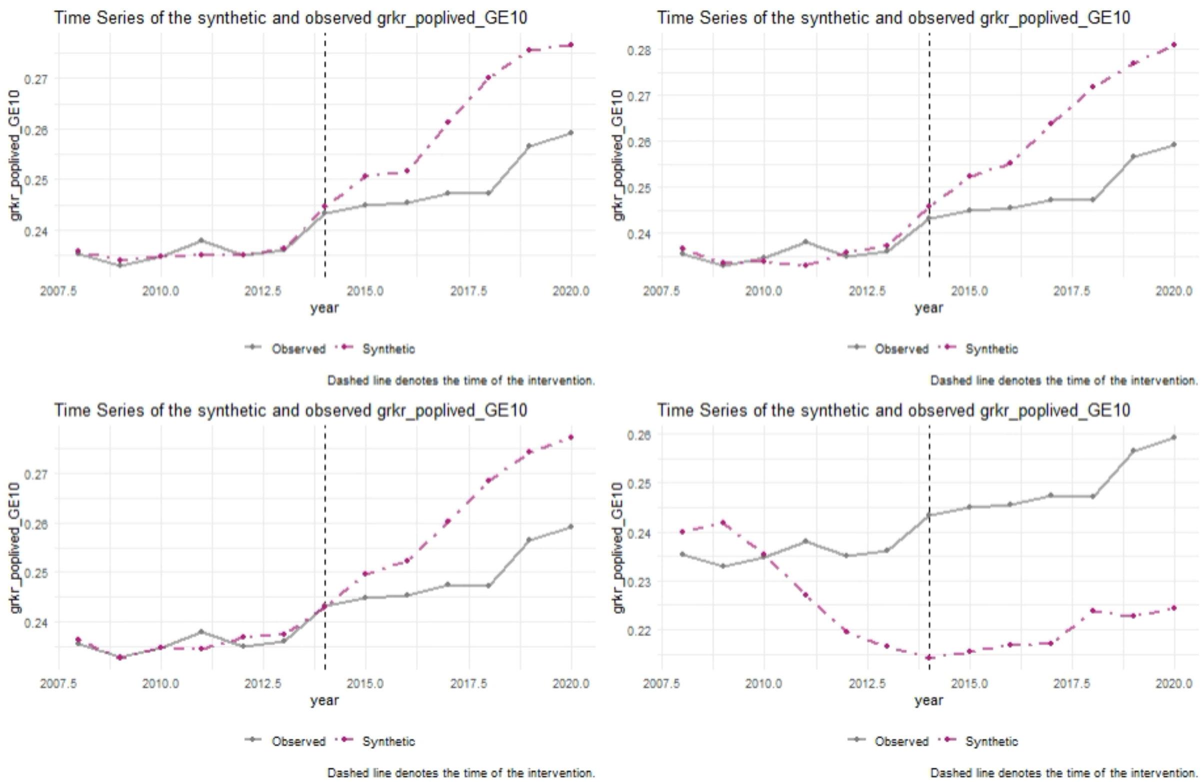


**Figure 8.** Synthetic controls and *Tøyen*, model 2-5

Now, upon visual inspection, the three models first in line have very similar fits and trends to that of model 1. Interestingly, model 2 (top left) in figure 5.5 has nearly identical trends as model 1. The fit in the pretreatment period for model 2 has trends somewhat close to *Tøyen* trends, however they do not follow the same pattern. The synthetic control and *Tøyen* diverge quite sharply from 2013, and continue into the postintervention period. In the year marking the starting point of the intervention, the difference between the two constitutes about 0,5% the difference As familiar from model 1, the outcome variable stabilizes in *Tøyen* after the intervention until 2018, while our synthetic control continues to rise, resulting in a proportion of 10 year residents of 27,7% in 2020, roughly 1,8% above the actual *Tøyen* outcomes in 2020, which is remarkably close to the results from model 1. In absolute terms, this difference suggests that roughly 247 more people that had been living in *Tøyen* for 10 years still resided there, had *Tøyen*løftet not been implemented.

Moving on to the trends for model 3, of which the constituting donor pool consists of 20 units. The first three years of the pretreatment period shows a promising fit between the synthetic and actual outcomes, however it diverges briefly in 2011 before returning close to the *Tøyen* outcomes in 2012 and 2013, just like models 1 and 2. At the start of intervention in 2014, the difference between the synthetic and actual outcomes are 0,2%. While the postintervention outcomes for *Tøyen* trends for the synthetic control flatten out until 2018, the synthetic outcomes in model 3 continue rising, following a similar pattern to models 1 and 2. In 2020, model 3 synthetic outcomes are at 28,1%, a value 2,2% higher than the *Tøyen* 25,9%. If taken literally, this constitutes a difference of 310 less 10-year residents in *Tøyen* outcomes compared to the synthetic control.

Upon visual inspection, model 4, our synthetic control where all available units are in the donor pool, may have the best pretreatment fit of all the models. Deviating from the *Tøyen* outcomes at most 0,3% in 2011. The synthetic outcomes for 2012 and 2013 don't follow the *Tøyen* outcomes very well. However, the trends converge at the time of intervention. Meanwhile, as previously discussed, synthetic controls constructed with large donor pools do risk "overfitting" to the trends of the treated unit. In light of this, the first three years of model 4 are conspicuously close to the *Tøyen* outcomes. The posttreatment curve of this model is quite similar to the ones we see in model 2 and 3, with a slight decrease in the rate of increase between the years 2015 and 2016, before returning to a steady rate of increasing proportions in 2016. Our synthetic outcome for model 4 ends up with a proportion of long term residents of 27,7%. This is 1,8% above the *Tøyen* outcome at 25,9%. As for the meaning of this in absolute terms, it is the smallest effect of the models discussed in this section, suggesting that the counterfactual *Tøyen* would have 255 more long-term residents than *Tøyen* had in 2020.

Immediately upon inspection, it is clear that model 5 does not satisfy the requirements of a good fit in the pretreatment period. Therefore, for this step of the analysis, further analyzing model 5 is futile. Rather, we return to discuss this model in the following analysis of unit and variable weight allocations to see if we can determine what went wrong in its configuration. To see the graph plotting the differences for each model and *Tøyen* outcomes, see Figure A.1 in the appendix.

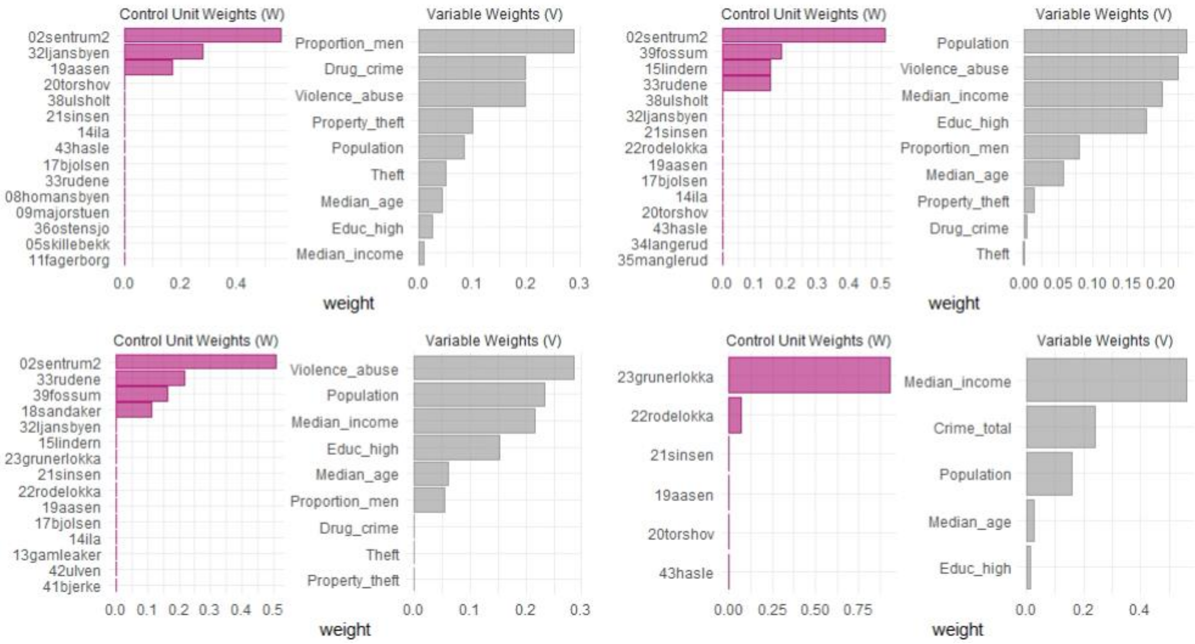


**Figure 9.** Unit and variable weights for model 2, 3, 4 and 5. Showing top 15 comparison unit weights for model 2-4.

*Sentrum 2* is a recurring and considerable contributor across models 2-4. For model 2, interestingly, the unit weights are identical to model 1. The largest contributor is *Sentrum 2*, followed by *Ljansbyen* and *Åsen*. In contrast to our first two models, model 3 allocates weights to four units in the donor pool. Again, *Sentrum 2* is the biggest contributor with 51,5%. The three other contributors are Fossum with 18,4% and 14,9% coming from Lindern and *Rudene* each. Lindern is a semi-central sub-district, and Fossum and *Rudene* are located in the outer eastern sections of the municipality. Furthermore, model 4 also favors *Sentrum 2*, allocating it 51%, while giving *Rudene* 21,6%, Fossum 16,1% and Sandaker 11,3% of the unit weights in the model. It seems that model 5 has not found a composition in its donor pool to construct a meaningful pretreatment MSPE, judging by the fact that almost the entire model is based on the weighted variable outcomes from Grünerløkka. Again, model 5 seems to be infeasible. Interestingly, model 5 does not have *Sentrum 2* in its donor pool, a significant contributor to all other models. Likewise, it does not include other instrumental units in models 2, 3 and 4 like *Ljansbyen*, *Rudene* or Fossum. This suggests that out of the available donor pool, the trends and relations to our outcome variable are not present in the units of model 5. Notably, model 5 does have *Åsen* in its donor pool, which is a contributor in model 1 and 2, but does not employ it in the synthetic control. This suggests that the contribution of *Åsen* is only relevant in conjunction with the other unit weights in model 2.

The biggest difference in weight allocation between the models, and perhaps the most interesting, seems to be in which variables the models favor. As noted, model 2 has almost the exact same synthetic outcome trends and unit weights as model 1, meaning variable weights are potentially their only compositional difference. Primarily, model 2 favors proportion of men as a predictor for long-term residency. The following three variable weights are allocated to three crime indicators, which intuitively seem more plausible as predictors of long-term residency dynamics than "proportion of men". One variable of notable difference between model 1 and  2 is the income indicator. In model 1, it has the third highest weight, while in model 2 it barely has any weight at all. Additionally, as with model 1, the weight distributions are fairly balanced., which implies a balanced synthetic unit, taking into account more characteristics of its constituent weighted units. Variable weights for model 3 are slightly less evenly distributed compared to model 1 and 2. Here, however, population and violent/abusive crime contribute around 20% each, with median incomes and high education indicators closely following.

Population is a plausible predictor of residential mobility patterns, as a growth in population can directly impact the amount of residents in the area. Intuitively, violent and abusive crime is more difficult to imagine having too large impacts on the amount of long-term residents, though it is not implausible that it might carry some correlative or confounding impacts with it. The weight allocations in model 4 also favor population and violent and abusive crime variables, only swapping their order. Both constitute a larger portion of the predictive power for this model's synthetic *Tøyen*. Model 5 takes most of its prediction for our outcome of interest from median incomes, but in light of having data predominantly from Grünerløkka and its unconvincing pretreatment fit, this model is not informative as to the potential effects of the treatment in study. It does however give a glimpse into the importance of the donor pool units and their respective contributions to the previous models.

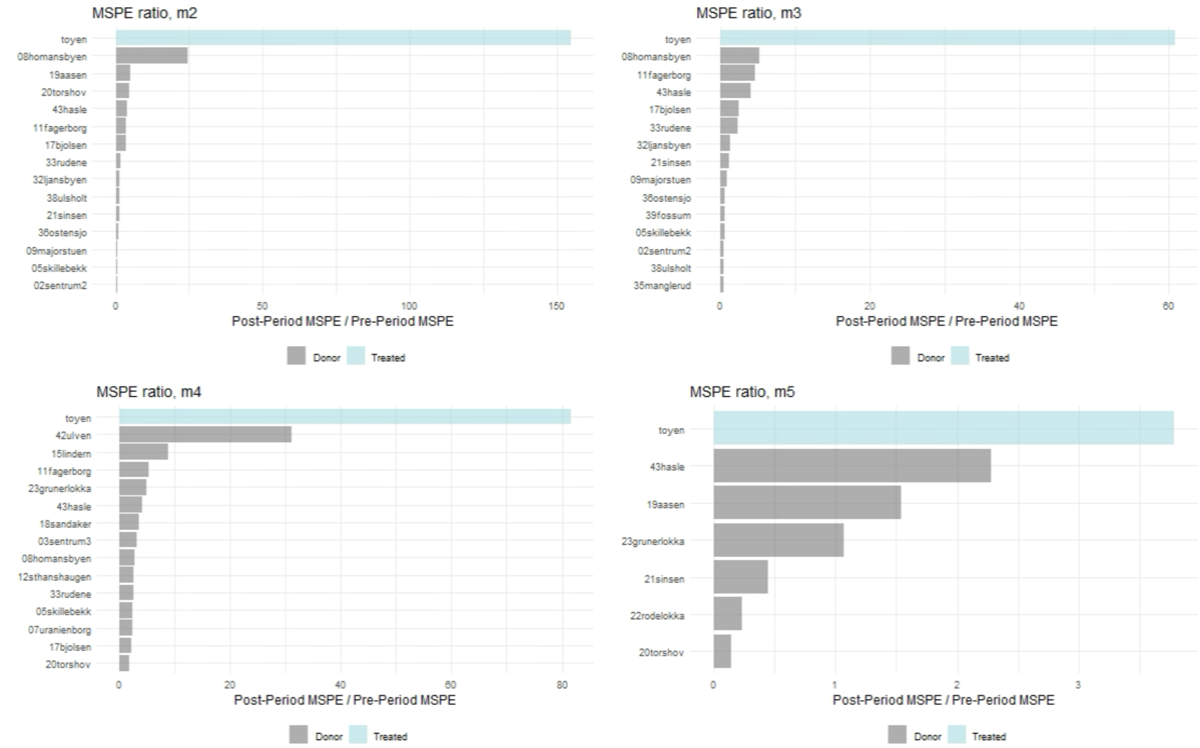


**Figure 10.** MSPE ratios for model 2-5

Next, we turn to significance testing[8]. First, let's discuss the MSPE ratios of our models. Remember, this value is calculated by dividing the postintervention MSPE with the preintervention MSPE. In Figure 5.6 we see that, disregarding model 5, MSPE ratios are very high compared to our donor pool placebo tests. The highest is found in model 2, with a ratio of 154, followed by Homansbyen with a ratio of 25. Model 3 has a MSPE ratio of 61 and model 4 an MSPE ratio of 82. Again, a higher MSPE ratio than the placebo cases suggests a statistically significant effect. I want to emphasize, however, that this does not constitute proof of an effect.

Now, turning to Figure 5.7, whereby visual inspection of whether the treated unit outcome trends stand out from the placebo units is next. For model 2, there is quite clearly a difference in the posttreatment period. In model 3 and 4, the amount of donor pool units makes the

[8] For complete significance data table for models 2-5, see appendix

graphs crowded. However, it is possible to discern that the synthetic control has more pronounced trends in the posttreatment period. Model 5 differences are inconclusive, further cementing its lack of findings.

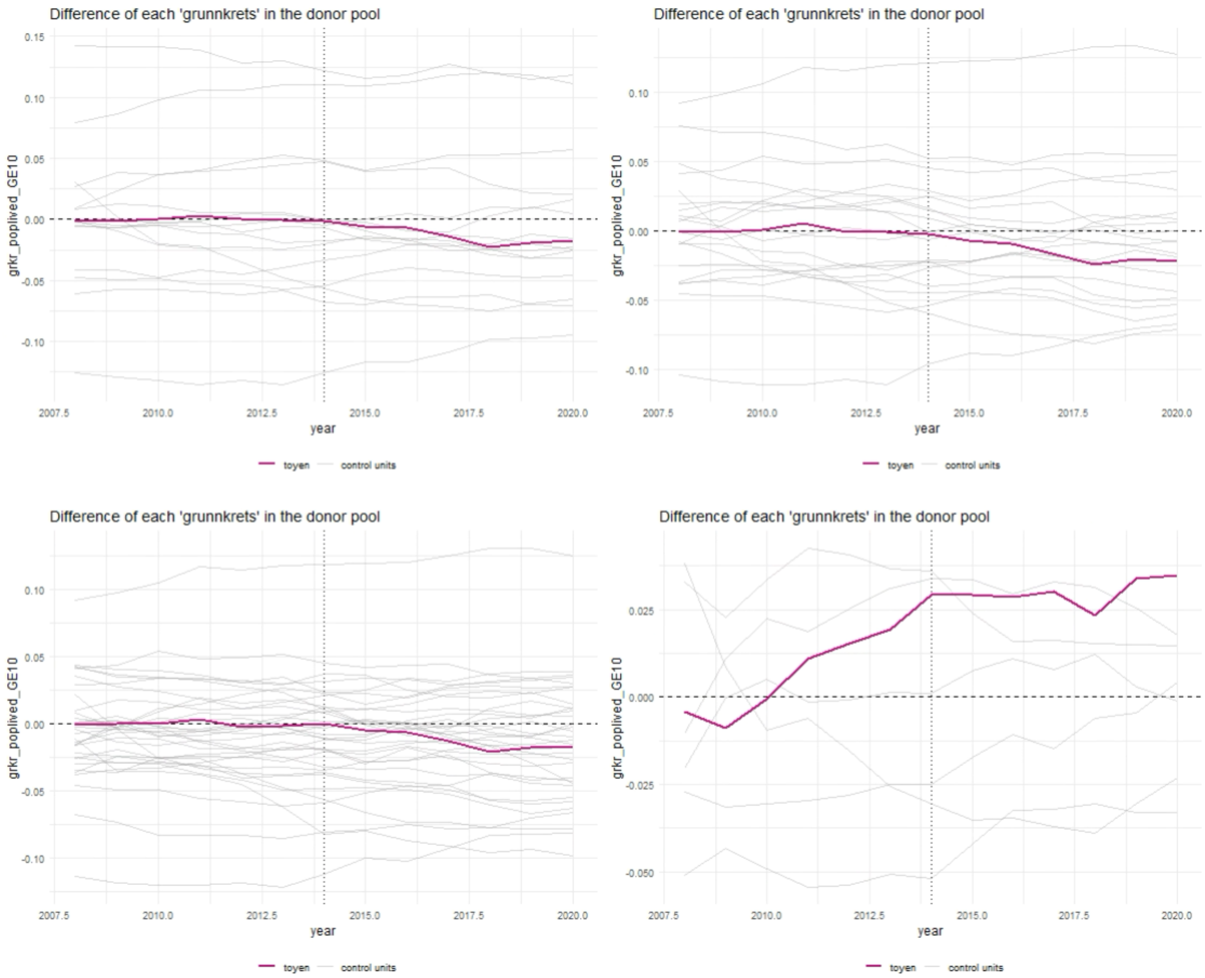


**Figure 11.** Placebo tests model 2-5

In model 1, we saw that the fisher's exact p-test did not produce satisfying outputs from which to determine its statistical significance. To test whether this was due to the donor pool being too small. built 4 additional models of different sizes to test see if the first model was based on a significant relation in the data. The p-values calculated for models 2, 3 and 4 show an improvement over model 1. For model 2, the p-value outcome is 0.0625. Model 3 has a p-value of 0.048, and model 4 has a p-value of 0.029. This means that model 3 and 4 pass the commonly held threshold of a p-value under 0.05. As mentioned previously, in the context of the synthetic control method, this should not be taken as a sign to reject the null hypothesis altogether, rather as suggestive of an effect.

The final significance test at our disposal is the z-score. Every model, except for model 5, have very high z-scores, ranging from 3.707 for model 2 to 5.267 for model 4. Checking these numbers against a z-score table shows that the z-test also suggests that the estimated effects for model 2, 3 and 4 are statistically significant.

In conclusion, the synthetic control models employed in this study demonstrate interesting findings. Models 1-4 all exhibit similar trends during both the pretreatment and posttreatment periods. According to these models, the synthetic control outcomes indicate a decrease in the number of 10-year residents between 249 and 310 in 2020, 6 years after the implementation of *Tøyenløftet*. The construction of these trends relies on unit weights, with *Sentrum 2* being favored in models 1-4. It is noteworthy that model 5, which did not include *Sentrum 2* in its donor pool, failed to provide a satisfactory fit for the pretreatment period. This suggests that *Sentrum 2* was crucial in determining the potential effects of *Tøyenløftet* on long-term residency. Considering *Sentrum 2* shares similarities with *Tøyen* in terms of being an inner city district with high residential turnover rates, this outcome is somewhat unsurprising.

Furthermore, the constituent unit weights in the remaining models tend to favor a geographically balanced mix. Apart from *Sentrum 2*, each model assigns weights to one or two outer eastern sub-districts and one inner city sub-district. It is worth noting that the specific units used in the models are not consistently the same, indicating potential geographically consistent patterns of residential mobility across different units. With a few exceptions, most of the significance tests conducted for models 1-4 suggest that the estimated effects are statistically significant, adding further support to the findings.

Overall, the synthetic control models provide insightful results, showcasing the estimated impact of *Tøyen*løftet on the proportion of long-term residents. The consistent trends observed across four of the models, along with the statistical significance of the estimated effects, contribute to the validity and reliability of the findings.

# 6.0 Discussion

Over the course of this thesis, one underlying focus has been to understand what motivates residential relocations, and how area-based initiatives influence these motivations. Another overarching theme is to understand what role area-based initiatives play within the wider welfare policy framework of the Norwegian, social democratic welfare state. Essentially, these are the two notions that informed the two research questions of this thesis. In the interest of clarity, the following discussion will tackle the empirical research question first, meaning the research questions are tackled in reverse order. The reason for this structure is that the discussion of the model results will supplement the following discussion of area-based initiatives and welfare policy.

The empirically oriented research question of this thesis asks “did *Tøyenløftet* lead to a decrease in the proportion of long-term residents in *Tøyen*?” Consequently, the research design of this thesis was constructed with this question in mind. The underlying notion that motivated this question, was to understand whether contemporary urban policy prescriptions like area-based initiatives lead to unintended consequences, ultimately displacing the disadvantaged populations that they are meant to help. Furthermore, the theoretically oriented research question asks “

To reiterate the findings from chapter 5, the estimated models 1-4 suggest that *Tøyenløftet* has influenced the proportion of 10-year residents in *Tøyen*. In absolute terms, the models indicate that an additional 249-310 10-year residents would still have lived in *Tøyen* in 2020, had *Tøyenløftet* not been implemented. In proportional terms, this range represents a difference of 1,7 to 2,2 percent of the total residents in the area in 2020. Considering the percentage of people who had lived in *Tøyen* for ten years or more in 2020 was roughly 26%, an estimate that is a rather significant portion of the area’s long-term residents. Thus, whether I can confidently answer the research question in light of these results comes down to the reliability of the results. The results stayed consistent across models. All models with convincing pretreatment fits relied heavily on *Sentrum 2* for their respective trends, suggesting that the trends in this unit predicted the curve of the outcome of interest most reliably. However, with different subsequent unit weights, the model results stayed consistent. The estimates produced in models 3 and 4 indicate that the proportion of long-term residents did go down during the Tøyen implementation period. Area-based initiatives like *Tøyenløftet* are part of larger policy structures with bigger budgets. Remember, the budget for the initiative was 215 million NOK over the 5-year implementation period. Therefore, it is important to consider possible explanations for these findings.

There are some underlying factors that may account for some of these numbers. As discussed, *Tøyenløftet* included measures that shut down the social housing provision in two of its housing blocks in the area, proposing to sell it to the residents that lived in them for 80% of their market value. Many could not afford this, and accordingly moved from their social housing dwellings. As the social housing that replaced the ones in *Tøyen* were in other parts of inner-eastern Oslo, this may explain portions of the effect that the models estimate. Another aspect that may have some explanatory potential is the increasing housing prices that *Tøyen* saw both prior and during the *Tøyenløftet* implementation period. Notably, social housing rates follow the market rate development, meaning that social housing residents are not exempt from the consequences of rising housing costs. While it would be presumptuous to ascribe the increasing housing costs in *Tøyen* to *Tøyenløftet* exclusively, it is not unthinkable that it played a role in the higher relative price growth in *Tøyen* compared to the rest of Oslo.

In the Norwegian urban owner-occupier housing market, the competition for housing is fierce. This is particularly true for inner-city areas such as *Tøyen*. As mentioned previously, The Ministry of Environment government report from 2013 included a description of housing in the Norwegian context being both perceived as a welfare good, and an investment vehicle. One implication of this is that the people not receiving housing provision through thoroughly residualized social housing or means-tested economic support, are investors in a largely open market. Another implication of this is that when considering buying a dwelling, one would be remiss not to speculate over whether the housing prices in the local housing market is likely to grow the value of the dwelling in consideration. Thus, individuals on the housing market can be thought of as forward-looking economic agents in much the same sense that property developers and buyers-to-let are.

I emphasize this to make the point that area-based initiatives play into this dynamic, knowingly or unknowingly. An aspect of area-based initiatives is that they raise the “image” and public perception of an area. Thus, they increase the likelihood that economic actors will look to the area for their housing investment, whether that be owner-occupiers or property investors. Overall, this may increase the “pull” that *Tøyen* has on the housing market of the city. This aspect of area-based initiatives somewhat contradicts one of the stated overarching aims of such initiatives in Oslo, to stabilize turnover rates in the housing market.

The most consistent measures in *Tøyenløftet*, are the ones pertaining to transforming the area into one where families want to raise their children. The three overarching goals of *Tøyenløftet* articulated in 2016, all aimed at making the area more attractive to families and facilitate “local residential careers”. Out of 58 measures, 21 of them are in this category. hese include measures aimed at providing children with after-school activities and sports teams. As mentioned by Dieleman (2001), the decision of where to live is made by several members of a household. Accordingly, measures directed at improving children’s well-being may influence their opinions on this matter. Looking at these measures in push and pull terms, one could argue that they increase the pull-factor that *Tøyen* has for the population group “families with children”. That includes the families with children already living in *Tøyen*. However, while some measures alleviate some of the costs of living in the area, for example by providing free after-school programs for all school children in the school district, they do not address the roots of the increasing housing prices.

This is the juncture where an ostensibly paradoxical outcome of area-based initiatives occurs. As discussed earlier, the Norwegian housing market operates on relatively free market terms. Area-based initiatives have been linked to increasing house prices in other parts of Oslo. Area improvements made by an ABI are readily absorbed into housing values. Combined with the fact that social housing rates are set based on the rates in the private market, neither state nor municipality seem to have effective tools to alleviate the pressures put on vulnerable residents in an area receiving an area-based initiative. Importantly, this is not to say that improvements in areas with vulnerable residents should not be strived for because of accompanying consequences in economic sector far outside the jurisdiction of area-based initiatives. Rising housing prices are, after all, an indication that the area is an attractive place to live. The point is then, when these accompanying consequences are known to policymakers, and if the area-based initiatives implemented are serious about preventing displacement of the original residents, there needs to be explicit measures taken to manage the repercussions felt by the disadvantaged of inevitable housing market reactions. Considering the limited budgets of *Tøyenløftet*, however, it may not be fair to expect it to solve all these issues simultaneously. The discussion thus far has addressed a few points that pertain to welfare policy. Below this point, the ideals that are represented by the terms universalism, stratification and decommodification, serve as the starting points for discussing the findings.

Because of the inherent delineated nature of area-based initiatives, in a very strict sense of the term, they are not universal. As these initiatives primarily rely on statistical trends to determine which areas are eligible, individuals in wealthier neighborhoods do not receive the same level of policy attention as those in disadvantaged areas. Furthermore, the estimated models suggest portions of long-term residents may be displaced, possibly indicating that some of the vulnerable residents of *Tøyen* were not helped by the initiative either. On the other hand, area-based initiatives are part of the broader welfare policy framework. Therefore, they can be seen as a supplement to the broader, universalist structures of the welfare state. In a sense, area-based initiatives seem to play the function of “filling the gaps” left by national welfare policy. Now, regarding stratification, the methodological design of this project does not afford much of substance to discuss. As previously noted, the estimated models do not reveal anything about which groups of long-term residents were affected. Some of the measures taken in *Tøyenløftet* attempt to moderately redistribute capital in a targeted manner, yet not of the magnitude that could affect overall stratification.

When considering the degree of decommodification reflected in area-based initiatives, once again, the relationship between housing markets and area-based initiatives becomes relevant. As covered earlier, housing is largely regarded as “the fourth wobbly pillar of the welfare state” because of its location between market and welfare. The remaining pillars are the health sector, pensions and schooling, which are largely decommodified and have considerable institutional accompaniment overseeing their provision. Social housing, on the other hand, accounts for 3% of the housing stock in Oslo. The residualized nature of the provision means that it is reserved only for the most marginalized. Furthermore, it is structured in a dualist rental market, whereby omitting any chance to affect the wider private housing market norms and conditions. It can even be argued that this dualistic system supports the lacking standards in the private housing market by taking the “problematic” housing demand off the market. Area-based initiatives like *Tøyenløftet* do not have the budgets or institutional capacity to deal with dynamics that are produced at a higher geographical level. The somewhat lofty goals of *Tøyenløftet* of not displacing residents and lowering turnover rates in a way downplays and redirects blame for the failures that should be attributed to welfare policies.

Overarchingly, area-based initiatives in Norway can in one way be understood as an attempt to help connect the disadvantaged populations to the broader, universalist welfare institutions. They help in building trust in the local public service institutions by being present and active in a community that some argue are “excluded places”. However, when facing dynamics of the larger market structures such as the housing market, the area-based initiatives seem to not have feasible measures to counteract the disproportionate effects of rising housing prices on the most vulnerable residents in the areas. I conclude this section by imploring future area-based initiatives like *Tøyenløftet* to have measures that take this into account, to safeguard these vulnerable residents from potential displacement. This could include regulation that prevents housing market speculation from large property developers and buyers-to-let. However, in a country where 80 percent of the population own their homes, many of which have taken maxed-out loans to pay for, making changes that fundamentally challenges market-based housing allocation is politically strenuous.

This is not to say that the project should be expected to solve every issue within the area, but it seems like area-based initiatives of this magnitude are unable to meaningfully affect inequalities that are produced at a higher level of society. The image of these initiatives “swimming against the tide” seems pertinent. In light of national welfare institutions seemingly automatically growing in budgetary scales, area-based initiatives may be a cost-effective way to make improvements in an area. Yet, these initiatives should be realistic in their goals. While it might be politically infeasible to do so, being honest and pragmatic about how such initiatives may affect the most vulnerable, seems like an easy first step.

To conclude, the empirical research question asked whether *Tøyenløftet* led to a decrease of long-term residents in the area. With certain reservations, the synthetic control models suggest that this is indeed the case. The theoretical research question aimed to discuss area-based initiatives considering historical social democratic welfare principles. While such initiatives can play supplementary role to reaching intended welfare outcomes, they do not have the scale to meaningfully affect inequalities produced in dynamics with higher-level market structures. Accordingly, area-based initiatives should either promise less from the start or have significantly larger budgets to tackle these issues as new initiatives are implemented.

**Future research and limitations of the research design**

In future synthetic control research designs aimed at investigating the potential effects that area-based initiatives may have on residential mobility patterns, would be well served to include variables that enable thorough descriptions of housing market attributes of an area. Having indicators on housing price developments, proportion of renters and owner-occupiers or average dwelling sizes would be helpful. This would improve the accuracy of the matched units. Additionally, further research can be done with similar research designs on other outcomes of interest, such as income levels, educational attainment and related variables. Furthermore, more substantial descriptions of the relationship between area-based initiatives and housing markets are instrumental to understanding the effects of such initiatives.

In many ways, this thesis is not only an investigation into the dynamics of area-based initiatives, but also a test of the methodological tool that is the synthetic control model. The method is usually applied to higher geographical levels. Meanwhile, a prominent limitation of the research design in this project is that discerning the differential effects on various population groups is not possible. Another limitation is that while the estimates demonstrate a decrease in long-term residents, it does not describe the residential mobility patterns that were triggered by this. It cannot describe where these long-term residents moved. All we know is that they moved out of the delineated area. Also, it does not describe who moved into the area in their place. Data that is coded with geographical information may provide additional analytical depth in questions regarding residential mobility. Nonetheless, the synthetic control model does show some promise as to its merits of use for evaluating policy implementation at the sub-district level.

# 7.0 Conclusion

This thesis has conducted an evaluation of the area-based initiative *Tøyenløftet*, which was implemented to compensate for the loss of the Munch Museum. Spanning the period 2014-2018, 58 different measures were implemented in the area. Some researchers point out that initiatives of this sort do not help the disadvantaged residents they ostensibly are meant to help, and in some cases lead to displacement of original residents. This motivated the empirical research question, investigating whether long-term residents were displaced by the implementation of the policy package *Tøyenløftet*. To build a substantial backdrop of previous research to enable discussion of the findings, insights from area-based initiative research, residential mobility research and housing studies were presented. Meanwhile, area-based initiatives are defined as welfare policy in Norway. Therefore, to enable a discussion of the role that these initiatives play in the wider welfare policy framework in Norway, an additional research question asked whether Norwegian area-based initiatives conform to social democratic welfare principles.

To investigate the connection between area-based initiatives and long-term residents, the synthetic control method was employed. The synthetic control model is a comparative case study that uses a donor pool of similar, yet untreated, city sub-districts in Oslo to construct a "counterfactual" Tøyen, which represents the trends of a Tøyen where the area-based initiative was not implemented. The research design constructed five models with different sizes of units in the donor pool at disposal. While different in composition, their configurations were identical, with one exception. The models estimated that a margin of between 249 and 310 additional long-term residents moved out of Tøyen by year 2020 than would have moved if Tøyenløftet had not been implemented. Models 3 and 4 had the most reliable results, having concurrent trends with the ones estimated by the other models and passing each of the four significance tests available to the research design.

Furthermore, there are some possible explanations for this estimated difference between actual Tøyen outcomes and the synthetic control. A significant portion of these residents likely moved when the social housing functions were shut down in two social housing blocks that have been in the area since the 1970s. Another likely influence is the rapidly increasing housing prices in the area. Since housing market rates takes place on a much higher level and scale than *Tøyenløftet*, one cannot expect an initiative of this size to meaningfully counteract these trends of rising housing costs. An important point to mention is that social housing rates are based on rental market rates. Therefore, the residents of the 800 or so social housing units are not exempted from the dynamics of the relatively free housing market. While there are certainly other factors than *Tøyenløftet* that may influence the estimated exodus of a portion of the area's long-term residents, the units in the donor pool are also part of the Oslo housing market, meaning the housing market dynamics are somewhat accounted for in the research design.

Furthermore, the role of area-based initiatives in the Norwegian welfare state is discussed. The three terms meant to represent the principles that characterize social democratic welfare states are universalism, (low) stratification and decommodification. Pertaining to the former of the three, area-based initiatives may be seen as a supplement to the broader welfare policies, "filling in the gaps" where the larger institutions are not sufficient to curtail negative trends. The estimated models are not sufficient to provide satisfying answers as to the stratification structures that area-based initiatives may produce. This is largely due to the model's inability to discriminate between group-specific effects. The latter of the three terms discusses decommodification. Again, when discussing dynamics of residential mobility, one cannot sidestep discussion of the characteristics of the housing market. As mentioned, the dualist way in which the Norwegian housing market is structured, places social housing in a residualized state and preclude a lot of the control that national policy may have had on the rental housing market.

If area-based initiatives are serious about their commitment to prevent displacement of vulnerable people as a result of improving a broad set of characteristics in an area, measures need to be taken to protect vulnerable residents from the inevitable housing market reactions to such programs.

Further research on this matter could employ different data structures that include geographical data, allowing for analysis of where long-term residents relocate to. Furthermore, future synthetic control methods investigating similar outcomes, would be well served by including variables that indicate housing or population characteristics. This would aid in determining which donor pool units most closely resemble the treated unit, allowing for more robust findings.

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All sources in this thesis are declared.

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# Appendix

## Appendix 1: Figures and Tables

X.x Data table after initial preparation

Values are averages from 2000-2020. Districts with scant population and NA values are omitted from the data.

| City subdistrict | Total pop. | Prop. men | Med. age | Med. income | Population 18-67 | Prop. men, 18-67 | Med. incomes, 18-67 | BSU, new residents | BSU, lived 1 year | BSU, lived 2 years | BSU, lived 3 years | BSU, lived 5 years | BSU, lived 10 years | Education low | Education, high | Theft[1] | Property theft[1] | Narcotics[1] | Violence, abuse[1] | Crime, total[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sentrum 2 | 8,114 | 0.572 | 30.9 | 258,699 | 7,265 | 0.580 | 283,175 | 0.312 | 0.688 | 0.506 | 0.392 | 0.258 | 0.119 | 0.248 | 0.474 | 0.004 | 0.006 | 0.010 | 0.004 | 0.029 |
| Sentrum 3 | 4,017 | 0.533 | 32.5 | 290,253 | 3,410 | 0.542 | 323,514 | 0.272 | 0.728 | 0.562 | 0.455 | 0.326 | 0.183 | 0.208 | 0.512 | 0.003 | 0.003 | 0.005 | 0.002 | 0.019 |
| Skillebekk | 4,582 | 0.496 | 38.3 | 329,555 | 3,499 | 0.519 | 381,559 | 0.210 | 0.790 | 0.655 | 0.562 | 0.441 | 0.283 | 0.149 | 0.587 | 0.002 | 0.002 | 0.004 | 0.001 | 0.014 |
| Frogner | 12,479 | 0.478 | 39.1 | 323,081 | 9,343 | 0.492 | 373,297 | 0.183 | 0.817 | 0.695 | 0.610 | 0.494 | 0.333 | 0.153 | 0.581 | 0.002 | 0.002 | 0.004 | 0.002 | 0.014 |
| Uranienborg | 5,680 | 0.494 | 35.4 | 314,762 | 4,434 | 0.503 | 367,803 | 0.209 | 0.791 | 0.656 | 0.564 | 0.441 | 0.282 | 0.156 | 0.589 | 0.002 | 0.002 | 0.004 | 0.001 | 0.015 |
| Homansbyen | 8,355 | 0.501 | 33.0 | 305,684 | 6,890 | 0.518 | 341,789 | 0.250 | 0.750 | 0.596 | 0.494 | 0.370 | 0.223 | 0.176 | 0.564 | 0.003 | 0.003 | 0.006 | 0.002 | 0.017 |
| Majorstuen | 12,047 | 0.485 | 34.7 | 314,666 | 9,381 | 0.506 | 359,695 | 0.222 | 0.778 | 0.637 | 0.540 | 0.416 | 0.262 | 0.156 | 0.582 | 0.002 | 0.003 | 0.005 | 0.002 | 0.015 |
| Fagerborg | 4,556 | 0.475 | 33.8 | 326,372 | 3,624 | 0.480 | 376,942 | 0.216 | 0.784 | 0.643 | 0.544 | 0.419 | 0.265 | 0.121 | 0.638 | 0.001 | 0.002 | 0.003 | 0.001 | 0.011 |
| St. Hanshaugen | 9,481 | 0.500 | 32.4 | 321,083 | 7,782 | 0.510 | 364,959 | 0.236 | 0.764 | 0.614 | 0.513 | 0.385 | 0.236 | 0.144 | 0.620 | 0.002 | 0.003 | 0.005 | 0.002 | 0.015 |
| Gamle Aker | 5,655 | 0.509 | 31.7 | 305,726 | 4,805 | 0.519 | 344,521 | 0.272 | 0.728 | 0.556 | 0.441 | 0.304 | 0.164 | 0.176 | 0.577 | 0.002 | 0.003 | 0.006 | 0.002 | 0.017 |
| Ila | 6,531 | 0.486 | 32.8 | 304,723 | 5,252 | 0.501 | 361,620 | 0.228 | 0.772 | 0.619 | 0.511 | 0.372 | 0.216 | 0.166 | 0.606 | 0.002 | 0.004 | 0.006 | 0.002 | 0.016 |
| Lindern | 3,684 | 0.450 | 35.9 | 264,296 | 2,588 | 0.478 | 337,122 | 0.226 | 0.774 | 0.623 | 0.519 | 0.384 | 0.221 | 0.196 | 0.561 | 0.002 | 0.004 | 0.005 | 0.003 | 0.017 |
| Sagene | 5,511 | 0.473 | 32.9 | 316,409 | 4,323 | 0.473 | 371,901 | 0.201 | 0.799 | 0.652 | 0.542 | 0.397 | 0.230 | 0.171 | 0.610 | 0.002 | 0.003 | 0.004 | 0.002 | 0.014 |
| Bjølsen | 6,593 | 0.490 | 33.3 | 268,845 | 5,245 | 0.506 | 331,692 | 0.222 | 0.778 | 0.626 | 0.519 | 0.384 | 0.231 | 0.201 | 0.561 | 0.003 | 0.004 | 0.006 | 0.003 | 0.018 |
| Sandaker | 2,625 | 0.495 | 34.8 | 294,212 | 2,055 | 0.510 | 351,255 | 0.260 | 0.740 | 0.570 | 0.454 | 0.310 | 0.162 | 0.261 | 0.481 | 0.003 | 0.007 | 0.009 | 0.004 | 0.025 |
| Åsen | 8,827 | 0.496 | 34.6 | 285,416 | 6,671 | 0.510 | 357,574 | 0.191 | 0.809 | 0.671 | 0.567 | 0.428 | 0.260 | 0.232 | 0.522 | 0.003 | 0.005 | 0.007 | 0.003 | 0.019 |
| Torshov | 9,912 | 0.506 | 33.0 | 301,170 | 8,140 | 0.516 | 351,394 | 0.218 | 0.782 | 0.634 | 0.527 | 0.389 | 0.226 | 0.213 | 0.548 | 0.003 | 0.005 | 0.008 | 0.003 | 0.021 |
| Sinsen | 7,804 | 0.509 | 33.1 | 279,521 | 6,326 | 0.524 | 326,034 | 0.239 | 0.761 | 0.600 | 0.487 | 0.344 | 0.193 | 0.251 | 0.466 | 0.003 | 0.005 | 0.007 | 0.003 | 0.021 |
| Rodeløkka | 8,031 | 0.511 | 32.9 | 271,549 | 6,439 | 0.523 | 331,610 | 0.224 | 0.776 | 0.626 | 0.520 | 0.383 | 0.219 | 0.237 | 0.499 | 0.003 | 0.004 | 0.008 | 0.003 | 0.022 |
| Grünerløkka | 12,009 | 0.512 | 31.9 | 262,824 | 9,912 | 0.519 | 315,810 | 0.225 | 0.775 | 0.629 | 0.529 | 0.397 | 0.233 | 0.232 | 0.503 | 0.003 | 0.004 | 0.007 | 0.003 | 0.021 |
| Bekkelaget | 11,379 | 0.490 | 41.4 | 275,757 | 7,219 | 0.500 | 399,499 | 0.096 | 0.904 | 0.832 | 0.775 | 0.682 | 0.506 | 0.155 | 0.507 | 0.001 | 0.002 | 0.003 | 0.001 | 0.011 |
| Nordstrand | 11,055 | 0.484 | 42.0 | 281,725 | 6,846 | 0.492 | 402,934 | 0.092 | 0.908 | 0.838 | 0.781 | 0.690 | 0.519 | 0.147 | 0.511 | 0.001 | 0.001 | 0.003 | 0.001 | 0.010 |
| Ljansbyen | 20,526 | 0.495 | 37.0 | 224,141 | 13,741 | 0.495 | 318,051 | 0.086 | 0.914 | 0.846 | 0.788 | 0.692 | 0.511 | 0.304 | 0.344 | 0.002 | 0.004 | 0.005 | 0.003 | 0.019 |
| Rudene | 19,961 | 0.503 | 32.5 | 185,795 | 13,144 | 0.499 | 309,627 | 0.106 | 0.894 | 0.809 | 0.738 | 0.622 | 0.413 | 0.342 | 0.303 | 0.003 | 0.004 | 0.005 | 0.003 | 0.019 |
| Langerud | 24,306 | 0.464 | 38.7 | 259,036 | 15,624 | 0.479 | 348,457 | 0.104 | 0.896 | 0.812 | 0.744 | 0.637 | 0.466 | 0.254 | 0.370 | 0.001 | 0.003 | 0.004 | 0.002 | 0.014 |
| Manglerud | 17,780 | 0.482 | 38.0 | 265,972 | 11,598 | 0.496 | 367,141 | 0.118 | 0.882 | 0.793 | 0.723 | 0.615 | 0.441 | 0.222 | 0.410 | 0.001 | 0.003 | 0.004 | 0.002 | 0.014 |
| Østensjø | 24,628 | 0.476 | 39.7 | 270,629 | 15,547 | 0.486 | 371,006 | 0.092 | 0.908 | 0.835 | 0.774 | 0.677 | 0.509 | 0.214 | 0.414 | 0.001 | 0.003 | 0.003 | 0.002 | 0.012 |
| Alfaset | 17,674 | 0.487 | 39.4 | 248,028 | 11,513 | 0.497 | 327,863 | 0.098 | 0.902 | 0.825 | 0.762 | 0.659 | 0.483 | 0.306 | 0.310 | 0.002 | 0.003 | 0.004 | 0.002 | 0.015 |
| Ulsholt | 25,392 | 0.495 | 35.5 | 219,028 | 17,123 | 0.499 | 302,698 | 0.095 | 0.905 | 0.829 | 0.764 | 0.659 | 0.475 | 0.384 | 0.238 | 0.002 | 0.004 | 0.005 | 0.004 | 0.020 |
| Fossum | 29,154 | 0.499 | 38.4 | 218,207 | 19,002 | 0.504 | 299,151 | 0.088 | 0.912 | 0.844 | 0.786 | 0.693 | 0.522 | 0.394 | 0.216 | 0.002 | 0.004 | 0.005 | 0.003 | 0.019 |
| Grorud | 25,381 | 0.487 | 37.4 | 228,896 | 16,778 | 0.499 | 308,373 | 0.098 | 0.902 | 0.825 | 0.761 | 0.657 | 0.479 | 0.369 | 0.251 | 0.002 | 0.004 | 0.005 | 0.003 | 0.019 |
| Bjerke | 26,692 | 0.490 | 36.6 | 244,016 | 17,417 | 0.502 | 335,497 | 0.123 | 0.877 | 0.784 | 0.712 | 0.603 | 0.430 | 0.290 | 0.366 | 0.002 | 0.003 | 0.004 | 0.002 | 0.015 |
| Ulven | 13,969 | 0.496 | 35.9 | 278,331 | 10,054 | 0.513 | 349,910 | 0.159 | 0.841 | 0.723 | 0.632 | 0.504 | 0.330 | 0.263 | 0.392 | 0.002 | 0.003 | 0.005 | 0.003 | 0.016 |
| Hasle | 9,917 | 0.500 | 34.8 | 284,926 | 7,077 | 0.513 | 370,539 | 0.193 | 0.807 | 0.671 | 0.571 | 0.436 | 0.267 | 0.204 | 0.505 | 0.002 | 0.003 | 0.005 | 0.002 | 0.016 |
| Tøyen[2] | 12,612 | 0.519 | 32.2 | 218,613 | 9,661 | 0.531 | 285,686 | 0.201 | 0.799 | 0.660 | 0.559 | 0.418 | 0.235 | 0.334 | 0.421 | 0.004 | 0.007 | 0.009 | 0.005 | 0.027 |
| SD, total[3] | **7,628** | **0.021** | **3.0** | **36,007** | **4,688** | **0.020** | **30,064** | **0.066** | **0.066** | **0.102** | **0.122** | **0.137** | **0.127** | **0.074** | **0.117** | **0.001** | **0.001** | **0.002** | **0.001** | **0.004** |
| Means, total | **12,483** | **0.495** | **35.3** | **275,484** | **8,849** | **0.507** | **344,277** | **0.182** | **0.818** | **0.694** | **0.605** | **0.482** | **0.318** | **0.229** | **0.475** | **0.002** | **0.004** | **0.005** | **0.003** | **0.017** |

[1] Only convictions are included

[2] Treated unit

[3] Standard deviation values

Dataset is provided by the ISS project **Criminal exposure in vulnerable areas**, University of Oslo

**Table A.1** Average values for (almost) all variables and all units in the initial data set.

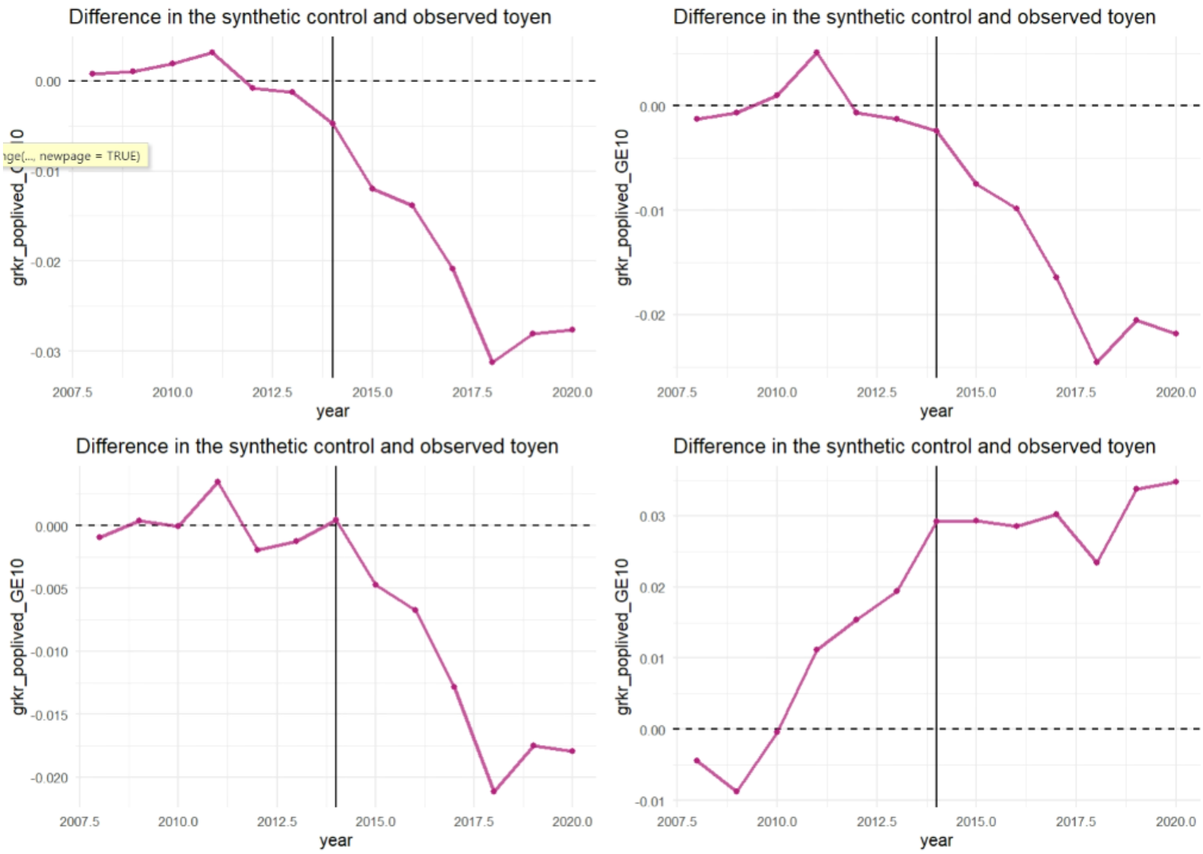


**Figure A.1** Synthetic control difference relative to *Tøyen* outcomes. Model 2, 3, 4 and 5.

Significance data, m2

| Subdistrict | Type | MSPE Ratio | Fishers P | Z-score |
|---|---|---|---|---|
| toyen | Treated | 154.515 | 0.0625 | 3.707 |
| 08homansbyen | Donor | 24.473 | 0.1250 | 0.301 |
| 19aasen | Donor | 4.794 | 0.1875 | −0.214 |
| 20torshov | Donor | 4.482 | 0.2500 | −0.223 |
| 43hasle | Donor | 4.012 | 0.3125 | −0.235 |
| 11fagerborg | Donor | 3.468 | 0.3750 | −0.249 |
| 17bjolsen | Donor | 3.390 | 0.4375 | −0.251 |
| 33rudene | Donor | 1.662 | 0.5000 | −0.296 |
| 32ljansbyen | Donor | 1.325 | 0.5625 | −0.305 |
| 38ulsholt | Donor | 1.279 | 0.6250 | −0.307 |
| 21sinsen | Donor | 1.205 | 0.6875 | −0.308 |

Significance data, m3

| Subdistrict | Type | MSPE Ratio | Fishers P | Z-score |
|---|---|---|---|---|
| toyen | Treated | 60.857 | 0.048 | 4.334 |
| 08homansbyen | Donor | 5.334 | 0.095 | 0.085 |
| 11fagerborg | Donor | 4.738 | 0.143 | 0.039 |
| 43hasle | Donor | 4.068 | 0.190 | −0.012 |
| 17bjolsen | Donor | 2.488 | 0.238 | −0.133 |
| 33rudene | Donor | 2.424 | 0.286 | −0.138 |
| 32ljansbyen | Donor | 1.337 | 0.333 | −0.221 |
| 21sinsen | Donor | 1.279 | 0.381 | −0.225 |
| 09majorstuen | Donor | 0.913 | 0.429 | −0.253 |
| 36ostensjo | Donor | 0.664 | 0.476 | −0.272 |
| 39fossum | Donor | 0.662 | 0.524 | −0.273 |

Significance data, m4

| Subdistrict | Type | MSPE Ratio | Fishers P | Z-score |
|---|---|---|---|---|
| toyen | Treated | 81.641 | 0.029 | 5.267 |
| 42ulven | Donor | 31.032 | 0.059 | 1.788 |
| 15lindern | Donor | 8.696 | 0.088 | 0.252 |
| 11fagerborg | Donor | 5.266 | 0.118 | 0.017 |
| 23grunerlokka | Donor | 4.815 | 0.147 | −0.014 |
| 43hasle | Donor | 4.106 | 0.176 | −0.063 |
| 18sandaker | Donor | 3.490 | 0.206 | −0.106 |
| 03sentrum3 | Donor | 3.033 | 0.235 | −0.137 |
| 08homansbyen | Donor | 2.619 | 0.265 | −0.165 |
| 12sthanshaugen | Donor | 2.566 | 0.294 | −0.169 |
| 33rudene | Donor | 2.513 | 0.324 | −0.173 |

Significance data, m5

| Subdistrict | Type | MSPE Ratio | Fishers P | Z-score |
|---|---|---|---|---|
| toyen | Treated | 3.787 | 0.143 | 1.843 |
| 43hasle | Donor | 2.279 | 0.286 | 0.698 |
| 19aasen | Donor | 1.540 | 0.429 | 0.138 |
| 23grunerlokka | Donor | 1.073 | 0.571 | −0.217 |
| 21sinsen | Donor | 0.450 | 0.714 | −0.690 |
| 22rodelokka | Donor | 0.234 | 0.857 | −0.853 |
| 20torshov | Donor | 0.146 | 1.000 | −0.920 |

**Table A.2** Significance values, M2-M5.

## Appendix 2: R-script

```
# packages
library('tidyverse')
library('tidysynth')
library('MatchIt')
library('gt')
library('gridExtra')
library('grid')

# datasett
setwd("N:/durable/students/heineha")
gkdata <- read_rds("data/grunnkretsdata.Rds")


# treat-dummy for psm
gkdata <- mutate(gkdata, treat = ifelse(grunnkrets == "toyen", "1", "0"))
gkdata$treat <- as.numeric(gkdata$treat)

# add sub-district names for initially included units

gkdata_ren <- gkdata %>%
  mutate(grunnkrets = case_when(
    str_sub(grunnkrets, 1,6) == "030102" ~ "02sentrum2",
    str_sub(grunnkrets, 1,6) == "030103" ~ "03sentrum3",
    str_sub(grunnkrets, 1,6) == "030105" ~ "05skillebekk",
    str_sub(grunnkrets, 1,6) == "030106" ~ "06frogner",
    str_sub(grunnkrets, 1,6) == "030107" ~ "07uranienborg",
    str_sub(grunnkrets, 1,6) == "030108" ~ "08homansbyen",
    str_sub(grunnkrets, 1,6) == "030109" ~ "09majorstuen",
    str_sub(grunnkrets, 1,6) == "030111" ~ "11fagerborg",
    str_sub(grunnkrets, 1,6) == "030112" ~ "12sthanshaugen",
    str_sub(grunnkrets, 1,6) == "030113" ~ "13gamleaker",
    str_sub(grunnkrets, 1,6) == "030114" ~ "14ila",
    str_sub(grunnkrets, 1,6) == "030115" ~ "15lindern",
    str_sub(grunnkrets, 1,6) == "030116" ~ "16sagene",
    str_sub(grunnkrets, 1,6) == "030117" ~ "17bjolsen",
    str_sub(grunnkrets, 1,6) == "030118" ~ "18sandaker",
    str_sub(grunnkrets, 1,6) == "030119" ~ "19aasen",
    str_sub(grunnkrets, 1,6) == "030120" ~ "20torshov",
    str_sub(grunnkrets, 1,6) == "030121" ~ "21sinsen",
    str_sub(grunnkrets, 1,6) == "030122" ~ "22rodelokka",
    str_sub(grunnkrets, 1,6) == "030123" ~ "23grunerlokka",
    str_sub(grunnkrets, 1,6) == "030130" ~ "30bekkelaget",
    str_sub(grunnkrets, 1,6) == "030131" ~ "31nordstrand",
    str_sub(grunnkrets, 1,6) == "030132" ~ "32ljansbyen",
    str_sub(grunnkrets, 1,6) == "030133" ~ "33rudene",
    str_sub(grunnkrets, 1,6) == "030134" ~ "34langerud",
    str_sub(grunnkrets, 1,6) == "030135" ~ "35manglerud",
    str_sub(grunnkrets, 1,6) == "030136" ~ "36ostensjo",
    str_sub(grunnkrets, 1,6) == "030137" ~ "37alfaset",
    str_sub(grunnkrets, 1,6) == "030138" ~ "38ulsholt",
    str_sub(grunnkrets, 1,6) == "030139" ~ "39fossum",
    str_sub(grunnkrets, 1,6) == "030141" ~ "41bjerke",
    str_sub(grunnkrets, 1,6) == "030142" ~ "42ulven",
    str_sub(grunnkrets, 1,6) == "030143" ~ "43hasle",
    str_sub(grunnkrets, 1,5) == "toyen" ~ "toyen"))

# omit infeasible units and remove years 2000-2007
gkdata_ren <- gkdata_ren %>%
  na.omit() %>%
  filter(!year < 2008)
```

```
# reorder

gkdata_ren <- gkdata_ren %>%
  arrange(grunnkrets) %>%
  relocate(treat, .after = grunnkrets)

# isolate years for PSM

gkdata_psm <- gkdata_ren %>%
  filter(!year < 2012) %>%
  filter(!year > 2012)


#### MatchIt - Propensity Score Matching

# Model 1: nearest neighbor, mahalanobis match, ratio 10

m.out10 <- matchit(treat ~
                     persons +
                     median_incomes +
                     median_age +
                     utd_hoy +
                     prop_men +
                     grkr_poplived_GE10 +
                     vinningslovbrudd +
                     eiendomstyveri +
                     rusmiddellovbrudd +
                     vold_og_mishandling,
                   data = gkdata_psm,
                   method = "nearest",
                   distance = "mahalanobis",
                   ratio = 10)
m.sum10 <- summary(m.out10)

# Units from PSM r10 data set

m.data10 <- match.data(m.out10, data = gkdata_psm, distance = "mahalanobis")
view(m.data10)

# Fetch all unit years for model 1

gkdata_scm10 <- gkdata_ren %>%
  filter(str_detect(grunnkrets, "02|08|09|14|19|20|21|32|33|43|toyen"))

# Model 2: nearest neighbor, mahalanobis match, ratio 15

m.out15 <- matchit(treat ~
                     persons +
                     median_incomes +
                     median_age +
                     utd_hoy +
                     prop_men +
                     grkr_poplived_GE10 +
                     vinningslovbrudd +
                     eiendomstyveri +
                     rusmiddellovbrudd +
                     vold_og_mishandling,
                   data = gkdata_psm,
                   method = "nearest",
                   distance = "mahalanobis",
                   ratio = 15)

# Units PSM15

m.data15 <- match.data(m.out15, data = gkdata_psm, distance = "mahalanobis")
view(m.data15)

# fetch all unit years for model 2
```

```
gkdata_scm15 <- gkdata_ren %>%
  filter(str_detect(grunnkrets,
"02|05|08|09|11|14|17|19|20|21|32|33|36|38|43|toyen"))

# Model 3: nearest neighbor, mahalanobis match, ratio 20

m.out20 <- matchit(treat ~
                     persons +
                     median_incomes +
                     median_age +
                     utd_hoy +
                     prop_men +
                     grkr_poplived_GE10 +
                     vinningslovbrudd +
                     eiendomstyveri +
                     rusmiddellovbrudd +
                     vold_og_mishandling,
                   data = gkdata_psm,
                   method = "nearest",
                   distance = "mahalanobis",
                   ratio = 20)

# unit results

m.data20 <- match.data(m.out20, data = gkdata_psm, distance = "mahalanobis")
view(m.data20)

# fetch all unit years for model 3

gkdata_scm20 <- gkdata_ren %>%
  filter(str_detect(grunnkrets,
"02|05|08|09|11|14|15|17|19|20|21|22|32|33|34|35|36|38|39|43|toyen"))

# Model 5: nearest neighbor, mahalanobis match, ratio 6

m.out6 <- matchit(treat ~
                    persons +
                    median_incomes +
                    median_age + utd_hoy +
                    prop_men +
                    grkr_poplived_GE10 +
                    lovbrudd_ialt,
                  data = gkdata_psm,
                  method = "nearest",
                  distance = "mahalanobis",
                  ratio = 6)

# unit results

m.data6 <- match.data(m.out6, data = gkdata_psm, distance = "mahalanobis")
view(m.data6)

# fetch all unit years for model 5

gkdata_scm6 <- gkdata_ren %>%
  filter(str_detect(grunnkrets, "19|20|21|22|23|43|toyen"))



#eCDF plot - balance data for model 1
ecdf_test<- plot(m.out10, type = 'ecdf')



### Tidysynth - synthetic control method
```

```
# SCM model 1 -- ratio 10

kontroll10 <- gkdata_scm10 %>%
  synthetic_control(outcome = grkr_poplived_GE10,
                    unit = grunnkrets,
                    time = year,
                    i_unit = "toyen",
                    i_time = 2014,
                    generate_placebos = T) %>%
  generate_predictor(time_window=2008:2014,
                     Median_income = mean(median_incomes, na.rm = TRUE),
                     Population = mean(persons, na.rm = TRUE),
                     Median_age = mean(median_age, na.rm = TRUE),
                     Theft = mean(vinningslovbrudd, na.rm = TRUE),
                     Property_theft = mean(eiendomstyveri, na.rm = TRUE),
                     Drug_crime = mean(rusmiddellovbrudd, na.rm = TRUE),
                     Violence_abuse = mean(vold_og_mishandling, na.rm = TRUE),
                     Proportion_men = mean(prop_men, na.rm = TRUE),
                     Educ_high = mean(utd_hoy, na.rm = TRUE)) %>%
  generate_weights(optimization_window=2008:2014,
                   #genoud = TRUE,
                   optimization_method = c('Nelder-Mead', 'BFGS', 'CG', 'L-BFGS-B',
'nlm', 'nlminb', 'spg', 'ucminf'),
                   #quadopt = "LowRankQP",
                   #include_fit = TRUE,
                   Margin.ipop=.05,
                   Sigf.ipop=7,
                   Bound.ipop=8) %>%
  generate_control()

# SCM model 1 -- ratio 10
k10trends <- kontroll10 %>% plot_trends(time_window = 2008:2020)
k10dif <- kontroll10 %>% plot_differences(time_window = 2008:2020)
k10weights <- kontroll10 %>% plot_weights()
k10placebo <- kontroll10 %>%  plot_placebos(time_window = 2008:2020, prune = F)

k10mspe <- kontroll10 %>% # full code to specify color and time window
  grab_signficance(time_window=2008:2020) %>%
  dplyr::mutate(unit_name =
forcats::fct_reorder(as.character(unit_name),mspe_ratio)) %>%
  ggplot2::ggplot(ggplot2::aes(unit_name,
                               mspe_ratio,
                               fill=type)) +
  ggplot2::geom_col(alpha=.65) +
  ggplot2::coord_flip() +
  ggplot2::labs(y = "Post-Period MSPE / Pre-Period MSPE",x="",fill="",color="",
                title="MSPE ratio") +
  ggplot2::scale_fill_manual(values=c("grey50","#addae2")) +
  ggplot2::scale_color_manual(values=c("grey50","#addae2")) +
  ggplot2::theme_minimal() +
  ggplot2::theme(legend.position = "bottom")

#significance data

k10pval_unf <- kontroll10 %>%
  grab_signficance() %>%
  select(!rank, -pre_mspe, -post_mspe)

k10pval <- k10pval_unf %>%
  gt() %>%
  tab_header(title = "Significance data") %>%
  fmt_number(columns = mspe_ratio,
             decimals = 3
  ) %>%
  fmt_number(columns = z_score,
             decimals = 3
  ) %>%
```

```
  opt_align_table_header(align = "left") %>%
  cols_label(
    type = "Type",
    unit_name = "Subdistrict",
    mspe_ratio = "MSPE Ratio",
    fishers_exact_pvalue = "Fishers P",
    z_score = "Z-score"
  )


# exact numbers for difference-analysis

grab_sc10 <- kontroll10 %>% grab_synthetic_control()



# various data extraction code

# k10.unit_w <- kontroll10 %>% grab_unit_weights()
# k10pred_w <- kontroll10 %>% grab_predictor_weights()
# view(k10pred_w)
# scm.pred_t <- kontroll_synt2 %>% grab_predictors(type = "treated")
# scm.pred_c <- kontroll_synt2 %>% grab_predictors(type = "controls")
# scm.signif_ <- kontroll20 %>% grab_signficance()
# k10balance <- kontroll10 %>% grab_balance_table()
# k10loss_ <- kontroll10 %>% grab_loss()
# scm.outcome_ <- kontroll_synt2 %>% grab_outcome()
# k10pred_ <- kontroll10 %>% grab_predictors()
# k10grabsynth <- kontroll20 %>% grab_synthetic_control()




#SCM model 2 -- ratio 15

kontroll15 <- gkdata_scm15 %>%
  synthetic_control(outcome = grkr_poplived_GE10,
                    unit = grunnkrets,
                    time = year,
                    i_unit = "toyen",
                    i_time = 2014,
                    generate_placebos = T) %>%
  generate_predictor(time_window=2008:2014,
                     Median_income = mean(median_incomes, na.rm = TRUE),
                     Population = mean(persons, na.rm = TRUE),
                     Median_age = mean(median_age, na.rm = TRUE),
                     Theft = mean(vinningslovbrudd, na.rm = TRUE),
                     Property_theft = mean(eiendomstyveri, na.rm = TRUE),
                     Drug_crime = mean(rusmiddellovbrudd, na.rm = TRUE),
                     Violence_abuse = mean(vold_og_mishandling, na.rm = TRUE),
                     Proportion_men = mean(prop_men, na.rm = TRUE),
                     Educ_high = mean(utd_hoy, na.rm = TRUE)) %>%
  generate_weights(optimization_window=2008:2014,
                   optimization_method = c('Nelder-Mead', 'BFGS', 'CG', 'L-BFGS-B',
'nlm', 'nlminb', 'spg', 'ucminf'),
                   Margin.ipop=.05,
                   Sigf.ipop=7,
                   Bound.ipop=8) %>%
  generate_control()

# Dataviz


k15trends <- kontroll15 %>% plot_trends(time_window = 2008:2020)
k15dif <- kontroll15 %>% plot_differences(time_window = 2008:2020)
k15weights <- kontroll15 %>% plot_weights()
k15placebo <- kontroll15 %>%  plot_placebos(time_window = 2008:2020, prune = F)
```

```
k15mspe <- kontroll15 %>% # full code to specify color and time window
  grab_signficance(time_window=2008:2020) %>%
  slice_head(n=15) %>%
  dplyr::mutate(unit_name =
forcats::fct_reorder(as.character(unit_name),mspe_ratio)) %>%
  ggplot2::ggplot(ggplot2::aes(unit_name,
                               mspe_ratio,
                               fill=type)) +
  ggplot2::geom_col(alpha=.65) +
  ggplot2::coord_flip() +
  ggplot2::labs(y = "Post-Period MSPE / Pre-Period MSPE",x="",fill="",color="",
                title="MSPE ratio, m2") +
  ggplot2::scale_fill_manual(values=c("grey50","#addae2")) +
  ggplot2::scale_color_manual(values=c("grey50","#addae2")) +
  ggplot2::theme_minimal() +
  ggplot2::theme(legend.position = "bottom")

k15pval_unf <- kontroll15 %>% grab_signficance() %>%
  select(!rank, -pre_mspe, -post_mspe) %>%
  slice_head(n=11)
k15pval <- k15pval_unf %>%
  gt() %>%
  tab_header(title = "Significance data, m2") %>%
  fmt_number(columns = mspe_ratio,
             decimals = 3
  ) %>%
  fmt_number(columns = z_score,
             decimals = 3
  ) %>%
  fmt_number(columns = fishers_exact_pvalue,
             decimals = 3
  ) %>%
  opt_align_table_header(align = "left") %>%
  cols_label(
    type = "Type",
    unit_name = "Subdistrict",
    mspe_ratio = "MSPE Ratio",
    fishers_exact_pvalue = "Fishers P",
    z_score = "Z-score"
  )

k15results <- grid.arrange(grobs=list(k15trends,k15dif, k15weights), cols = 2)
k15signif <- grid.arrange(grobs=list(k15mspe, k15placebo), cols = 2)
k15pval

k15gsig <- kontroll15 %>% grab_signficance()
view(k15gsig)
grab_sc15 <- kontroll15 %>% grab_synthetic_control()
view(grab_sc15)
k15unit_w <- kontroll15 %>% grab_unit_weights()
view(k15unit_w)
k15pred_w <- kontroll15 %>% grab_predictor_weights()
view(k15pred_w)

#SCM model 3 -- ratio 20

kontroll20 <- gkdata_scm20 %>%
  synthetic_control(outcome = grkr_poplived_GE10,
                    unit = grunnkrets,
                    time = year,
                    i_unit = "toyen",
                    i_time = 2014,
                    generate_placebos = T) %>%
  generate_predictor(time_window=2008:2014,
                     Median_income = mean(median_incomes, na.rm = TRUE),
                     Population = mean(persons, na.rm = TRUE),
                     Median_age = mean(median_age, na.rm = TRUE),
                     Theft = mean(vinningslovbrudd, na.rm = TRUE),
```

```
                    Property_theft = mean(eiendomstyveri, na.rm = TRUE),
                    Drug_crime = mean(rusmiddellovbrudd, na.rm = TRUE),
                    Violence_abuse = mean(vold_og_mishandling, na.rm = TRUE),
                    Proportion_men = mean(prop_men, na.rm = TRUE),
                    Educ_high = mean(utd_hoy, na.rm = TRUE)) %>%
  generate_weights(optimization_window=2008:2014,
                  optimization_method = c('Nelder-Mead', 'BFGS', 'CG', 'L-BFGS-B',
'nlm', 'nlminb', 'spg', 'ucminf'),
                  Margin.ipop=.05,
                  Sigf.ipop=7,
                  Bound.ipop=8) %>%
  generate_control()

# Dataviz



kontroll20[[7]][[2]] <- kontroll20[[7]][[2]] %>% # shorten the amount of units in
mspe_plot
  arrange(desc(weight)) %>%
  slice_head(n=15)

k20trends <- kontroll20 %>% plot_trends(time_window = 2008:2020)
k20dif <- kontroll20 %>% plot_differences(time_window = 2008:2020)
k20weights <- kontroll20 %>% plot_weights()
k20placebo <- kontroll20 %>%  plot_placebos(time_window = 2008:2020, prune = F)

k20mspe <- kontroll20 %>%  # full code to specify color and time window
  grab_signficance(time_window=2008:2020) %>%
  slice_head(n=15) %>%
  dplyr::mutate(unit_name =
forcats::fct_reorder(as.character(unit_name),mspe_ratio)) %>%
  ggplot2::ggplot(ggplot2::aes(unit_name,
                              mspe_ratio,
                              fill=type)) +
  ggplot2::geom_col(alpha=.65) +
  ggplot2::coord_flip() +
  ggplot2::labs(y = "Post-Period MSPE / Pre-Period MSPE",x="",fill="",color="",
                title="MSPE ratio, m3") +
  ggplot2::scale_fill_manual(values=c("grey50","#addae2")) +
  ggplot2::scale_color_manual(values=c("grey50","#addae2")) +
  ggplot2::theme_minimal() +
  ggplot2::theme(legend.position = "bottom")

#Construct table

k20pval_unf <- kontroll20 %>%
  grab_signficance() %>%
  select(!rank, -pre_mspe, -post_mspe) %>%
  slice_head(n=11)

k20pval <- k20pval_unf %>%
  gt() %>%
  tab_header(title = "Significance data, m3") %>%
  fmt_number(columns = mspe_ratio,
           decimals = 3
  ) %>%
  fmt_number(columns = z_score,
           decimals = 3
  ) %>%
  fmt_number(columns = fishers_exact_pvalue,
           decimals = 3
  ) %>%
  opt_align_table_header(align = "left") %>%
  cols_label(
    type = "Type",
    unit_name = "Subdistrict",
    mspe_ratio = "MSPE Ratio",
```

```
    fishers_exact_pvalue = "Fishers P",
    z_score = "Z-score"
  )


#plots and significance table
k20results <- grid.arrange(grobs=list(k20trends,k20dif, k20weights), cols = 2)
k20signif <- grid.arrange(grobs=list(k20mspe, k20placebo), cols = 2)
k20pval

# extract exact numbers
grab_sc20 <- kontroll20 %>% grab_synthetic_control()
k20unit_w <- kontroll20 %>% grab_unit_weights()
k20pred_w <- kontroll20 %>% grab_predictor_weights()

#Model 4 -- ratio 6

kontroll6 <- gkdata_scm6 %>%
  synthetic_control(outcome = grkr_poplived_GE10,
                    unit = grunnkrets,
                    time = year,
                    i_unit = "toyen",
                    i_time = 2014,
                    generate_placebos = T) %>%
  generate_predictor(time_window=2008:2014,
                     Median_income = mean(median_incomes, na.rm = TRUE),
                     Population = mean(persons, na.rm = TRUE),
                     Median_age = mean(median_age, na.rm = TRUE),
                     Crime_total = mean(lovbrudd_ialt, na.rm = TRUE),
                     Educ_high = mean(utd_hoy, na.rm = TRUE)) %>%
  generate_weights(optimization_window=2008:2014,
                   optimization_method = c('Nelder-Mead', 'BFGS', 'CG', 'L-BFGS-B',
'nlm', 'nlminb', 'spg', 'ucminf'),
                   include_fit = TRUE,
                   Margin.ipop=.05,
                   Sigf.ipop=7,
                   Bound.ipop=8) %>%
  generate_control()

# Dataviz

k6trends <- kontroll6 %>% plot_trends(time_window = 2008:2020)
k6dif <- kontroll6 %>% plot_differences(time_window = 2008:2020)
k6weights <- kontroll6 %>% plot_weights()
k6placebo <- kontroll6 %>%  plot_placebos(time_window = 2008:2020, prune = F)

k6mspe <- kontroll6 %>% # full code to specify color and time window
  grab_signficance(time_window=2008:2020) %>%
  dplyr::mutate(unit_name =
forcats::fct_reorder(as.character(unit_name),mspe_ratio)) %>%
  ggplot2::ggplot(ggplot2::aes(unit_name,
                               mspe_ratio,
                               fill=type)) +
  ggplot2::geom_col(alpha=.65) +
  ggplot2::coord_flip() +
  ggplot2::labs(y = "Post-Period MSPE / Pre-Period MSPE",x="",fill="",color="",
                title="MSPE ratio, m5") +
  ggplot2::scale_fill_manual(values=c("grey50","#addae2")) +
  ggplot2::scale_color_manual(values=c("grey50","#addae2")) +
  ggplot2::theme_minimal() +
  ggplot2::theme(legend.position = "bottom")

k6pval_unf <- kontroll6 %>% grab_signficance() %>%
  select(!rank, -pre_mspe, -post_mspe)
k6pval <- k6pval_unf %>%
  gt() %>%
  tab_header(title = "Significance data, m5") %>%
  fmt_number(columns = mspe_ratio,
```

```
             decimals = 3
  ) %>%
  fmt_number(columns = z_score,
             decimals = 3
  ) %>%
  fmt_number(columns = fishers_exact_pvalue,
             decimals = 3
  ) %>%

  opt_align_table_header(align = "left") %>%
  cols_label(
    type = "Type",
    unit_name = "Subdistrict",
    mspe_ratio = "MSPE Ratio",
    fishers_exact_pvalue = "Fishers P",
    z_score = "Z-score"
  )

k6results <- grid.arrange(grobs=list(k6trends,k6dif, k6weights), cols = 2)
k6signif <- grid.arrange(grobs=list(k6mspe, k6placebo), cols = 2)
k6pval



# SCM Model 5 - full data set, 33 comparison units

kontroll33 <- gkdata_ren %>%
  synthetic_control(outcome = grkr_poplived_GE10,
                    unit = grunnkrets,
                    time = year,
                    i_unit = "toyen",
                    i_time = 2014,
                    generate_placebos = T) %>%
  generate_predictor(time_window=2008:2014,
                     Median_income = mean(median_incomes, na.rm = TRUE),
                     Population = mean(persons, na.rm = TRUE),
                     Median_age = mean(median_age, na.rm = TRUE),
                     Theft = mean(vinningslovbrudd, na.rm = TRUE),
                     Property_theft = mean(eiendomstyveri, na.rm = TRUE),
                     Drug_crime = mean(rusmiddellovbrudd, na.rm = TRUE),
                     Violence_abuse = mean(vold_og_mishandling, na.rm = TRUE),
                     Proportion_men = mean(prop_men, na.rm = TRUE),
                     Educ_high = mean(utd_hoy, na.rm = TRUE)) %>%
  generate_weights(optimization_window=2008:2014,
                   optimization_method = c('Nelder-Mead', 'BFGS', 'CG', 'L-BFGS-B',
'nlm', 'nlminb', 'spg', 'ucminf'),
                   Margin.ipop=.05,
                   Sigf.ipop=7,
                   Bound.ipop=8) %>%
  generate_control()

### Dataviz

# Cutting off unit weights at 15
kontroll33[[7]][[2]] <- kontroll33[[7]][[2]] %>%
  arrange(desc(weight)) %>%
  slice_head(n=15)

k33trends <- kontroll33 %>% plot_trends(time_window = 2008:2020)
k33dif <- kontroll33 %>% plot_differences(time_window = 2008:2020)
k33weights <- kontroll33 %>% plot_weights()
k33placebo <- kontroll33 %>%  plot_placebos(time_window = 2008:2020, prune = F)

k33mspe <- kontroll33 %>% # full code to specify color and time window
  grab_signficance(time_window=2008:2020) %>%
  slice_head(n=15) %>%
  dplyr::mutate(unit_name =
forcats::fct_reorder(as.character(unit_name),mspe_ratio)) %>%
```

```
  ggplot2::ggplot(ggplot2::aes(unit_name,
                               mspe_ratio,
                               fill=type)) +
  ggplot2::geom_col(alpha=.65) +
  ggplot2::coord_flip() +
  ggplot2::labs(y = "Post-Period MSPE / Pre-Period MSPE",x="",fill="",color="",
                title="MSPE ratio, m4") +
  ggplot2::scale_fill_manual(values=c("grey50","#addae2")) +
  ggplot2::scale_color_manual(values=c("grey50","#addae2")) +
  ggplot2::theme_minimal() +
  ggplot2::theme(legend.position = "bottom")


k33pval_unf <- kontroll33 %>%
  grab_signficance() %>%
  select(!rank, -pre_mspe, -post_mspe) %>%
  slice_head(n=11)
k33pval <- k33pval_unf %>%
  gt() %>%
  tab_header(title = "Significance data, m4") %>%
  fmt_number(columns = mspe_ratio,
             decimals = 3
  ) %>%
  fmt_number(columns = z_score,
             decimals = 3
  ) %>%
  fmt_number(columns = fishers_exact_pvalue,
             decimals = 3
  ) %>%
  opt_align_table_header(align = "left") %>%
  cols_label(
    type = "Type",
    unit_name = "Subdistrict",
    mspe_ratio = "MSPE Ratio",
    fishers_exact_pvalue = "Fishers P",
    z_score = "Z-score"
  )




k33results <- grid.arrange(grobs=list(k33trends,k33dif, k33weights), cols = 2)
k33signif <- grid.arrange(grobs=list(k33mspe, k33placebo), cols = 2)
k33pval

grab_sc33 <- kontroll33 %>% grab_synthetic_control()
view(grab_sc33)

k33sign <- kontroll33 %>% grab_signficance()
k33unit_w <- kontroll33 %>% grab_unit_weights()
view(k33unit_w)
k33pred_w <- kontroll33 %>% grab_predictor_weights()
view(k33pred_w)

#Presentasjon m1
k10results <- grid.arrange(grobs=list(k10trends,k10dif))
k10weights

lay2 <- rbind(c(1, 1),
              c(1, 1),
              c(2, 2))
k10signif <- grid.arrange(grobs=list(k10placebo, k10mspe), cols = 2, layout_matrix
= lay2)
k10pval
k15pval
k20pval
k33pval
k6pval
```

```
# Presentasjon m2, m3, m4, m5
k_m4results <- grid.arrange(grobs=list(k15trends, k20trends, k33trends, k6trends),
cols = 2)
k_m4weights <- grid.arrange(grobs=list(k15weights, k20weights, k33weights,
k6weights), cols = 2)
k_m4dif <- grid.arrange(grobs=list(k15dif, k20dif, k33dif, k6dif), cols = 2)
k_m4mspe <- grid.arrange(grobs=list(k15mspe, k20mspe, k33mspe, k6mspe), cols = 2)
k_m4placebo <- grid.arrange(grobs=list(k15placebo, k20placebo, k33placebo,
k6placebo), cols = 2)
k_m4pval <- grid.table(k15pval, k20pval, k33pval, k6pval)

k_m4results_exp <- arrangeGrob(k15trends, k20trends, k33trends, k6trends, cols = 2)

#varplots

ggsave(file="varplots", t.varplots)

#Model 1 exports
ggsave(file="m10results.png", k10results)
ggsave(file="m10weights.png", k10weights)
ggsave(file="m10signif.png", k10signif)



# Model 2-5 exports
ggsave(file="m4results.png", k_m4results)
ggsave(file="m4weights.png", k_m4weights)
ggsave(file="m4dif.png", k_m4dif)
ggsave(file="m4mspe.png", k_m4mspe)
ggsave(file="m4placebo.png", k_m4placebo)
```