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Vacation homes and regional economic development*

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Abstract

This paper studies the relationship between vacation homes and regional development. Vacation homes are often in peripheral regions with relatively low standards of living. Seasonal residents contribute income to these areas but make local housing costlier and may have negative effects on local housing, labour, and product markets. I introduce a model that demonstrates how demand for housing from seasonal residents affects the welfare of local residents. I then study the effects of a Norwegian policy that obliges homeowners in certain municipalities to reside on their properties. The policy is shown to increase local population, employment, wages, and house prices.

Keywords: Regional growth, Regional policy, Residency requirement, Seasonal housing, Vacation homes

JEL classification: R11, R23, R31, R58

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1 Introduction

A significant share of the housing stock in many developed countries is held as seasonal or vacation homes: secondary residences that are used for part of the year by people who primarily live and work elsewhere. In the United States there are 3.6 million vacation homes, which is 3.1% of the housing stock (US Census Bureau, 2011). In France, secondary homes represent 9.4% of all private residences (INSEE, 2016) and in Switzerland the share is around 5% (Credit Suisse, 2005). The popularity of vacation homes also varies widely by location. In the United States, the proportion of vacation homes varies by state from 0.6% in Illinois to 15.6% in Maine. In Norway, a full 26% of houses are used as vacation homes (Statistics Norway, 2017). Vacation homes tend to be in sparsely-populated regions that are experiencing poor economic and population growth. It is therefore important to understand how the presence of vacation homes affects the economic outcomes for local residents.

Seasonal residents contribute to local economies through the income from property sales and local spending, which explains why policymakers often seek to attract them. However, seasonal residents reduce the amount of housing available for local residents while contributing less to local labour and product markets. Therefore, home ownership by seasonal residents may either be positive or negative for the local residents and firms. Despite the relevance to regional policy and active local debates in communities that attract seasonal residents, it is not well understood how vacation homes affect a regional economy. This paper proposes a theoretical model that can be used to analyse the impact of vacation homes on regional economies and studies the effects of a Norwegian policy applied to alleviate their negative effects.

The model I introduce is of a small regional economy with both local and seasonal residents. In this stylised framework, local residents work in the region and consume local products, while seasonal residents work elsewhere but occupy housing in the local area. The model predicts that the presence of seasonal residents generally makes local housing more expensive and reduces local employment, as the seasonal residents occupy land while contributing less to local housing and labour markets.

Furthermore, if there are increasing returns to scale in local production, the model predicts that an increase in demand for housing by seasonal residents can lead to a sharp decline in local employment. Increased demand for housing by seasonal residents can even reduce local employment to such a degree that the total demand for local housing decreases, leading to a decrease in local house prices. This represents additional harm to local homeowners who are forced to move away to find work.

In places where vacation homes are popular, concerns often arise that these houses being left vacant for most of the year can harm the local economy and lead to a decline in local services. In some cases this may be an illusion, as a decline in local economic activity can lead to lower house prices that attract vacation-home buyers. However, the model demonstrates that vacation homes can, in certain circumstances, have detrimental effects on the local economy.

In response to these concerns, some governments have introduced policies that restrict the use of properties as vacation homes. The Norwegian policy I study in this paper was introduced in 1974 and it obliges the owner of a property either to reside on it for a majority of the year, to rent it out, or to sell. Each municipality decides whether to impose this 'residency requirement'. By the end of 2016, 92 of the 428 municipalities in Norway had imposed the residency requirement for some period of time.

A range of policies have been introduced in other countries to counteract the perceived negative effects of vacation homes. Denmark has a similar residency requirement to Norway.[1] Jersey and Guernsey restrict the ownership of real estate to people born locally and long-standing residents.[2] In France, a higher rate of property tax is imposed on secondary residences and the rate is elevated further in areas where housing is deemed to be in 'short supply', which includes coastal and mountainous areas popular for second homes (General Directorate of Public Finances, 2015). Switzerland has restrictions on the construction of new houses in areas with high shares of second homes (Gerber and Tanner, 2018). These types of policy may not be politically feasible in countries where the property rights of private owners are stronger. Indeed it has been argued that the residency requirements in Norway and Denmark are not consistent

[1] The policy is described (in Danish) on the website of the Ministry of Environment and Food of Denmark at http://naturerhverv.dk/landbrug/arealer-og-ejendomme/landbrugsloven/bopaelspligt/.

[2] Guernsey classifies housing into Local Market housing, which is restricted to people who have resided in Guernsey for at least 10 years, and Open Market housing, which anybody may purchase (described on the website of the States of Guernsey at https://www.gov.gg/populationmanagement). In Jersey, a resident of at least 10 years can purchase any property, though a limited set of properties may be purchased by an 'essential employee' (described on the website of the States of Jersey at http://www.gov.je/Working/Contributions/RegistrationCards/Pages/ResidentialStatus.aspx).

with the rules of the European Free Trade Association.[3]

One feature that distinguishes these policies from more common types of regional policy is that they require little or no public spending. Most developed countries apply some type of regional policy, mostly in the form of subsidies or direct spending (OECD, 2010). A prime example is the EU's Structural and Cohesion Funds, which cost around €50 billion annually and produce only mixed results (Mohl and Hagen, 2010; Becker, Egger and von Ehrlich, 2010; Becker, Egger and von Ehrlich, 2012).[4] Policies that restrict the ownership or use of land have the advantage of placing a far smaller burden on public finances, so it is worthwhile to understand whether they are effective.

The model predicts that the Norwegian residency requirement will lead to a larger local population and more local employment. Depending on the parameters, the effects on the local wage and house prices can have either sign as they depend on whether the local businesses would survive if seasonal residents are allowed to purchase housing.

The empirical analysis shows that the introduction of the residency requirement is associated with a subsequent increase in the local population and possible increases in employment, wages, and house prices. A corollary is that the presence of vacation homes has negative effects on the local population, employment, and wages in the Norwegian municipalities where the policy has been introduced. However, as the model predicts effects on employment, wages, and house prices that vary in sign depending on the parameters, it should be noted that the results may well be different in other parts of the world or for different types of travel.

The remainder of this paper is organised as follows. Section 2 reviews the related literature. Section 3 presents the data and describes the Norwegian residency requirement in detail. Section 4 describes the model for a small regional economy with demand for housing from seasonal residents. Sections 5 and 5 present theoretical predictions for the effects of seasonal residents on the local economy and the implications of the residency requirement, which are then tested using the Norwegian municipality-level data in Section 7. The final section presents concluding remarks.

[3]See for example the *NRK* report "Boplikten kan bli begrenset" ("Residency requirement may be scaled back") from June 4th, 2007 and the *Nationen* article "UmB-professor går hardt ut mot boplikten" ("UmB professor strongly opposes the residency requirement") from July 31st, 2012.

[4]The total budget for the Structural and Cohesion Funds for the 2014-2020 period is €371 billion, with the annual amount varying between €36 billion and €60 billion (European Commission, 2017).

2 Literature review

The literature on the local economic effects of vacation homes dates back at least to Wolfe (1951), who described their role and geographical distribution in Canada. Two decades later, Ragatz (1970b, 1970a) studied the prevalence of vacation homes in the United States and raised issues that they could create for housing markets and local services. Subsequent research has sought to quantify the local effects of vacation homes.

One fundamental question is what effect vacation homes have on local house and land prices. The model presented in this paper describes situations in which vacation homes have positive or negative effects on local house prices. The literature has mostly identified positive effects. Riebsame, Gosnell and Theobald (1996) found that higher demand for second homes in Colorado had increased house prices in rural areas. Wasson, McLeod, Bastian and Rashford (2013) found similar results for Wyoming, as environmental amenities that are valuable for visitors but unrelated to agriculture have positive effects on the value of agricultural land. However, Marjavaara (2007) found that the increased house prices in the Stockholm Archipelago in Sweden, an area popular for vacation homes, were rather due to permanent homes than vacation homes. The current paper presents evidence that contrasts with these previous studies, as there is a weak positive effect of vacation homes on local house prices.

The research into other local economic outcomes also finds largely positive effects. Marcouiller, Green, Deller and Sumathi (1996) found a positive contribution of vacation homes in Wisconsin and Minnesota to local retailers that may exceed the burden on public services. Curry, Koczberski and Selwood (2001) studied a rural area near Perth in Western Australia and found divergent outcomes for the various interest groups. Hoogendoorn and Visser (2004; 2011) and Hoogendoorn, Visser and Marais (2009) studied rural towns in South Africa with substantial numbers of second homes and observed that the spending by part-time residents had helped these towns to develop and had positive effects on employment growth and property values. Winkler, Deller and Marcouiller (2015) found that the concentration of vacation homes in rural US counties correlates with lower economic well-being but higher environmental quality.

A related literature studies the relationship between vacation homes and local public finances. In terms of public revenue, Fritz (1982) found a positive effect of vacation homes on property tax rates in rural Vermont, while Hadsell and Colarusso (2009) found that vacation homes in New York State were associated with higher property tax rates in villages but lower property tax rates in larger towns. On the spending side, Anderson (2006) found a positive relationship between vacation homes and per-capita local public spending in Minnesota, which he attributed to the lower burden that vacation-home owners place on public services. Combining revenue and spending, Deller, Marcouiller and Green (1997) found a slight positive contribution of vacation homes to local government finances in Wisconsin. Johnson and Walsh (2013) studied the relationship in the opposite direction and found a small negative effect of tax rates on the number of vacation homes in Michigan, particularly in more rural areas with relatively elastic housing supply.

The Norwegian residency requirement was studied by Aanesland and Holm (2002) and Aanesland, Holm and Labugt (2004), who gave a detailed history of the policy and studied its consequences. They argued that the policy was largely intended to avoid regional areas being depopulated but that it could lead to greater risk for property owners, as the future value of a house may be higher if it can be sold as a vacation property. However, in their empirical analysis they found no significant economic effects of the policy.

The current paper contributes to this literature in a number of ways. Firstly, it presents a theoretical framework that can be used to analyse the effects of vacation homes on regional economies. Secondly, the theoretical results explain why the effects differ between regions. Thirdly, the empirical results demonstrate some implications of vacation homes for regional areas in Norway and the effects of the residency requirement.

3 Data

The empirical analysis in this paper uses an annual panel of data for Norwegian municipalities for the period 1974 to 2016. The islands of Jan Mayen and Svalbard are excluded, so the sample is comprised of the 428 municipalities on the Norwegian mainland.[5] Table 1 summarises the main variables in the dataset, which were all obtained from Statistics Norway.

[5]Due to mergers and other changes, the set of municipalities in Norway changes over time. The analysis uses the municipalities that existed in 2016 and maps the data from earlier periods onto these.

	Number of municipalities	Number of observations	Mean	Standard deviation	Minimum	Maximum
Population	428	18,404	10,376	29,930	201	662,575
Number of employees (full-time equivalents)	428	11,556	4,558	14,370	70	305,489
Mean wage income (NOK)	428	10,272	175,123	65,752	57,200	425,200
House-price index (detached houses)	328	4,920	12,625	5,704	2,398	51,941

Table 1: Summary statistics for the population and economic variables in the dataset.

As can be seen in Table 1, the numbers of observations are different for the different variables. Data on the numbers of employees are only available from 1990 and wage data are only available from 1993, so there are fewer observations for these variables than for population. The house-price index is only available from 2003 and only for a subset of the municipalities.

3.1 Residency requirement in Norway

To counter the perceived negative effects of absentee ownership on peripheral regions, in 1974 the Norwegian government introduced a residency requirement for property owners. Under the law, the owner of any property in Norway larger than a specified minimum size is required to reside on the property a majority of the nights of the year.[6] If this requirement is not fulfilled, then the owner can be forced to sell.

Furthermore, the law allows the municipalities to choose to apply a 'zero limit', meaning that the residency requirement applies to all properties in the municipality that are or have ever been used as permanent residences. The policy is non-personal, so the owner of a property may satisfy the requirement by renting out the property to a tenant who resides there for a majority of the year. To keep the terminology simple, the remainder of this paper uses the term 'residency requirement' to refer exclusively to the application of the zero limit.

By the end of 2016, 92 of the 428 municipalities in Norway had made the residency requirement law for some period of time. However, 41 of these municipalities had since removed it, leaving 51 municipalities with the residency requirement in force on January 1st, 2017. The data on the application of the residency requirement were obtained from the internet database

[6]The original 1974 law specified that the residency requirement would apply to all vacation properties of at least 0.2 hectares and all other properties of at least 2 hectares (Government of the Kingdom of Norway, 1974). In 2003, the minimum size of non-vacation properties was raised to 10 hectares with no more than 2.5 hectares of cultivated land (Government of the Kingdom of Norway, 2003).

Lovdata.

Figure 1 plots the number of municipalities that had the residency requirement in force in each year and the aggregate population of these municipalities. The number of municipalities with the residency requirement grew steadily during the 1980s and 1990s, peaked at 75 in 2005, and has been generally declining since then.

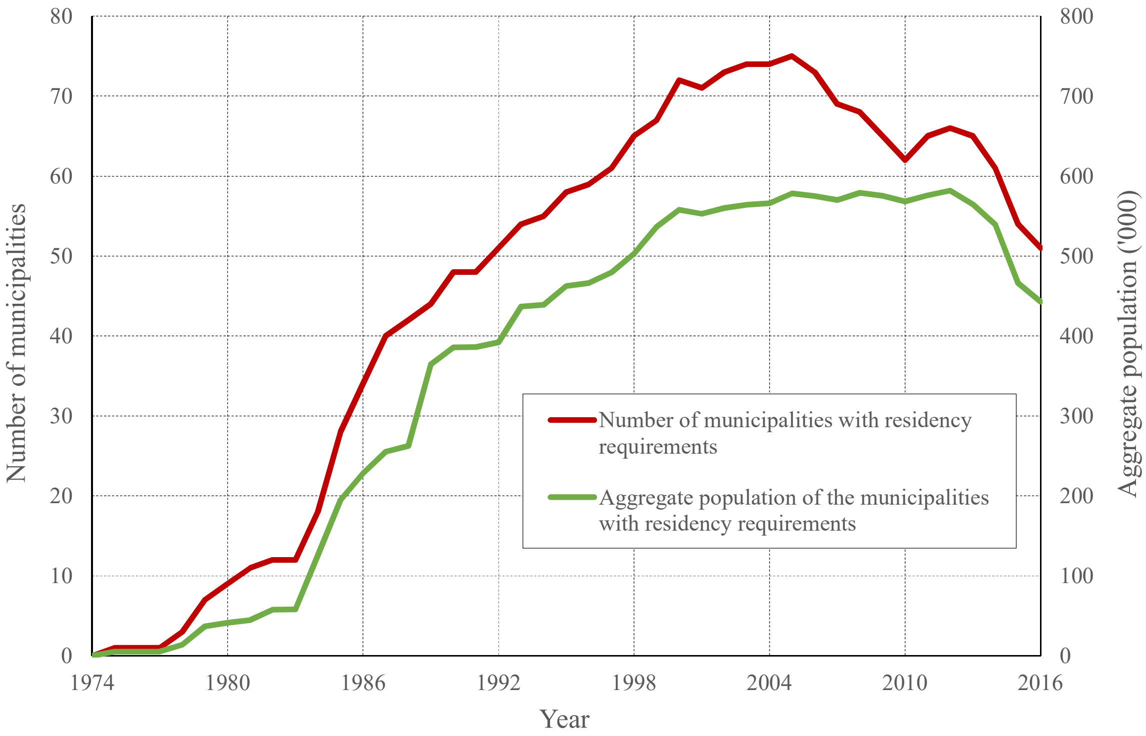

Figure 1: Number of Norwegian municipalities with the residency requirement in each year from 1974 to 2016 and the aggregate population of those municipalities.

Figure 2 presents maps of the municipalities that had the residency requirement in force in 1985, 1995, 2005, and 2015. The maps show that the greatest concentration of municipalities with the residency requirement is along the southern coast of Norway within 300 kilometres of Oslo. There is also a tendency for municipalities in the mountainous areas in the south of the country to have the residency requirement. Few municipalities in the north of the country, far from the largest population centres, have the residency requirement.

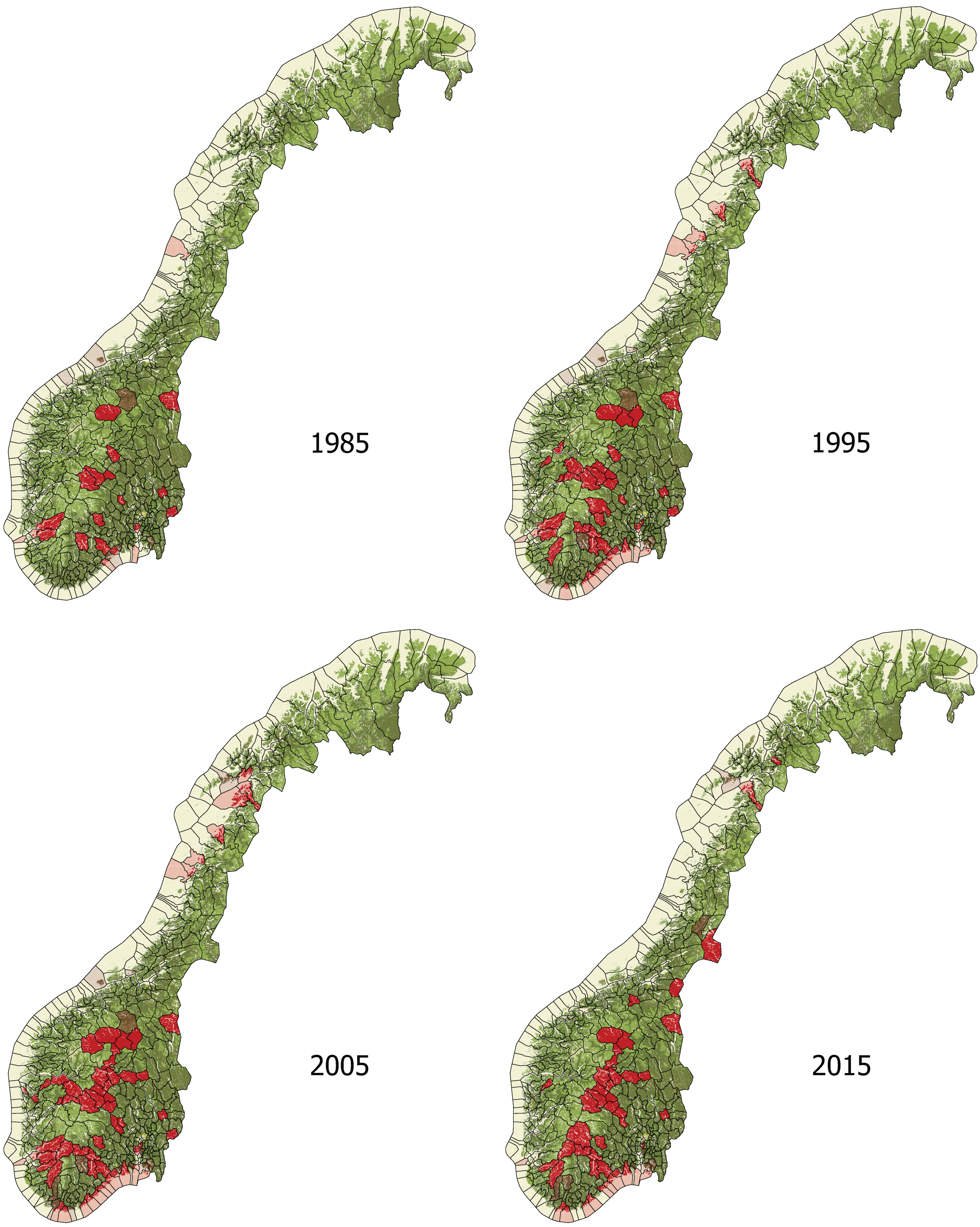

Figure 2: Maps of the Norwegian municipalities with the residency requirement in 1985, 1995, 2005, and 2015. The municipalities with the residency requirement are shaded. Municipalities where the residency requirement applies to only part of the municipality have a lighter shade.

Appendix A details some statistics for the municipalities that have had the residency requirement. The statistics on political representation allay a potential concern about the estimated effects of the policy being due to other policies introduced by the same political parties.

4 Model

In order to understand how a small regional economy can be affected by the demand for housing by seasonal residents, I introduce a model of such an economy. The model represents a general equilibrium in the local area, in which wages, goods prices, and house prices are generated as equilibrium outcomes. To keep things simple, the housing demand from seasonal residents is assumed to be exogenous.

The model is intended to represent a small regional economy that may have local and seasonal residents. The local residents work and shop in the region but migrate away if their standard of living would be higher elsewhere. The seasonal residents own houses but do not consume local goods or supply labour in the local area. A single firm, located at the arbitrarily-defined 'centre' of the region, employs local residents and produces a non-tradable good that is consumed in the local area.[7]

Locations in the region are homogeneous except for their distance from the centre of the region, where all production and shopping occurs. The locations are therefore characterised by the distance r from the centre of the region.

4.1 Individuals

Local residents gain utility from consuming amount $x \geq 0$ of the locally-produced consumption good and $y \geq 0$ of a tradable good. The local good has price q_x. The tradable good is freely traded and serves as the numeraire, so its price is fixed at unity. The utility of each local resident is described by the function:

$$u(x,y) = \ln(x) + y \tag{1}$$

Local residents are all employed by the local firm and each earns wage w. To live in the local area, each individual must secure housing at some location r, which costs $p(r)$. Commuting to work (and travelling to shop) from location r costs $\tau(r)$, where $\tau' > 0$. In addition to the wages, each local resident receives an exogenous annual amount I from investment income. The budget

[7]The assumption of an arbitrarily-defined 'centre' where local employment and shopping occurs is made for simplicity. The theoretical results would apply if local employment and shopping occurred in a broad area such as a main street or in several separate locations. All that is required is that local residents value the same locations as seasonal residents.

constraint of a local resident who lives at r is therefore:

$$w + I \geq p(r) + \tau(r) + q_x x + y \tag{2}$$

Individuals are able to migrate freely and would obtain the prevailing level of utility $\bar{u}$ if they lived elsewhere. The population of local residents is therefore in equilibrium when the utility level of each individual satisfies:

$$u(x, y) = \bar{u} \tag{3}$$

The demand for the local good by each individual is found by maximising utility (1) given the budget constraint (2):

$$\hat{x} = \frac{1}{q_x} \tag{4}$$

The demand for the tradable good is simply the amount that can be purchased given (4). Therefore, given the utility level (3):

$$\hat{y} = \bar{u} - \ln\left(\frac{1}{q_x}\right) \tag{5}$$

As the labour input of each worker in the region is used by the local firm to produce one unit of output, the amount of the local good consumed by each local resident in equilibrium must be:

$$\hat{x} = 1 \tag{6}$$

The total spending on the consumption goods in equilibrium is found by combining (4), (5), and (6):

$$q_x \hat{x} + \hat{y} = 1 + \bar{u} \tag{7}$$

4.2 Housing market

As the utility function is strictly increasing in consumption of the two goods, the budget constraint must bind in equilibrium. Furthermore, the migration equilibrium requires each local resident to have consumption levels $\hat{x}$ and $\hat{y}$. The budget constraint (2) thus yields the following expression for the combined housing and commuting costs for an individual living at r:

$$p(r) + \tau(r) = w + I - q_x\hat{x} - \hat{y} \tag{8}$$

The seasonal residents are willing to pay $p_s \geq 0$ for housing in any location in the region.[8] The value of p_s is assumed to be determined by local amenities and factors external to the local economy and is thus treated as a parameter, which is supported by the finding of Aanesland and Holm (2002) that demand for housing by seasonal residents in Norway is not affected by the local labour market. As the owners of vacation homes in Norway spend far less on consumption in the local area than do local residents, for simplicity it is assumed in the model that the seasonal residents do not consume the local good or participate in the local labour market.[9] The same theoretical predictions would arise under the assumption that the seasonal residents consume a small positive amount in the local area.

Local and seasonal residents each bid what they are willing to pay for the houses at each location r. For local residents this is the price $p_l(r)$ implied by (8) given the local wage w, required consumption level $\hat{x}$, and the commuting costs $\tau(r)$:

$$p_l(r) = [w + I - q_x\hat{x} - \hat{y} - \tau(r)]^+ \tag{9}$$

For seasonal residents the willingness to pay is simply p_s for all locations. Figure 3 plots the house price bids of the local and seasonal residents by the distance r from the centre.

[8] p_s is assumed to be constant across space to keep the model simple. In reality, seasonal residents may prefer to be near the centre of the region or some natural amenity elsewhere, in which case p_s should vary by location. However, the interpretations would largely be obvious, as seasonal residents would tend to outbid local residents in the locations they value more.

[9] Total spending by Norwegian households on vacation-home trips in 2002 was 15 billion NOK (Hille, Aall and Klepp, 2007), roughly 2% of total consumption spending. While this spending would be concentrated in certain regions and does not include capital spending (though it does include spending on items visitors bring with them), local spending by vacation-home owners is generally a small proportion of the spending by local residents.

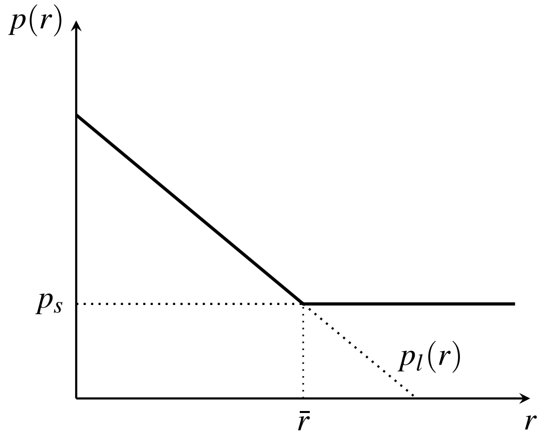

Figure 3: House price bids of local and seasonal residents by distance from the centre of the region.

As the price bids of the local residents (9) are decreasing in r while the price bids of the seasonal residents are constant in r, in equilibrium the two types of resident sort by distance, with local residents at nearer locations and seasonal residents at more distant locations. The most distant location at which local residents live is defined to be $\bar{r}$. Equilibrium house prices are therefore:

$$p(r) = \begin{cases} w + I - q_x\hat{x} - \hat{y} - \tau(r) & if \quad r \leq \bar{r} \\ p_s & if \quad r > \bar{r} \end{cases} \tag{10}$$

Two simplifying assumptions are now introduced. Firstly, there is assumed to be one unit of housing at each unit of distance from the centre, so the most distant location at which local residents live is simply:

$$\bar{r} = n \tag{11}$$

Secondly, the function for commuting costs is assumed to take the following linear form with parameter $\gamma > 0$:

$$\tau(r) = \gamma r \tag{12}$$

By definition, the house price bids of local residents at $\bar{r}$ must equal the bids of the seasonal residents at that location, so $\hat{p}(\bar{r}) = p_s$. Thus the wage that a local resident requires to live in the region as a function of the number of local residents may be derived from (7), (10), (11), and (12):

$$w(n) = p_s + \gamma n + 1 + \bar{u} - I \tag{13}$$

4.3 Production

The firm has a fixed cost of operation $f \geq 0$ and produces one unit of output for each unit of labour input. For wage $w \geq 0$, the cost of producing X units of output is therefore:

$$c(X) = f + wX \tag{14}$$

The firm's output is sold for price q_x. The profit $\pi(q_x, w, X)$ earned by the firm is thus:

$$\pi(q_x, w, X) = (q_x - w)X - f \tag{15}$$

As each local resident supplies one unit of labour and each unit of labour is used to produce one unit of the local good, the equilibrium output of the firm must equal n:

$$\hat{X} = n \tag{16}$$

The firm maximises its profit by setting the price, wage, and level of output that maximise (15). From (4) and (6) the price q_x must equal one for the local goods market to clear, wages are directly related to n by (13), and the aggregate output in equilibrium $\hat{X}$ is related to n by (16), so the firm's profit can be expressed in terms of the single decision variable n:

$$\pi(n) = (I - p_s - \gamma n - \bar{u})n - f \tag{17}$$

The firm chooses n to maximise its profits (17). If the maximum obtainable profit is negative then the firm does not operate, so $n = 0$. As the profit is decreasing in p_s, given the other parameters there is some threshold level of p_s below which the firm faces negative profit and thus does not operate. This threshold is denoted $\widetilde{p_s}$ and can be found by choosing n to maximise profit (17) and setting $\pi(n) = 0$:

$$\widetilde{p_s} = \left[I - \bar{u} - 2\sqrt{\gamma f}\right]^+ \tag{18}$$

The firm's profit (17) is maximised when the number of local residents is:

$$\hat{n} = \begin{cases} \frac{1}{2\gamma}(I - p_s - \bar{u}) & if \quad p_s \leq \widetilde{p_s} \\ 0 & if \quad p_s > \widetilde{p_s} \end{cases} \tag{19}$$

The equilibrium wage paid to all local workers is derived from (13) and (19):

$$\hat{w} = \begin{cases} 1 - \frac{1}{2}(I - p_s - \bar{u}) & if \quad p_s \leq \widetilde{p_s} \\ 0 & if \quad p_s > \widetilde{p_s} \end{cases} \tag{20}$$

The equilibrium profit of the firm is found by combining (17) and (19):

$$\hat{\pi} = \begin{cases} \frac{1}{4\gamma}(I - p_s - \bar{u})^2 - f & if \quad p_s \leq \widetilde{p_s} \\ 0 & if \quad p_s > \widetilde{p_s} \end{cases} \tag{21}$$

4.4 Equilibrium house prices

The equilibrium house price is characterised in terms of the exogenous variables by combining (7), (10), (12), and (20):

$$\hat{p}(r) = \begin{cases} \frac{1}{2}(I + p_s - \bar{u}) - \gamma r & if \quad r \leq \bar{r} \\ p_s & if \quad r > \bar{r} \end{cases} \tag{22}$$

Furthermore, the most distant location occupied by a local resident can be defined in terms of the exogenous variables by combining (11) and (19):

$$\bar{r} = \begin{cases} \frac{1}{2\gamma}(1 - p_s - \hat{x}) & if \quad p_s \leq \widetilde{p_s} \\ 0 & if \quad p_s > \widetilde{p_s} \end{cases} \tag{23}$$

5 Effects of seasonal residents on the local economy

The house price bids of seasonal residents affect the equilibrium levels of the local house prices, population, wages, and firm profit. This section explores these relationships in detail.

How the house price bids of seasonal residents p_s affect equilibrium house prices by location

(22) is complex, as changes in p_s affect the house price bids of both local and seasonal residents, shift the threshold distance $\bar{r}$, and cause a discrete change in local economic activity if the threshold $\widetilde{p_s}$ is traversed. Figure 3 illustrates the equilibrium house price by distance from the centre of the region for four selected levels of p_s, which highlights two features of the model that are important for the policy analysis. The first is the threshold level of house price bids by seasonal residents $\widetilde{p_s}$, which in this case lies between p_s^1 and p_s^2. The second is that an increase in p_s can lead to a decrease in the equilibrium house prices at some locations. This is demonstrated by the equilibrium prices$\hat{p}^0(r)$ and $\hat{p}^1(r)$ being higher than $\hat{p}^2(r)$ for some locations near the centre of the region.

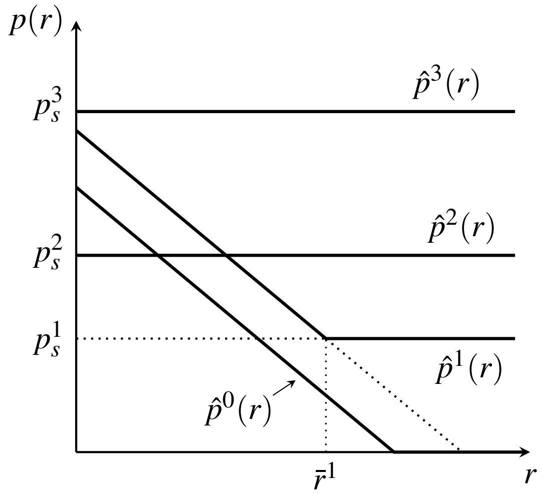

Figure 4: Equilibrium house prices by distance from the centre of the region for four levels of house price bids by seasonal residents.

To further illustrate the relationship between the house price bids of seasonal residents and equilibrium house prices, Figure 5 plots the relationship at location $r = 0$. It shows the non-monotonic relationship between p_s and equilibrium house prices, with prices increasing in p_s over the range of values where the location is inhabited by local residents, then a discrete drop to p_s at the threshold $\widetilde{p_s}$. A similar relationship applies to all other locations that are inhabited by local residents if $p_s = 0$.

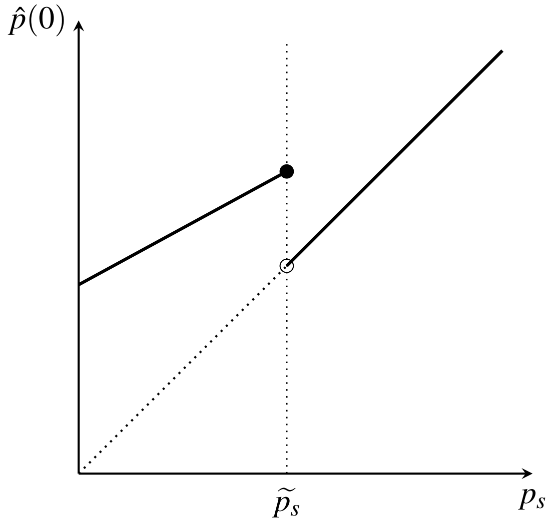

Figure 5: Relationship between the house price bids of seasonal residents and the equilibrium house price bids of local residents at the centre of the region.

Figure 6 plots the relationship from (19) between the house price bids of seasonal residents and the equilibrium population of local residents. Figure 7 plots the relationships from (20) and (21) between the house price bids of seasonal residents and the equilibrium local wages and profits of the local firm. . Firm profit is decreasing in p_s up to the threshold $\widetilde{p_s}$, as increases in p_s shrink the local market for the firm's products and require the firm to pay higher wages for the workers to obtain utility $\bar{u}$. For any level of p_s above the threshold $\widetilde{p_s}$, the firm would earn a negative profit so it does not operate. At the threshold $\widetilde{p_s}$ there is a precipitous decrease in the number of local residents, as the fixed cost prevents low levels of production from being profitable.[10]

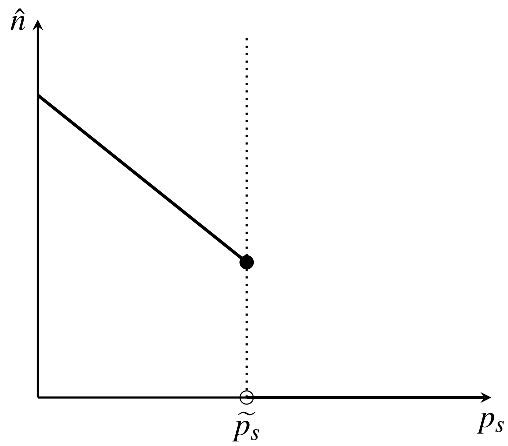

Figure 6: Relationship between the house price bids of seasonal residents and the equilibrium population of local residents.

[10]If $f = 0$, then the firm operates with constant returns to scale and there is no precipitous drop in the local population at $\widetilde{p_s}$.

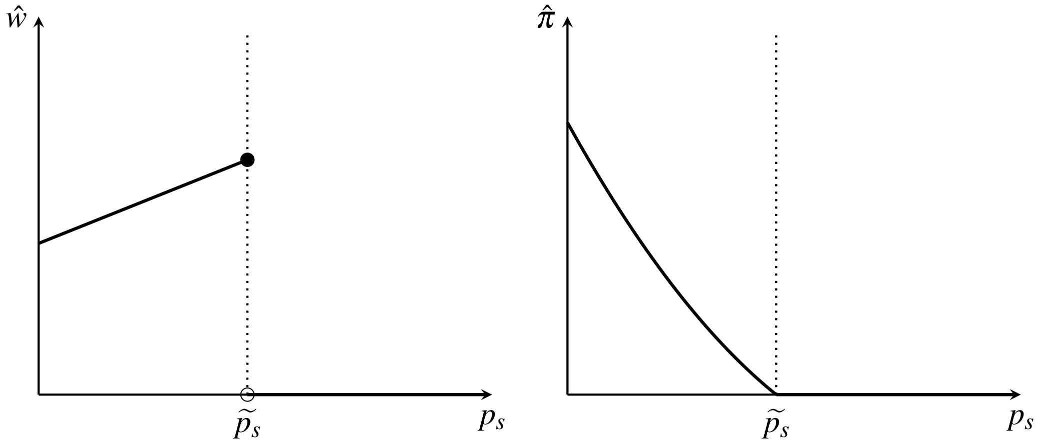

Figure 7: Relationships between the house price bids of seasonal residents and equilibrium local wages and firm profit.

The decline in local population at $\tilde{p}_s$ validates the concern that seasonal housing may lead to a hollowing-out of the local community. As the demand for locally-produced goods and services decreases, local firms close down, which reduces the availability of local products. In a sense, the region would be *too* successful in attracting seasonal residents to benefit from their presence. It is notable that the sharp drop in the population at $\tilde{p}_s$ is not predictable from the marginal decreases in population at lower levels of p_s.

6 Effects of the residency requirement on the local economy

I now turn to the Norwegian residency requirement and ask how such a policy would affect outcomes in the model. The residency requirement can be represented in the model by artificially setting the house price bids of seasonal residents to zero. The outcomes can then be compared with and without the policy, which generates predictions that are tested with the data. For simplicity, I assume for this section that the house price bids of seasonal residents are strictly positive, so $p_s > 0$.

The equilibrium values of the variables with the residency requirement are differentiated from the market equilibrium by the superscript *RR*. As there are no seasonal residents when the residency requirement is in place, $\bar{r}^{RR}$ simply represents the most distant location at which local residents live. As the parameters are assumed to give rise to local production in the absence of seasonal residents, $\hat{n}^{RR} > 0$ and therefore $\bar{r}^{RR} > 0$. The equilibrium number of local residents and local wages with the residency requirement are derived by setting $p_s = 0$ in (19) and (20):

$$\hat{n}^{RR} = \frac{1}{2\gamma}(I - \bar{u}) \tag{24}$$

$$\hat{w}^{RR} = 1 - \frac{1}{2}(I - \bar{u}) \tag{25}$$

It follows from (24) and $\bar{r}^{RR} = \hat{n}^{RR}$ that:

$$\bar{r}^{RR} = \frac{1}{2\gamma}(I - \bar{u}) \tag{26}$$

The equilibrium house prices with the residency requirement are derived by setting $p_s = 0$ in (22):

$$\hat{p}^{RR}(r) = \begin{cases} \frac{1}{2}(I - \bar{u}) - \gamma r & if \quad r \leq \bar{r}^{RR} \\ 0 & if \quad r > \bar{r}^{RR} \end{cases} \tag{27}$$

The effect of the residency requirement on the size of the local population is characterised by the following proposition.

Proposition 1. *The residency requirement increases the equilibrium size of the local population.*

Proof. Comparing $\hat{n}$ with $\hat{n}^{RR}$ from (19) and (24) yields $\hat{n}^{RR} = \frac{1}{2\gamma}(I - \bar{u}) > \hat{n} = \frac{1}{2\gamma}(I - p_s - \bar{u})$ for $p_s \leq \widetilde{p_s}$ and $\hat{n}^{RR} = \frac{1}{2\gamma}(I - \bar{u}) > \hat{n} = 0$ for $p_s > \widetilde{p_s}$. The equilibrium population size is therefore larger when the residency requirement is in force. □

The result in Proposition 1 is evident from Figure 6, which shows $\hat{n}$ to be strictly decreasing in p_s for $p_s \leq \widetilde{p_s}$ and then zero for all $p_s > \widetilde{p_s}$. The situation in which there is a residency requirement and thus $p_s = 0$ is represented by the vertical axis of Figure 6.[11]

The effect of the residency requirement on local wages may be positive or negative, depending on whether local business survives when seasonal residents can purchase housing. The possibilities are detailed in the following proposition.

Proposition 2. *The residency requirement leads to:*

1. *Lower local wages in equilibrium if $p_s \leq \widetilde{p_s}$;*
2. *Higher local wages in equilibrium if $p_s > \widetilde{p_s}$.*

[11] A trivial exception to Proposition 1 would be if the local population would be zero even in the absence of demand from seasonal residents.

Proof. Comparing $\hat{w}$ with $\hat{w}^{RR}$ from (20) and (25) yields $\hat{w}^{RR} = 1 - \frac{1}{2}(I - \bar{u}) < \hat{w} = 1 - \frac{1}{2}(I - p_s - \bar{u})$ for $p_s \leq \widetilde{p_s}$ and $\hat{w}^{RR} = 1 - \frac{1}{2}(I - \bar{u}) > \hat{w} = 0$ for $p_s > \widetilde{p_s}$. The equilibrium wage is therefore lower with the residency requirement for $p_s \leq \widetilde{p_s}$ but higher with the residency requirement for $p_s > \widetilde{p_s}$. □

The result in Proposition 2 can be inferred from the plot for the equilibrium wage $\hat{w}$ in Figure 7. Relative to the situation where $p_s = 0$, the wages are higher when there are seasonal residents if $p_s \leq \widetilde{p_s}$, but lower for any $p_s > \widetilde{p_s}$.

The effect of the residency requirement on house prices is also ambiguous. For example, in any area that would be inhabited by local residents with or without the policy, the residency requirement leads to lower house prices as $p_l^{RR}(r) = \frac{1}{2}(I - \bar{u}) - \gamma r \leq p_l(r) = \frac{1}{2}(I + p_s - \bar{u}) - \gamma r$. However, the residency requirement may lead to higher house prices in some locations if local production only occurs with the residency requirement. The following proposition summarises the possibilities.

Proposition 3. *The residency requirement leads to:*

1. *Lower (or identical) house prices at location r in equilibrium if* $p_s \leq \widetilde{p_s}$ *or* $p_l^{RR}(r) \leq p_s$*;*
2. *Higher house prices at location r in equilibrium if* $p_l^{RR}(r) > p_s > \widetilde{p_s}$*.*

Proof. Setting $p_s^{RR} = 0$ in (22) yields $\hat{p}^{RR}(r) = \max\left\{\frac{1}{2}(I - \bar{u}) - \gamma r, 0\right\}$. With no residency requirement, each type of resident bids more for each location r, as $p_s \geq 0$ and $p_l(r) = \frac{1}{2}(I + p_s - \bar{u}) - \gamma r \geq p_l^{RR}(r) = \frac{1}{2}(I - \bar{u}) - \gamma r$. Therefore, the residency requirement leads to higher house prices at location r if and only if (1) location r is occupied by local residents if there is a residency requirement but by seasonal residents if there is not and (2) those local residents bid more than p_s. That is, $\hat{p}^{RR}(r) > \hat{p}(r)$ iff $p_s > \widetilde{p_s} = I - \bar{u} - 2\sqrt{\gamma f}$ and $p_l^{RR}(r) = \frac{1}{2}(I - \bar{u}) - \gamma r > p_s$. □

7 Empirical analysis of the Norwegian residency requirement

In this section I test the effects of the Norwegian residency requirement using the municipality-level data. The aim is to estimate a relationship of the following type:

$$y_{m,t} - y_{m,t-1} = \beta Z_{m,t} + \varepsilon_{m,t} \tag{28}$$

The term $y_{m,t}$ is the log magnitude of the outcome variable, which may either be the population, employment, wages, or house-price index. The term $Z_{m,t}$ is a binary variable that is equal to one if municipality m has the residency requirement in year t and is equal to zero otherwise. $\varepsilon_{m,t}$ is an error term.

The relationship in (28) is estimated using an event-study approach, as described by MacKinlay (1997). The event-study approach operates by centring the variables around the time when the policy change occurs, so the changes in the outcome variables around that 'event' can be combined even though the 'event' occurs at different times in different places. Furthermore, as the technique is based on variation in the application of the policy over time within a municipality, the potential for problems from reverse causality or unobserved variables are reduced.[12] A difference-in-difference estimation was also run but the results were weak and inconclusive, so it is presented in Appendix B.

The event-study estimation equation is set up as follows. Let i_m be the year that the residency requirement is introduced in municipality m.[13] A set of binary variables $I_{[t=i_m+k]}$ indicate whether year t is k years before or after the introduction of the policy in municipality m, where $-5 \leq k \leq 5$. The binary variables are only defined for a period of five years before and after the policy is introduced and are not defined for years after the policy is removed or for municipalities that never introduced the policy. The following equation is estimated:

$$y_{m,t} - y_{m,t-1} = \sum_{k=-5}^{5} \beta_k^1 I_{[t=i_m+k]} + \mu_m^1 + \nu_t^1 + \varepsilon_{m,t}^1 \tag{29}$$

A similar expression is estimated for the removal of the residency requirement, with r_m denoting the year that the residency requirement is removed in municipality m. The binary variables $I_{[t=r_m+k]}$ are defined for five years before to five years after the removal of the policy, but not for any years before the policy was introduced or for municipalities where it was never removed:

$$y_{m,t} - y_{m,t-1} = \sum_{k=-5}^{5} \beta_k^2 I_{[t=r_m+k]} + \mu_m^2 + \nu_t^2 + \varepsilon_{m,t}^2 \tag{30}$$

Table 2 presents the estimates of (29) for the changes in population, employment, wages,

[12] To identify the effects of the residency requirement, it would be ideal to have some quasi-experimental source of variation in which municipalities have the residency requirement. However, there are no obvious factors that determine the timing of the residency requirement but are not otherwise correlated with the outcome variables.

[13] As of January 2017, no municipality had introduced the policy, removed it, then introduced it a second time.

and house prices relative to the year the residency requirement was introduced. The first column uses data from 1975 – the earliest year the residency requirement could be introduced. The other samples begin in 1994 or 2003 – the first years for which wage data and the house-price index are available.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Population		Employment		Mean wage		House prices
First year of data	1975	1994	2003	1994	2003	1994	2003	2003
$I_{[t=i(m)-5]}$	0.0002	−0.0002	0.0005	0.0019	0.0123	−0.0112^a	−0.0044	0.0261
	(0.0011)	(0.0015)	(0.0029)	(0.0061)	(0.0105)	(0.0035)	(0.0055)	(0.0192)
$I_{[t=i(m)-4]}$	−0.0005	0.0005	−0.0012	0.0027	0.0032	0.0015	0.0056	0.0344^c
	(0.0011)	(0.0014)	(0.0036)	(0.0042)	(0.0103)	(0.0037)	(0.0062)	(0.0204)
$I_{[t=i(m)-3]}$	0.0001	0.0004	0.0018	0.0029	0.0203^b	0.0018	0.0126	0.0249
	(0.0010)	(0.0017)	(0.0035)	(0.0057)	(0.0091)	(0.0040)	(0.0120)	(0.0209)
$I_{[t=i(m)-2]}$	0.0006	0.0009	0.0024	0.0060	0.0049	0.0051	0.0178^b	0.0281
	(0.0010)	(0.0016)	(0.0021)	(0.0047)	(0.0069)	(0.0032)	(0.0076)	(0.0243)
$I_{[t=i(m)-1]}$	0.0003	0.0011	−0.0008	0.0052	0.0033	0.0034	0.0067	0.0095
	(0.0008)	(0.0013)	(0.0022)	(0.0037)	(0.0063)	(0.0028)	(0.0052)	(0.0173)
$I_{[t=i(m)]}$	0.0014^c	0.0026^c	0.0012	0.0059	0.0039	0.0000	−0.0011	−0.0104
	(0.0008)	(0.0016)	(0.0024)	(0.0044)	(0.0058)	(0.0033)	(0.0064)	(0.0188)
$I_{[t=i(m)+1]}$	0.0025^a	0.0042^a	0.0038^c	0.0059	0.0159^a	0.0001	0.0064	0.0471^b
	(0.0009)	(0.0014)	(0.0019)	(0.0042)	(0.0060)	(0.0028)	(0.0044)	(0.0197)
$I_{[t=i(m)+2]}$	0.0028^a	0.0043^a	0.0024	0.0091^c	0.0022	−0.0000	0.0086^b	−0.0009
	(0.0010)	(0.0014)	(0.0022)	(0.0049)	(0.0073)	(0.0032)	(0.0040)	(0.0348)
$I_{[t=i(m)+3]}$	0.0022^b	0.0035^b	0.0045^c	−0.0008	0.0015	−0.0017	0.0010	0.0389^c
	(0.0010)	(0.0015)	(0.0024)	(0.0037)	(0.0055)	(0.0038)	(0.0040)	(0.0220)
$I_{[t=i(m)+4]}$	0.0017^c	0.0039^a	0.0064^a	0.0109^b	0.0098^b	−0.0011	−0.0001	−0.0275
	(0.0009)	(0.0012)	(0.0018)	(0.0045)	(0.0047)	(0.0031)	(0.0041)	(0.0349)
$I_{[t=i(m)+5]}$	0.0014^c	0.0028^b	0.0037^b	−0.0025	0.0017	0.0007	−0.0004	0.0130
	(0.0008)	(0.0012)	(0.0017)	(0.0040)	(0.0045)	(0.0024)	(0.0034)	(0.0214)
R^2	0.52	0.60	0.63	0.36	0.42	0.64	0.68	0.16
Number of observations	18,404	9,844	5,992	9,844	5,992	9,844	5,992	4,592

Note: robust standard errors in parentheses; *a*, *b*, *c* denote significance at 1%, 5%, 10%

Table 2: Event-study estimation of the changes in the population, employment, wages, and house prices around the year the residency requirement was introduced.

The results in Table 2 suggest that the municipalities that have instituted the residency requirement were not different from other municipalities before they introduced the policy. This can be seen from the coefficients for the years preceding the introduction of the residency requirement, which are mostly not significant.

The coefficients in Table 2 for the periods after the introduction of the residency requirement suggest that the introduction of the policy has positive effects on the local population, house prices, and possibly employment and wages. The coefficients for population are small in magnitude but positive and significant for most of the years following the introduction of the residency requirement for each sample. Two of the coefficients for house prices are positive and significant. Some coefficients for the other variables are significant, but as these results are not strong they should be interpreted with caution.

Table 3 presents the estimates of the changes around the removal of the residency requirement from (30), using the same dependent variables and samples as in Table 2. The results suggest that the municipalities that chose to remove the residency requirement may have had relatively low growth in population, employment, and house prices before the policy was removed. There is some evidence of negative changes in employment and house prices after the removal of the policy, but no significant change in the population or wages.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
								House
	Population			Employment		Mean wage		prices
First year of data	1975	1994	2003	1994	2003	1994	2003	2003
$I_{[t=r(m)-5]}$	−0.0021[c]	−0.0014	−0.0009	−0.0064	−0.0086	−0.0026	−0.0042	−0.0292
	(0.0011)	(0.0013)	(0.0017)	(0.0042)	(0.0065)	(0.0026)	(0.0047)	(0.0229)
$I_{[t=r(m)-4]}$	−0.0004	0.0004	0.0001	−0.0060	−0.0044	−0.0007	−0.0014	−0.0430[c]
	(0.0015)	(0.0016)	(0.0020)	(0.0050)	(0.0062)	(0.0030)	(0.0046)	(0.0240)
$I_{[t=r(m)-3]}$	0.0003	0.0012	0.0015	−0.0049	−0.0097	−0.0029	−0.0023	0.0078
	(0.0015)	(0.0016)	(0.0020)	(0.0041)	(0.0063)	(0.0028)	(0.0048)	(0.0253)
$I_{[t=r(m)-2]}$	−0.0019[c]	−0.0012	−0.0008	−0.0023	−0.0055	−0.0057[b]	−0.0046	−0.0509[c]
	(0.0011)	(0.0012)	(0.0017)	(0.0050)	(0.0068)	(0.0028)	(0.0046)	(0.0266)
$I_{[t=r(m)-1]}$	−0.0033[b]	−0.0025[c]	−0.0020	−0.0062	−0.0107[c]	0.0001	−0.0000	0.0017
	(0.0013)	(0.0014)	(0.0017)	(0.0040)	(0.0064)	(0.0024)	(0.0046)	(0.0250)
$I_{[t=r(m)]}$	−0.0024[b]	−0.0017	−0.0005	0.0001	−0.0051	0.0028	0.0014	−0.0157
	(0.0012)	(0.0013)	(0.0017)	(0.0039)	(0.0061)	(0.0025)	(0.0044)	(0.0242)
$I_{[t=r(m)+1]}$	−0.0007	−0.0000	0.0004	0.0008	−0.0039	−0.0007	−0.0002	−0.0064
	(0.0014)	(0.0014)	(0.0017)	(0.0037)	(0.0060)	(0.0031)	(0.0051)	(0.0236)
$I_{[t=r(m)+2]}$	0.0002	0.0009	0.0010	−0.0100[b]	−0.0142[b]	−0.0005	−0.0021	−0.0568[b]
	(0.0015)	(0.0015)	(0.0018)	(0.0044)	(0.0064)	(0.0033)	(0.0050)	(0.0245)
$I_{[t=r(m)+3]}$	0.0029	0.0036	0.0035	0.0091	0.0054	−0.0043	−0.0037	−0.0419[c]
	(0.0029)	(0.0029)	(0.0030)	(0.0100)	(0.0110)	(0.0046)	(0.0059)	(0.0247)
$I_{[t=r(m)+4]}$	0.0031	0.0038	0.0040	−0.0032	−0.0058	−0.0003	−0.0007	−0.0507
	(0.0028)	(0.0028)	(0.0029)	(0.0044)	(0.0065)	(0.0035)	(0.0053)	(0.0458)
$I_{[t=r(m)+5]}$	−0.0002	0.0005	0.0010	0.0015	−0.0029	0.0001	−0.0008	−0.0231
	(0.0015)	(0.0016)	(0.0019)	(0.0049)	(0.0069)	(0.0037)	(0.0055)	(0.0337)
R^2	0.52	0.60	0.63	0.36	0.43	0.64	0.68	0.16
Number of observations	18,404	9,844	5,992	9,844	5,992	9,844	5,992	4,592

Note: robust standard errors in parentheses; *a*, *b*, *c* denote significance at 1%, 5%, 10%

Table 3: Event-study estimation of the changes in the population, employment, wages, and house prices around the year the residency requirement was removed.

There are at least two possible explanations for the relative declines in local population and employment before the removal of the residency requirement. One would be that the decrease in population is a partial cause of the removal of the policy, as municipalities in decline remove the policy in the hope of attracting seasonal residents who will bring income to the region. A second is that the housing market could be responding to the anticipated change in policy, as seasonal residents begin buying houses as soon as the local government decides to remove the policy, but before the change comes into effect, and displace local residents. The apparent relative decline in local employment following the removal of the policy could be the corollary of the increase in employment in Table 2 that follows the introduction of the policy.

Appendix C presents event-study estimates of the effect of the residency requirement on the local population using different subsets of the municipalities. The positive effect of the policy on the local population is found to be primarily due to its effects in coastal regions, Western Norway, and the region around Oslo.

8 Conclusion

As the world's population is becoming increasingly urbanised, many rural areas are experiencing declines in population and local economic activity. Some of these areas attract large numbers of seasonal residents who own vacation homes that they only occupy for part of the year. Though seasonal residents bring income to rural areas, concerns are sometimes raised that having houses left empty for most of the year could be harmful to the local economy, as local firms require workers and customers to maintain their operations. In response to such concerns, several countries have introduced policies that restrict the ownership of vacation homes. Norway has a particularly restrictive policy, which forbids home ownership by part-time residents in certain regions. This paper presents a theoretical model that can be used to analyse the impact of seasonal housing on rural areas and an empirical analysis of the effects of the Norwegian policy.

The model shows how the local labour, product, and housing markets are influenced by the use of local housing as vacation homes. The model is used to make predictions about the effects of the Norwegian residency requirement on the local population, wages, and house prices.

The empirical analysis shows that, after the policy is introduced in a municipality, the population of the municipality increases relative to other municipalities and there are weak positive effects on local employment, wages, and house prices. These results suggest that the policy is somewhat effective in achieving its aims. More broadly, the results highlight potential outcomes that should be considered by policymakers deciding whether to use vacation homes to aid in local development.

The results presented in this paper differ from the bulk of the literature on the effects of vacation homes, which generally finds that vacation homes have a positive overall effect on local wages and house prices (Hoogendoorn and Visser, 2011; Wasson et al., 2013). The difference could be explained by the fact that trips to Norwegian vacation homes do not represent the type of 'tourism' that is typical elsewhere. Rather than spending money on restaurants and other local businesses, the typical visit to a Norwegian vacation home involves free or cheap outdoor activities and mostly home-prepared meals, which could explain a relatively small contribution to the local economy.

Another explanation for the negative effects of vacation homes could be selection in the municipalities that introduce the residency requirement, whereby areas that benefit strongly from vacation homes never choose to introduce the policy, while places where vacation homes are negative choose to have the policy. This explanation is plausible as the municipalities where the residency requirement has been introduced include many relatively accessible places with good amenities, including the south coast and mountainous areas within a few hours' drive of Oslo, but not in remote areas in the north.

The results should thus be interpreted with some caution, as the apparently positive effects of the residency requirement may not apply to other parts of Norway or elsewhere. It is also questionable whether such a policy would be politically feasible in other countries, as it represents a strong restriction on the rights of property owners. Nevertheless, the policy appears to have been reasonably successful in the parts of Norway where it has been introduced.

The analysis presented here has other limitations that could represent possible extensions. The model has two generic production sectors, but could be made more realistic by including multiple local firms or sectors. The sectors could be of different types, for example an explicit local retail sector, real estate sales or maintenance, or firms that export tradable products. The model could also be extended to include local services such as post offices or transport connections, which are not well represented by the local firms in the model.

Another limitation of the model is that it is focused on the type of vacation-home ownership that exists in Norway. In other places, seasonal residents may spend a larger amount of money in the local area or stay in rented accommodation. These features would require different model assumptions and may generate new predictions. Other possible extensions would be to allow for different lot sizes or different types of local housing.

Finally, the model presented here is only a partial equilibrium for the overall economy, as it does not explain the allocation of people and production between regions. That would require a more detailed model, though it could be an extension of the model presented here. To explain regional differences in production and in the local and seasonal populations, the model should include differences in local amenities and productivity levels in the tradition of Roback (1982). Such a model could be used to estimate the factors for the prevalence of vacation homes by region and the broader consequences of policies to restrict vacation homes.

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Appendix A. Characteristics of the municipalities that have introduced the residency requirement

Table A1 presents statistics for geography and population density of the sets of municipalities that did and did not have the residency requirement between 1974 and 2016. The first row shows the means and standard deviations for all municipalities, the second row has the statistics for the 92 municipalities that had introduced the residency requirement before January 1st, 2017, and the third row has the statistics for the 336 municipalities that had never had the residency requirement up to that date. The statistics in Table A1 make clear that the municipalities that have introduced the residency requirement are on average less likely to be on the coast, at higher elevation, nearer to Oslo, and lower in population density than those that have not introduced the policy.

Municipalities	Coastal location	Mean elev. (metres)	Dist. From Oslo (km)	Population per km^2
All (n=428)	0.647	384.7	395.2	47.3
	(0.478)	(305.2)	(355.8)	(125.5)
Ever had residency requirement	0.576	503.1	278.4	29.9
(n=92)	(0.497)	(408.7)	(226.2)	(54.4)
Never had residency requirement	0.667	352.2	427.2	52.0
(n=336)	(0.472)	(261.6)	(377.7)	(138.4)

Note: standard deviations in parentheses; 'coastal location' is a binary variable that takes value 1 if the municipality has a section of coastline and value 0 otherwise; the distance from Oslo is the 'crow' distance from the centre of Oslo to the largest town or city in the municipality; population density is measured in 2000

Table A1: Geographical and population statistics for the sets of municipalities that did and did not have the residency requirement between 1974 and 2016.

Table A2 presents statistics for the shares of political parties' representatives on municipal councils over the period from 1980 to 2016, using data from Statistics Norway. Three sets of municipality-by-year combinations are compared: all municipalities in all years, only the municipalities that had the residency requirement at some time between 1980 and 2016 but with data for all years, and municipalities in the years that they introduced the residency requirement. If the residency requirement were more strongly favoured by certain political parties, then there would be a concern that those parties might also favour other policies that influence local growth. This may bias the results, as a measured effect of the introduction of the residency requirement on local growth may in fact be due to the other policies. However, the statistics for the representation on municipal councils suggest that this should not be a concern.

	Left-wing parties			Right-wing parties			Centrist
Municipalities	Labour	Liberal	Socialist Left	Christian Democrat	Conser-vative	Progress	Centre
All (n=15,592)	0.336	0.045	0.049	0.084	0.165	0.061	0.163
	(0.137)	(0.055)	(0.054)	(0.079)	(0.106)	(0.078)	(0.130)
Ever had residency requirement	0.328	0.053	0.043	0.078	0.162	0.052	0.179
(n=3,356)	(0.142)	(0.065)	(0.051)	(0.083)	(0.110)	(0.076)	(0.142)
Year residency requirement	0.345	0.047	0.037	0.086	0.162	0.038	0.178
introduced (n=83)	(0.157)	(0.052)	(0.051)	(0.088)	(0.113)	(0.062)	(0.135)

Note: standard deviations in parentheses; the parties shown in the table are all those with at least 4% of the representatives on municipal councils over the period from 1980 to 2016

Table A2: Representation on municipal councils by political party between 1980 and 2016 in all municipalities, those that introduced the residency requirement, and municipalities in the year that the residency requirement was introduced.

The statistics in Table A2 indicate that in municipalities that had the residency requirement at some point, there was significantly higher or lower than average representation for each party. The differences are all significant at at least the 10% level. This means that the types of municipalities that had the residency requirement do tend to have different political representation on average.

However, in the year when the policy is introduced, most political parties are statistically no more likely to be on the council than in other years. The one exception is the Progress Party, which has on average 1.4% less representation on councils when the residency requirement is introduced, the difference being significant at 5%. This implies that, though political representation is different on average in the municipalities that introduce the residency requirement, the political representation is no different from the average for those municipalities in the years they introduce the policy. As the estimation techniques in the paper use municipality fixed effects, these should capture the average differences in political representation, so the lack of any difference from the average in the year the policy is introduced means that the results should not be affected by the share of representatives on municipal councils.

Appendix B. Difference-in-difference estimation

The difference-in-difference estimation is run by fitting the following equation:

$$y_{m,t} - y_{m,t-1} = \beta Z_{m,t} + \mu_m + \nu_t + \varepsilon_{m,t} \tag{B1}$$

The variables $y_{m,t}$ and $Z_{m,t}$ have the same definitions as in equation (28). The term μ_m is a fixed effect for municipality m, ν_t is a fixed effect for year t, and $\varepsilon_{m,t}$ is an error term.

The fixed effects μ_m and ν_t control for the overall changes in the outcome variable by municipality across all years and by year across all municipalities. As such, the coefficient β represents the difference in the growth of the outcome variable relative to the average growth in the municipality and national trends. However, it may be appropriate to control for regional changes in the outcome variable, so the estimation is also run with county-by-year fixed effects $\xi_{c,t}$, where c indexes the 19 counties in mainland Norway:

$$y_{m,t} - y_{m,t-1} = \beta Z_{m,t} + \mu_m + \xi_{c,t} + \varepsilon_{m,t} \tag{B2}$$

The estimation of (B1) and (B2) is presented in Table B1. Columns 1 through 5 present estimates for the relationship between the residency requirement being in place in a municipality and the local population with a range of different fixed effects. Columns 6 through 8 present the estimates for the relationships between the residency requirement and local employment, wages, and house prices. To keep things as consistent as possible, the samples for population, employment, and wages use the data from 1994 onwards, which is the first year that the wage data are available.

	(1)	(2)	(3)	(4)	(5)	(6) Employment	(7) Mean wage	(8) House prices
			Population					
$I_{\text{[Residency requirement]}}$	−0.0001	0.0001	0.0000	0.0007	0.0009^{c}	−0.0007	−0.0009	0.0063
	(0.0003)	(0.0005)	(0.0003)	(0.0005)	(0.0005)	(0.0015)	(0.0010)	(0.0098)
R^2	0.00	0.53	0.06	0.59	0.63	0.36	0.64	0.15
Number of observations	9,844	9,844	9,844	9,844	9,844	9,844	9,844	4,592
Municipality fixed effects		Y		Y	Y	Y	Y	Y
Year fixed effects			Y	Y		Y	Y	Y
County-by-year fixed effects					Y			

Note: robust standard errors in parentheses; a, b, c denote significance at 1%, 5%, 10%

Table B1: Difference-in-difference estimation of the relationships between the application of the residency requirement in a municipality and the population, employment, wages, and house prices.

The results in Table B1 do not exhibit any clear relationship between the application of the residency requirement and the growth in the outcome variables. Municipalities with the residency requirement have slightly higher growth in population in the specification with the county-by-year fixed effects, but no other regression yields a significant effect.

Appendix C. Event-study results by type of municipality

This appendix analyses whether the event-study results in Tables 2 and 3 vary by region. Table C1 repeats the estimation of (29) for the change in population around the introduction of the residency requirement for different subsets of the municipalities in Norway. Column 1 uses only the 277 municipalities with some section of coastline and Column 2 uses the 151 municipalities with no coastline. Columns 3 and 4 divide up the municipalities according to their mean elevation above sea level. Columns 5 to 9 separate the sample into the five broad regions in Norway.[14]

[14]The five regions comprise the following sets of the counties as they existed in 2016. Eastern Norway: Østfold, Akershus, Oslo, Hedmark, Oppland, Buskerud, Vestfold, and Telemark. Southern Norway: Aust-Agder and Vest-Agder. Western Norway: Rogaland, Hordaland, Sogn og Fjordane, and Møre og Romsdal. Trøndelag: Sør-

The results in Table C1 suggest that the effect of the residency requirement varies somewhat with the characteristics or location of the municipality. The introduction of the residency requirement has a stronger positive effect on the growth in the local population in coastal municipalities than in non-coastal municipalities. The results in Columns 3 and 4 do not exhibit a clear relationship between elevation and the effect of the residency requirement on the local population, as some but not all coefficients are significant for municipalities above and below the threshold. There is also some evidence that the population may have been growing before the introduction of the policy for lower-lying areas.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Coastal location	Non-coast location	Mean elevation (m) 0-300	300+	Eastern Norway	Southern Norway	Western Norway	Trøndelag	Northern Norway
$I_{[t=i(m)-5]}$	−0.0016	−0.0009	0.0002	−0.0008	−0.0003	−0.0027	−0.0010	−0.0008	0.0003
	(0.0021)	(0.0021)	(0.0031)	(0.0018)	(0.0025)	(0.0029)	(0.0023)	(0.0058)	(0.0023)
$I_{[t=i(m)-4]}$	−0.0022	0.0012	0.0015	−0.0002	0.0005	0.0003	0.0020	−0.0009	-0.0089^{a}
	(0.0020)	(0.0017)	(0.0020)	(0.0018)	(0.0022)	(0.0031)	(0.0020)	(0.0052)	(0.0029)
$I_{[t=i(m)-3]}$	−0.0032	0.0023	0.0021	−0.0007	0.0025	−0.0019	−0.0012	−0.0002	-0.0054^{c}
	(0.0023)	(0.0021)	(0.0021)	(0.0022)	(0.0024)	(0.0034)	(0.0039)	(0.0059)	(0.0032)
$I_{[t=i(m)-2]}$	0.0001	0.0007	0.0042^{a}	−0.0010	0.0030	−0.0035	−0.0015	−0.0021	0.0009
	(0.0018)	(0.0024)	(0.0015)	(0.0021)	(0.0023)	(0.0037)	(0.0034)	(0.0061)	(0.0018)
$I_{[t=i(m)-1]}$	0.0016	−0.0003	0.0025	−0.0000	0.0013	−0.0019	0.0043	−0.0046	0.0001
	(0.0017)	(0.0017)	(0.0020)	(0.0017)	(0.0022)	(0.0027)	(0.0027)	(0.0059)	(0.0025)
$I_{[t=i(m)]}$	0.0024	0.0023	0.0012	0.0028	0.0058^{c}	−0.0026	0.0048	−0.0044	0.0036
	(0.0021)	(0.0023)	(0.0029)	(0.0018)	(0.0030)	(0.0022)	(0.0030)	(0.0057)	(0.0048)
$I_{[t=i(m)+1]}$	0.0046^{b}	0.0036^{c}	0.0028	0.0044^{a}	0.0070^{a}	0.0006	0.0055^{b}	0.0031	−0.0001
	(0.0019)	(0.0021)	(0.0026)	(0.0017)	(0.0025)	(0.0019)	(0.0028)	(0.0061)	(0.0036)
$I_{[t=i(m)+2]}$	0.0061^{a}	0.0022	0.0068^{a}	0.0029	0.0046^{b}	0.0069^{c}	0.0043	−0.0029	0.0032
	(0.0020)	(0.0020)	(0.0021)	(0.0018)	(0.0022)	(0.0037)	(0.0044)	(0.0049)	(0.0023)
$I_{[t=i(m)+3]}$	0.0048^{a}	0.0021	0.0059^{a}	0.0022	0.0040^{c}	0.0057^{b}	0.0031	−0.0064	0.0040
	(0.0016)	(0.0026)	(0.0019)	(0.0020)	(0.0021)	(0.0027)	(0.0025)	(0.0075)	(0.0042)
$I_{[t=i(m)+4]}$	0.0034^{b}	0.0048^{b}	0.0029^{b}	0.0040^{b}	0.0048^{a}	0.0051^{c}	0.0063^{a}	−0.0004	−0.0027
	(0.0013)	(0.0022)	(0.0012)	(0.0017)	(0.0017)	(0.0028)	(0.0019)	(0.0049)	(0.0043)
$I_{[t=i(m)+5]}$	0.0020	0.0044^{b}	0.0012	0.0038^{b}	0.0017	0.0044^{c}	0.0067^{a}	0.0028	−0.0020
	(0.0014)	(0.0020)	(0.0013)	(0.0016)	(0.0018)	(0.0023)	(0.0024)	(0.0059)	(0.0034)
R^2	0.61	0.59	0.63	0.49	0.66	0.57	0.61	0.54	0.45
Number of observations	6,371	3,473	5,083	4,761	3,266	690	2,783	1,104	2,001

Note: robust standard errors in parentheses; a, b, c denote significance at 1%, 5%, 10%; all regressions use the sample for 1994 to 2016

Table C1: Event-study estimation of the changes in population around the year the residency requirement was introduced, for subsets of municipalities.

The results in Table C1 also vary by region. For Eastern Norway – the region around Oslo and some mountainous areas to its north and west – the population clearly increases after the introduction of the residency requirement. There is some evidence of effects in Southern Norway and Western Norway, but not in Trøndelag or Northern Norway.

Trøndelag and Nord-Trøndelag. Northern Norway: Nordland, Troms, and Finnmark.

Table C2 presents the results from the estimation of (30) for the change in population around the time when the residency requirement is removed. The columns use the same subsets of municipalities as in Table C1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Coastal location	Non-coast location	Mean elevation (m)		Eastern Norway	Southern Norway	Western Norway	Trøndelag	Northern Norway
			0-300	300+					
$I_{[t=r(m)-5]}$	−0.0001	0.0044^{c}	−0.0004	0.0026	0.0027	0.0017	−0.0012	0.0094^{c}	−0.0014
	(0.0014)	(0.0024)	(0.0017)	(0.0019)	(0.0021)	(0.0017)	(0.0021)	(0.0053)	(0.0021)
$I_{[t=r(m)-4]}$	−0.0004	0.0029	−0.0005	0.0012	0.0014	−0.0011	−0.0026	0.0070^{c}	0.0018
	(0.0015)	(0.0022)	(0.0015)	(0.0021)	(0.0020)	(0.0017)	(0.0025)	(0.0038)	(0.0031)
$I_{[t=r(m)-3]}$	0.0010	0.0033^{c}	−0.0007	0.0036^{c}	0.0017	0.0001	−0.0004	0.0035	0.0040
	(0.0016)	(0.0020)	(0.0017)	(0.0019)	(0.0021)	(0.0022)	(0.0023)	(0.0031)	(0.0031)
$I_{[t=r(m)-2]}$	−0.0008	0.0049^{a}	−0.0020	0.0028	0.0029^{c}	0.0041	−0.0019	0.0024	−0.0037
	(0.0017)	(0.0014)	(0.0018)	(0.0021)	(0.0017)	(0.0031)	(0.0022)	(0.0032)	(0.0028)
$I_{[t=r(m)-1]}$	−0.0025	0.0022	-0.0046^{b}	0.0017	0.0002	0.0006	−0.0019	0.0031	−0.0064
	(0.0017)	(0.0020)	(0.0019)	(0.0018)	(0.0020)	(0.0017)	(0.0022)	(0.0029)	(0.0039)
$I_{[t=r(m)]}$	−0.0017	0.0000	-0.0036^{a}	0.0010	−0.0019	−0.0020	−0.0023	−0.0002	0.0023
	(0.0014)	(0.0029)	(0.0014)	(0.0021)	(0.0024)	(0.0020)	(0.0019)	(0.0036)	(0.0042)
$I_{[t=r(m)+1]}$	0.0009	−0.0006	−0.0005	0.0012	−0.0019	−0.0011	−0.0017	0.0025	0.0093^{b}
	(0.0019)	(0.0028)	(0.0024)	(0.0021)	(0.0028)	(0.0020)	(0.0024)	(0.0033)	(0.0040)
$I_{[t=r(m)+2]}$	0.0012	0.0014	−0.0012	0.0034^{c}	0.0004	−0.0033	−0.0000	0.0033	0.0093^{b}
	(0.0021)	(0.0022)	(0.0028)	(0.0017)	(0.0022)	(0.0027)	(0.0026)	(0.0047)	(0.0046)
$I_{[t=r(m)+3]}$	−0.0022	0.0013	-0.0043^{a}	0.0017	−0.0006	−0.0030	−0.0009	0.0028	−0.0011
	(0.0014)	(0.0023)	(0.0016)	(0.0018)	(0.0024)	(0.0031)	(0.0022)	(0.0019)	(0.0026)
$I_{[t=r(m)+4]}$	-0.0026^{c}	−0.0024	-0.0051^{a}	−0.0002	−0.0032	−0.0022	0.0000	0.0028	-0.0072^{a}
	(0.0016)	(0.0030)	(0.0014)	(0.0023)	(0.0027)	(0.0024)	(0.0024)	(0.0040)	(0.0024)
$I_{[t=r(m)+5]}$	−0.0025	0.0004	−0.0024	−0.0009	0.0000	−0.0010	−0.0026	0.0027	−0.0039
	(0.0015)	(0.0025)	(0.0017)	(0.0019)	(0.0022)	(0.0026)	(0.0025)	(0.0025)	(0.0029)
R^2	0.61	0.59	0.63	0.49	0.65	0.51	0.61	0.59	0.46
Number of observations	6,371	3,473	5,083	4,761	3,266	690	2,783	1,104	2,001

Note: robust standard errors in parentheses; a, b, c denote significance at 1%, 5%, 10%; all regressions use the sample for 1994 to 2016

Table C2: Event-study estimation of the changes in population around the year the residency requirement was removed, for subsets of municipalities.

The results in Table C2 exhibit few differences by region. The removal of the policy is associated with a subsequent decline in the population of municipalities below 300 metres in elevation and an increase in population in Northern Norway. The coefficients for the other categories of regions are generally not significantly different from zero.