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The impact of historic preservation policies on housing values

Ida Qvenild Nesset and Are Oust

NTNU Business School, Norwegian University of Science and Technology, Trondheim, Norway

ABSTRACT
Historic preservation dwellings offer qualities that benefit both owners and society. At the same time, preservation policies might include some costs and restrictions. Although many studies have aimed to assess the impact of historic preservation on housing values, this study, to our knowledge, is the first to investigate whether the historic preservation premium is due to the changed juridical status (a policy effect), or the qualities observed by the buyers that are unobserved in the model. By using a unique data set that combines data of preserved historic dwellings in Oslo, Norway, and data from the housing market from 1990 to 2017, we study sales prices for the same dwellings both before and after historic preservation. The higher prices of preserved historic dwellings seem to be caused by qualities in the dwellings that correlate with the forthcoming historic preservation, and not by the policy itself.

KEYWORDS Historic preservation; housing policies; housing values; fixed effects; differences-in-differences

Introduction

Historic preservation dwellings offer qualities that benefit both owners, users and society. Most western countries have historic preservation policies with the aim to safeguard these qualities for present and future generations 'as part of [the] cultural heritage and identity and as an element in the overall environment and resource management' (Cultural Heritage Act, 1978). Various historic preservation policies limit the possibility of intervention by the homeowner as they typically require maintenance of the dwelling. In principle, maintenance should safeguard original materials and details. However, any measure beyond regular maintenance requires the permission of the appropriate authorities, and may further increase costs

CONTACT Are Oust are.oust@ntnu.no

related to the maintenance and insurance of the dwelling, in addition to time spent, etc. However, professional support and financial compensation to the homeowners due to increased costs in the case of reconstruction, protection and maintenance of preserved historic dwellings, can balance out the effects of the costs of historic preservation policies.

Ahlfeldt and Maenning (2010) argued that a critical aspect of the heritage preservation policy is balancing the cost of preservation between owners and society. If owners achieve a price increase on their dwelling due to the change in juridical status (policy effect), they take a more significant part of the cost. Conversely, if there is no price increase, the profits from the historical preservation benefit the society.

To value built heritage, previous studies mainly employ hedonic methods to control the heterogeneous nature of dwellings when assessing the impact of historic preservation policies on housing values. Ford (1989) suggested that homebuyers pay a premium for homes located within historically preserved districts in Baltimore, MD, USA, which is confirmed by more recent studies, for exmple, in Texas, USA (Leichenko, Coulson, & Listokin, 2001). Schaeffer and Millerick (1991) conducted a study in Chicago, IL, USA, and found that the impact of historic preservation on housing values depends on whether the historic preservation is put into action by national or local authorities. Historic preservation orders from national authorities have positive effects on sales prices, while historic preservation orders from local authorities have negative effects on sales prices. The results of Asabere, Huffman, and Mehdian (1994) partly confirm this, as local historic preservation has a negative impact in Philadelphia, PA, USA.

Outside the United States, evidence for a positive price effect from historical preservation exists in Australia (Deodhar, 2004; Penfold, 1994), Canada (Shipley, 2000) and Germany (Ahlfeldt & Maenning, 2010).

Furthermore, studies of the Norwegian housing market show significantly positive historic preservation premiums (Gierløff, Magnussen, & Eide, 2017; Nome & Stige, 2016). The results of Nome and Stige's (2016) study suggest historic preservation premiums of 7.4, 1.8 and 5.0% per square metre for single-family houses, apartments and small houses (townhouses and semi-detached houses) located in Oslo, Norway, respectively. In Sweden, historically preserved dwellings sell for 7% more than expected market value, and non-preserved for 1% more (Kulturmiljö Halland, 2013). Similarly, findings from Denmark suggest that historically preserved single-family houses (apartments) achieve a price premium of 18% (4%) per square metre (Incentive, 2015).

Apart from Ford (1989), the studies, as mentioned above, focus on the internal effects of historic preservation. However, the historic preservation of dwellings or districts also causes external effects, including spillover effects to neighbouring housing values and socioeconomic conditions such as tourism. As pointed out in several studies (e.g., Ahlfeldt, Holman, & Wendland, 2012; Deodhar, 2004; Gierløff et al., 2017; Nome & Stige, 2016), the historic preservation premium measured using a hedonic approach includes both heritage (internal) and policy (external) effects. Preserved historic dwellings are likely to hold several unobserved characteristics (e.g., architectonic and aesthetic), which are known to induce positive price premiums. The observed historic preservation premium is therefore likely to proxy for qualities that contribute to dwelling preservation in the first place, and these studies cannot ascribe historic preservation premiums to historic preservation policies. In attempting to do so, Ahlfeldt et al. (2012) employed a differences-in-differences (DiD) approach and suggested relatively small policy effects relative to heritage effects through an analysis in England, including 912 historic preservations that occurred after 1995. Hedonic results in the same study suggested substantially higher premiums, which turned out to be upward biases from unobserved heritage qualities. Using a repeated sales framework, results from Noonan's (2007) study in Chicago, IL, USA suggested that a dwelling's sales price increases by 2% for each additional dwelling subject to a historic preservation policy within the same dwelling block. However, using a similar approach, results by Heintzelman and Altieri (2013) suggested adverse policy effects from both districts and homes in the USA, the latter being about 1%. Additionally, in cases where homes are subject to a historic preservation policy and are within a historic district, these effects seem to magnify each other. Oba and Noonan (2017) employed a repeated sales framework on the data from the city of Atlanta, GA, USA. Although the results showed sensitivity to different model specifications, local historic districts seem to generate some positive external effects, while national historic districts seem to produce stronger positive internal effects.

We use a unique data set that combines data of preserved historic dwellings in Oslo, Norway, and data from the housing market from 1990 to 2017. Our data set includes 1269 sales prices of dwellings that were later given historic preservation status. This allows us to study sales prices for the same dwellings both before and after preservation. We address the omitted variable bias by estimating a two-way fixed effects model, including a DiD estimator. Consistent with previous studies, we find a positive historic preservation premium of about 4% when applying the hedonic model. Preserved historical dwellings have a higher price compared with other dwellings that are sold at the same time within similar locations and of the same type, size and age. When we test the policy effect using a two-way fixed effects model, including a DiD estimator, we are not able to conclude that a significantly positive price premium exists. The higher prices of preserved historic buildings seem to be caused by qualities in the dwellings observed by the buyers, and not by those observed in the model. Examples include higher ceilings, and more elaborate facades and interiors, all of which are qualities that might have contributed to the historic preservation of the dwelling in the first place. To our knowledge, this is the first study that aims to distinguish between the policy and omitted bias effects (the heritage effect). Due to the main agent problem associated with historic preservation, our findings indicate that society should cover most—if not all—of the cost of preservation.

In addition to having results from our hedonic model be consistent with previous studies, there is also a consistency in which variables that are included and excluded. Since our results indicate there are no policy effects from historic preservation, they also suggest there are positive price effects from qualities associated with historic preservation (the heritage effect). We have no reason to believe that Norwegian households solely prefer and are willing to pay for these qualities. If this assumption is correct, we also must deduct a heritage price effect from the results to find the policy effect in these countries. Our results indicate that the price effect from historic preservation is smaller than what earlier studies have shown, not only in Norway but across countries. In the following section, we first provide facts about the historic preservation policies in Norway and describe the housing market in Oslo. Next, we describe the data sets underlying the methods in use. We then present the results. Finally, we discuss the findings and offer some concluding remarks.

Background

Historic preservation policies in Norway

The Department for Cultural Heritage Management in Norway is responsible for developing strategies and policies within the field of cultural heritage. Additional responsibilities include ensuring that Norway fulfils its obligations according to UNESCO conventions on cultural heritage protection and following the European Council conventions on cultural heritage. The management of cultural heritage is allocated to the Directorate for Cultural Heritage, whose purpose is described in the Cultural Heritage Act (CHA). Cultural heritage is to be protected in all its 'variety and detail, as part of as part of our cultural heritage and identity and as an element in the overall environment and resource management' (Cultural Heritage Act, 1978). Monuments and sites worthy of historic preservation have undergone a cultural history assessment. They have been identified as worth preserving because the owner, user or society benefits from the various qualities offered by the monument or site. Historic preservation policies ensure that these qualities exist for present and future generations.

In Norway, the most essential legislative instruments that help to preserve and manage cultural heritage are the CHA and the Planning and Building Act (PBA). Built heritage originating from 1537 to 1649 is automatically protected by law, while built heritage originating from different periods requires individual protection orders granted on a case-by-case basis. Built heritage of national significance is subject to the CHA, whereas built heritage of regional or local value is subject to a less strict policy—the PBA. These policies imply, to different degrees, restrictions on the owner or the user of the built heritage. Additionally, these policies typically detail restrictions related to maintenance, which, in principle, should safeguard original materials and details as far as possible. Any measure beyond regular maintenance requires the permission of the relevant authorities, and may further increase costs related to the maintenance insurance of the building, in addition to time spent on maintenance, etc. Such restrictions make it challenging to preserve and manage built heritage and may affect housing values negatively. However, the owner or user of the built heritage can apply for financial and professional support due to increased costs associated with reconstruction, protection and maintenance. Furthermore, homeowners of dwellings subject to the CHA are exempt from property taxes. These circumstances may positively affect housing values and can balance out the effects of the costs of historic preservation policies. Nevertheless, private and local commitments are crucial for successful preservation and management of cultural heritage, which points to the importance of balancing restrictions and benefits to the owner or user.

Through an analysis of how the different historic preservation policies affect buildings in Norway, Nesbakken, Dammamm, and Skrede (2015) found that buildings subject to the CHA rarely change. However, many buildings are subject to decay because of a lack of necessary maintenance. At the same time, few buildings are lost, which could be due to the responsibility falling on the owner to preserve the building. This may indicate a need for policy revisions to prevent preservation rules by the CHA from being ineffective. However, buildings subject to the PBA change more often, and only a few are threatened by decay. Hence, the PBA seems to find a balance between restrictions and benefits compared with the CHA. In fact, a social survey conducted in Norway suggests that a heritage should only be historically preserved if new use was possible (Koziot & Einen, 2016).[1] Evidently, individual policies affect buildings in Norway differently.

Oslo housing market

Our study area is Oslo, the capital city of Norway, which is both a county and a municipality. As of 2017, the city of Oslo had a population of approximately 670,000, while metropolitan Oslo had a population of more than one million. In the second half of the nineteenth century, both the population and activity in the construction sector increased significantly. Construction boomed in the 1870s, 1880s and 1890s when a large part of Oslo's current inner city was built. Typically, the buildings were four- or five-story brick apartments. The late nineteenth century also saw segregation between the affluent western part of the city and the poorer eastern quarters. Large factories were located alongside the Akerselva, a river in the east of the city, and around them, many high-density, low-standard rental blocks for workers were constructed. This pattern continued for several decades and can probably explain the price difference between the east and west today. The city boundary has been enlarged several times over the past century. The enlargements of 1859 and 1878 added many wooden residential buildings to the city's housing stock. The most significant expansion took place in 1948 when the Aker region was added. After the Second World War and up to the 1980s, construction of residential buildings in Oslo mainly occurred in the new suburbs of the former Aker region.

We refer to the city districts that became a part of Oslo following the expansion in 1948 as the outer city and to the pre-1948 city districts as the inner city. Figure 1 shows the 15 city districts in Oslo. The inner city districts are typically more expensive than the outer, and the western city districts are typically more expensive than the eastern. We have grouped the city districts Ullern, Vestre Aker and Nordre Aker and named them as Oslo Vest (Oslo West), treated Grünerløkka and Sagene as one district and named the outer eastern city districts Alna, Bjerke Grorud Nordstrand, Stovner, Søndre Nordstrand and Østensjø as Oslo Øst (Oslo East).

Data

This study combines data from two primary data sources. The first source is an up-to-date list of all buildings worthy of protection received from the Cultural Heritage Management Office in Oslo in January 2017. The list consists of all such buildings constructed after 1600, constituting nearly 13,000 buildings. The list includes buildings of all types, such as schools, commercial properties and storehouses. This study concentrates on dwellings. The list includes each dwelling's address, building type, type of historic preservation, construction year and date or year of historic preservation, as well as a short description. The second data source is the Norwegian property register. Various providers make the property register available online. Our data are collected from the source Eiendomsverdi.no. By using this address, the construction year and the dwelling description from the list of all

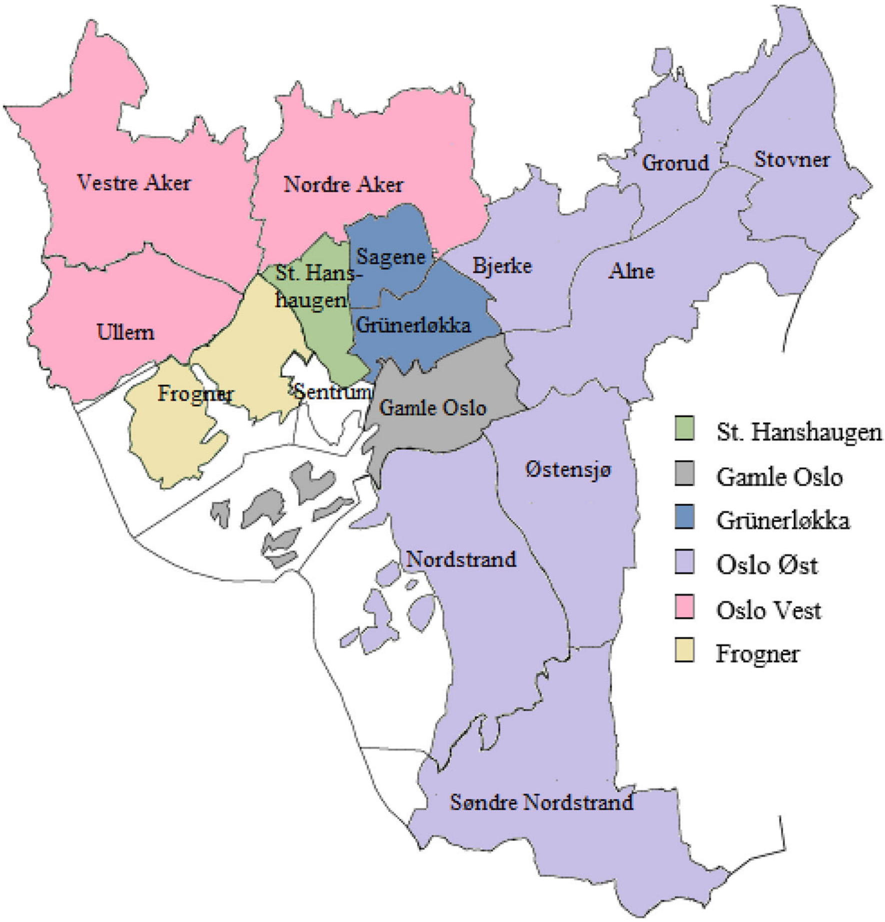

Figure 1. The 15 city districts in Oslo and how we have grouped them in this paper is showed. We have grouped the city districts Ullern, Vestre Aker and Nordre Aker and named it Oslo Vest (Oslo West), Grünerløkka and Sagene is treated as one district and the outer eastern city districts Alna, Bjerke Grorud Nordstrand, Stovner, Søndre Nordstrand and Østensjø is named Oslo Øst (Oslo East).

buildings worthy of protection by the Cultural Heritage Management Office in Oslo, we were able to combine the two data sets.

The Norwegian property register is organised in such a way that it includes all formal transactions of a property with the price and transaction date. We make use of this data to construct a panel data set over the period from 1990 to 2017. We also make use of Eiendomsverdi.no to register dwelling type, size and city district, in addition to price, transaction date and construction year. We also construct a control data set from Eiendomsverdi.no, including data on non-preserved historical dwellings.

Table 1. Descriptive statistics hedonic data.

	Pre-historic preservation			Post-historic preservation		
	Total	Historic preserved	Control	Total	Historic preserved	Control
Location						
St. Hanshaugen	379	97	282	1126	844	282
Gamle Oslo	395	121	274	799	522	277
Grünerløkka and Sagene	1257	616	641	2072	1417	655
Oslo vest	2298	199	2099	2304	184	2120
Oslo øst	3223	59	3164	3387	158	3229
Frogner	436	177	259	2,247	1959	288
Total	7988	1269	6719	11,935	5084	6851
Dwelling type						
Single-family house	1218	61	1157	1466	175	1290
Apartment	4688	1113	3575	8011	4437	3575
Townhouse	1157	34	1123	1313	190	1123
Semi-detached house	925	61	864	1145	282	863
Total	7988	1269	6719	11,935	5084	6851
Year of construction						
Prior to 1987	5386	1250	4136	9245	4986	4259
1987–1996	878	8	870	910	38	872
1997–2006	904	8	896	932	34	898
From 2007	815	1	814	831	13	818
Total	7983	1267	6716	11,918	5070	6851
Size (m^2)						
Very small (0, 40>)	424	77	347	985	634	351
Small (40, 80>)	3204	814	2390	4903	2493	2410
Medium (80, 120>)	1772	247	1525	2451	917	1534
Large (120, 300>)	2495	100	2395	3458	981	2477
Very large (300>)	93	31	62	138	59	79
Total	7988	1269	6719	11,935	5084	6851

Transactions in the Norwegian housing market are like an English auction where buyers compete with open bids and the highest wins the auction. This give us a fair valuation of the dwellings. Eiendomsverdi.no marks non-normal market transactions, which might be transactions within the family, transitions where only a share of a dwelling has changed owners or where the price indicates an error in the registration of the transaction. We exclude all non-normal market transactions.

Descriptive statistics

Table 1 presents descriptive statistics of the hedonic data. We have sales price data on 1269 dwellings that were subsequently given historic preservation. To obtain more robust results than previous studies applying hedonic pricing models, we divide the data set using the event of historic preservation as a cut-off, resulting in two data sets: *pre*-historic preservation and *post*-historic preservation. Thus, we are able to check whether dwellings have the same price premiums before the event of historic preservation.

Table 2. Descriptive statistics panel data.

	Descriptive statistics		
	Overall freq. (%)	Between freq. (%)	Within (%)
Location			
St. Hanshaugen	1224 (9.23)	628	(100)
Gamle Oslo	925 (6.97)	485	(100)
Grünerløkka and Sagene	2693 (20.3)	1322	(100)
Oslo vest	2525 (19.04)	1305	(100)
Oslo øst	3465 (26.12)	1981	(100)
Frogner	2433 (18.34)	1031	(100)
Total	13,265 (100)	6752 (100)	(100)
Dwelling type			
Single-family house	1584 (11.94)	1065 (15.77)	(100)
Apartment	9127 (68.81)	4089 (60.56)	(100)
Townhouse	1347 (10.15)	842 (12.47)	(100)
Semi-detached house	1207 (9.1)	756 (11.2)	(100)
Total	13,265 (100)	6752 (100)	(100)
Year of construction			
Prior to 1987	10,553 (79.56)	5303 (78.54)	(100)
1987–1996	918 (6.92)	427 (6.32)	(100)
1997–2006	940 (7.09)	468 (6.93)	(100)
From 2007	832 (6.27)	539 (7.98)	(100)
Total	13,243 (99.84)	6737 (99.77)	(100)
Size (m^2)			
Very small (0, 40>)	1062 (8.01)	518 (7.67)	(100)
Small (40, 80>)	5719 (43.11)	2547 (37.72)	(100)
Medium (80, 120>)	2717 (20.48)	1377 (20.39)	(100)
Large (120, 300>)	3590 (27.06)	2179 (32.27)	(100)
Very large (300>)	177 (1.33)	131 (1.94)	(100)
Total	13,265 (100)	6752 (100)	(100)
Historic preservation			
Cultural Heritage Act	1280 (9.65)	603 (8.93)	(100)
Planning and Building Act	5073 (38.24)	2248 (33.29)	(100)
Historic preservation	6353 (47.89)	2851 (42.22)	(100)
Non-preserved	6912 (52.11)	3901 (57.78)	(100)
Total	13,265 (100)	6752 (100)	(100)

We now utilise the fact that several of the dwellings sold more than once during the sample period. Table 2 presents descriptive statistics of the panel data. The data are unbalanced as the dwellings are not traded at given times or in given intervals. The panel data set consists of 13,265 sale price observations of 6752 dwellings with an average number of two sales per dwelling. Historic preservation policies have been applied to 2851 (42%) of these dwellings.

Methods

Most studies that examine the price effect of historic preservation have used a simple hedonic model to measure the impact. To study the price effect of historic preservation policies, we apply the method developed by Olaussen, Oust, and Solstad (2017). First, we reproduce the hedonic model used in earlier studies, and then we control to see if the same price premiums also existed before the event of historic preservation. We then expand upon previous studies by employing a two-way fixed effects model, including a DiD estimator to quantify the policy effect itself.

Hedonic models

We start with a simple hedonic model to verify that our results and data are similar to those used in earlier studies. Hedonic models are appropriate when valuing composite products, such as housing assets, which possess several attributes (including historic preservation) that constitute the overall value. We estimate a hedonic time dummy equation of the form

$$\ln(P_{it}) = \gamma_0 + \delta_t + \sum_k \alpha_k c_{kit} + e_{it} \tag{1}$$

where P is the transaction price per square metre, c is a set of explanatory variables for the presence of certain characteristics, k, the time period t ($t = 1, \ldots, T$) and the residential property, i. We let the term δ represent the year dummy coefficients, controlling for the time trend in the house prices. Finally, we have the error term, e. We apply a log-linear functional form.

To study the policy effect itself, we apply the method developed in Olaussen et al. (2017). After reproducing the hedonic model from earlier studies, we run the same hedonic model using the data prior to the historic preservation to see whether the same price premiums existed *before* the historic preservation.

Two-way fixed effects model

We consider the event of historically preservation as a quasi-experiment. Recall that our data set consists of historic preserved and non-preserved dwellings and that we have recorded transactions from both pre- and post-historic preservation periods. Despite the randomness introduced by variations in individual circumstances that make the event appear randomly assigned, there might be remaining differences (Stock & Watson, 2012). We use the DiD approach to address this issue.

Because of the panel structure of the data, we apply two different estimators to search for causal relationships, where each of them makes use of transformation techniques to account for unobserved effects. In cases where unobserved effects are likely to correlate with the included explanatory variables, a fixed effects transformation might be preferable to excluding the time-invariant component of the error term. During the fixed effects transformation, the variables are time-demeaned for each unit, which makes the estimator explore the relationship between transaction price per square metre and the presence of historic preservation *within* a unit. When including a dummy for events of historic preservation, its coefficient accounts for how much the mean value of the transaction price per square metre changes when dwellings change from non-preserved to historic preserved. This is made possible when the transaction price per square metre from before and after the historic preservation is known. Thus, we assess the price effect from the new information provided by the event of historic preservation itself.

If, however, we assume that the error term is not correlated with the included explanatory variables, a random effects transformation might be preferable. We estimate both fixed and random effects models. However, the fixed effects model seems more reasonable because of unobserved effects, such as architectural and aesthetic quality, which are likely to be constant over time and therefore, correlated with the included explanatory variables. Although we make use of the Hausman specification test (1978), we compare the consistent fixed effects model with the efficient random effects model. Note that the time-invariant explanatory variables drop out during the fixed effects transformation.

The classical DiD estimator involves two periods, one treatment group and one control group. In our case, we operate with more than two periods as the time at which dwellings are subject to the action of historic preservation differ. Therefore, we generalise the DiD estimation (see e.g., Bertrand, Duflo, & Mullainathan, 2004) and estimate an equation of the form

$$Y_{st} = \theta_s + \delta_t + \beta T_{st} + \varepsilon_{st} \quad (2)$$

where θ is the fixed effects for group s. The term δ still represents the year dummy coefficients. T is a binary variable equal to 1 if the treatment is in place in treatment group s in year t. The term β measures the estimated impact of the action of legal protection and ε_{st} is the error term. Including both group and year fixed effects, the generalised DiD turns out to be a two-way fixed effects model. The intuition of the estimation is the same as in the case of the classical DiD; we assume that the outcome—the transaction price per square metre—follows a common trend through time in the absence of the event of historic preservation.

Results

Hedonic results

Based on Equation (1), we estimate a two-period hedonic time dummy pricing model: post-historic preservation (Model 1) and pre-historic preservation (Model 2). The baseline dwelling in both models is an apartment smaller than 40 square metres located in Frogner, constructed before 1987 and sold in 2014. The baseline dwelling is also not subject to any legislative instruments.

The intercept in Model 1 is 11.17248, which equals NOK 71,145 per square metre. The controls are highly significant with the expected signs, except for the dummy variable 'Townhouses', possibly because of similarities to the baseline dwelling type. All locations, aside from the baseline 'Frogner', negatively influence the transaction price per square metre which is consistent, as Frogner is considered the most expensive residential area in Norway. Both single-family and semi-detached houses sell for more than apartments. For the year of construction, the results suggest that newer constructed dwellings sell for a premium compared with older constructed dwellings. Transaction price per square metre further declines with the dwelling size. Finally, the time dummies seem to constitute a reasonable price index.

The variable of interest, 'Historic preservation', is highly significant. Preserved historic dwellings are expected to sell for about 4% more per square metre, ceteris paribus. This result is consistent with the majority of previous studies applying the hedonic approach. We test whether the variable of interest has any explanatory power even before the event of historic preservation. From the results of Model 2 presented in Table 3, 'Historic preservation' is negative and insignificant, which implies that the observed price premium is the consequence of the action of historic preservation itself. The controls do not change significantly.

Finally, we assess the impact of the various historic preservation policies on housing values. Creating dummies for the two acts of legislation, we estimate a hedonic time dummy equation similar to Equation (1) (Table 4). We only discuss the variables of interest, as the controls show small changes only. In Model 3, the post-historic preservation model, both variables are positive and significant. The coefficient of the CHA is of greater magnitude (about 7%) compared with the coefficient of the PBA (about 4%). This is consistent, as dwellings subject to the former are more valuable. Hence, the CHA does not seem to lead the most significant buildings into decay, as suggested by Nesbakken et al. (2015). However, in Model 4, the pre-historic preservation model, the coefficient of the PBA is negative and significant at the 5% level (about 2%). We suspect that the event of historic preservation and the time of renovation may be correlated, considering that historic preservation by the PBA implies fewer restrictions, but yet comparable opportunities for funding, compared with historic preservation by the CHA. The coefficient of CHA is insignificant.

Two-way fixed effects results

We now turn to the results presented in Table 5 for both the fixed effects (Model 4) and random effects (Model 6). Under the current specification, the Hausman specification test (Hausman, 1978) rejects that a random

Table 3. Historic preservation and transaction prices, hedonic models.

	Model 1 (post-)		Model 2 (pre-)	
	Coef.	Std. err.	Coef.	Std. err.
Historic preservation	0.041737***	0.0063789	−0.0093993	0.0087965
St. Hanshaugen	−0.1063096***	0.0083515	−0.1412581***	0.0155349
Gamle Oslo	−0.2615222***	0.0096031	−0.2454613***	0.0154633
Grünerløkka and Sagene	−0.1929895***	0.0073515	−0.2131153***	0.0126038
Oslo vest	−0.1140858***	0.0083677	−0.1187121***	0.0119541
Oslo øst	−0.3977271***	0.008171	−0.4200349***	0.0118874
Single-family houses	0.0866677***	0.0084959	0.0487755***	0.0103969
Townhouses	0.004025	0.007988	−0.0112915	0.0094547
Semi-detached houses	0.0580544***	0.0083831	0.0335165***	0.0102812
Year of const. 2007−2017	0.1526853***	0.0085067	0.1586989***	0.008598
Year of const. 1997−2006	0.1179553***	0.0080802	0.1196905***	0.0081397
Year of const. 1987−1996	0.0329193***	0.0081566	0.0417334***	0.0082223
Small	−0.1751595***	0.0077988	−0.2060601***	0.0113411
Medium	−0.2609533***	0.0087216	−0.2858381***	0.0123964
Large	−0.3462156***	0.0094582	−0.3723617***	0.0138015
Very large	−0.402719***	0.0215226	−0.4203988***	0.026821
1990	−1.74032***	0.0304961	−1.691483***	0.0242336
1991	−1.832094***	0.0233446	−1.9058***	0.0211439
1992	−1.878995***	0.0219037	−1.838208***	0.0224336
1993	−1.957151***	0.0216443	−1.963885***	0.02266
1994	−1.713997***	0.0211982	−1.729608***	0.0220598
1995	−1.654***	0.018239	−1.660304***	0.0179052
1996	−1.526734***	0.0169229	−1.550717***	0.017778
1997	−1.376599***	0.0178638	−1.358196***	0.0183569
1998	−1.192288***	0.0173659	−1.178651***	0.0184706
1999	−1.024031***	0.0171145	−1.068139***	0.0182698
2000	−0.8777361***	0.0166295	−0.8770553***	0.0175365
2001	−0.7378332***	0.0147901	−0.7662977***	0.0163358
2002	−0.7163953***	0.0139561	−0.7209961***	0.0151165
2003	−0.7430563***	0.0132797	−0.7286717***	0.0143677
2004	−0.646888***	0.012738	−0.6042976***	0.0145255
2005	−0.5510403***	0.012081	−0.5364509***	0.0145463
2006	−0.409626***	0.0106947	−0.4241847***	0.0151098
2007	−0.3088279***	0.0114004	−0.3409201***	0.0167443
2008	−0.3385498***	0.0119768	−0.359516***	0.0166621
2009	−0.3112968***	0.0118795	−0.3269082***	0.016394
2010	−0.2471822***	0.0106135	−0.2416422***	0.0152274
2011	−0.1519549***	0.0109717	−0.1447365***	0.0157188
2012	−0.0868534***	0.0108228	−0.0932749***	0.0163993
2013	−0.044757***	0.0106367	−0.0661683***	0.0141306
2015	0.1125159***	0.0099869	0.0682878***	0.0144229
2016	0.2285611***	0.0072322	0.2236903***	0.0079278
2017	0.4301236***	0.0429371	0.5613151***	0.2163432
Constant	11.17248***	0.0109839	11.22576***	0.0158317
Adj. R^2	0.8602		0.8913	
Number of obs.	11,935		7,988	

Notes: 'Historic preservation' is a dummy variable that equals 1 if legally protected and 0 otherwise. The dummies 'St. Hanshaugen', 'Gamle Oslo', 'Grünerløkka and Sagene', 'Oslo vest' and 'Oslo øst' are dummies for different locations in Oslo, where 'Frogner' is the baseline. The dummies 'single-family houses', 'townhouses' and 'semi-detached houses' are dummies for different dwelling types where 'apartments' are the baseline. The dummies 'small', 'medium', 'large' and 'very large' allow square metre prices to be different at different square metre levels where 'very small' is the baseline. The dummies 'Year of const. 2007−2016', 'Year of const. 1997−2006' and 'Year of const. 1987−1996' are dummies for different periods of construction where construction year prior to 1987 is the baseline. The year dummies have a baseline in 2014. Dependent variable: natural logarithm of transaction prices per square metre.

***Significant at $p < 0.01$; **Significant at $p < 0.05$; *Significant at $p < 0.1$.

Table 4. Historic preservation by act of legislation and transaction prices, hedonic models.

	Model 3 (post-)		Model 4 (pre-)	
	Coef.	Std. err.	Coef.	Std. err.
Cultural Heritage Act	0.0648211***	0.0106247	0.0131627	0.0131064
Planning and Building Act	0.0371555***	0.0065964	−0.0196924**	0.0098485
St. Hanshaugen	−0.106915***	0.0083522	−0.1424562***	0.0155392
Gamle Oslo	−0.2649293***	0.0096821	−0.2480933***	0.0155006
Grünerløkka and Sagene	−0.2029872***	0.0082196	−0.223627***	0.0133891
Oslo vest	−0.1179979***	0.0084885	−0.1214736***	0.0120098
Oslo øst	−0.4017092***	0.0082993	−0.4234536***	0.011975
Single-family houses	0.0875403***	0.0084997	0.0487476***	0.010394
Townhouses	0.0049455	0.007993	−0.0112214	0.0094521
Semi-detached houses	0.059448***	0.0083965	0.0339172***	0.0102798
Year of const. 2007−2017	0.1539237***	0.0085166	0.1592012***	0.0085983
Year of const. 1997−2006	0.118403***	0.0080797	0.1200003***	0.0081386
Year of const. 1987−1996	0.0325724***	0.0081554	0.041415***	0.0082212
Small	−0.176928***	0.0078239	−0.2067578***	0.011342
Medium	−0.2626319***	0.0087411	−0.2864406***	0.0123957
Large	−0.3481923***	0.0094836	−0.373486***	0.0138062
Very large	−0.4046676***	0.0215287	−0.4204877***	0.0268136
Constant	11.17775***	0.0111511	11.23014***	0.0159394
Year dummies	Yes		Yes	
Adj. R^2	0.8603		0.8914	
Number of obs.	11,935		7988	

Notes: 'Cultural Heritage Act' and 'Planning and Building Act' are dummy variables referring to the acts of legislation applied to residential properties regarding historic preservation. If the residential property is protected by law, the respective dummy equals 1, and 0 otherwise. The dummies 'St. Hanshaugen', 'Gamle Oslo', 'Grünerløkka and Sagene', 'Oslo vest' and 'Oslo øst' are dummies for different locations in Oslo, where 'Frogner' is the baseline. The dummies 'single-family houses', 'townhouses' and 'semi-detached houses' are dummies for different housing types where 'apartments' are the baseline. The dummies 'small', 'medium', 'large' and 'very large' allow square metre prices to be different at different square metre levels where 'very small' is the baseline. The dummies 'Year of const. 2007−2016', 'Year of const. 1997−2006' and 'Year of const. 1987−1996' are dummies for different periods of construction where construction year prior to 1987 is the baseline. The year dummies have a baseline of 2014. Dependent variable: natural logarithm of transaction prices per square metre.
***Significant at $p < 0.01$; **Significant at $p < 0.05$; *Significant at $p < 0.1$.

effects model adequately models the group effects.[2] Henceforth, we focus on the fixed effects result. Even when addressing the omitted variable bias, the result remains relatively the same. On average, historic preservation is expected to command a policy price premium of about 4%.

Assessing the impact of the different historic preservation policies on housing values, the results suggest that dwellings subject to the PBA enjoy a higher policy premium compared with dwellings protected by the CHA (Table 6).

Results robustness tests

We perform three additional robustness tests. A disproportionately large share of the preserved historic dwellings in our data set is in the city

Table 5. Historic preservation and transaction prices, fixed and random effects model.

	Model 5 (fixed effects)		Model 6 (random effects)	
	Coef.	Std. Err.	Coef.	Std. Err.
DiD (historic preservation)	0.0433449***	0.0085318	0.1124463***	0.0055791
1990	−1.744015***	0.0184391	−1.711575***	0.017531
1991	−1.887609***	0.015362	−1.862244***	0.0147632
1992	−1.933198***	0.0157154	−1.912514***	0.0150549
1993	−1.97017***	0.0150786	−1.955955***	0.0144621
1994	−1.755816***	0.0146314	−1.732976***	0.0141524
1995	−1.665112***	0.0127979	−1.65075***	0.012263
1996	−1.577018***	0.012107	−1.5543***	0.0116711
1997	−1.38141***	0.0123394	−1.364482***	0.0119235
1998	−1.208167***	0.0125155	−1.193742***	0.0120842
1999	−1.037807***	0.0125148	−1.021314***	0.012022
2000	−0.8724405***	0.0121045	−0.8591824***	0.0116304
2001	−0.7843372***	0.0108377	−0.7601144***	0.0104223
2002	−0.7369122***	0.0104175	−0.7217368***	0.0098773
2003	−0.7589806***	0.0098564	−0.7360341***	0.0093085
2004	−0.6174571***	0.0097866	−0.6036884***	0.0091563
2005	−0.5461812***	0.0095899	−0.5331475***	0.009044
2006	−0.4307487***	0.0090518	−0.4224622***	0.0085393
2007	−0.316241***	0.0095522	−0.3116842***	0.0090943
2008	−0.3522508***	0.0099569	−0.3491129***	0.009525
2009	−0.3244261***	0.0099593	−0.3196632***	0.0094673
2010	−0.257726***	0.0089659	−0.247784***	0.008488
2011	−0.1592093***	0.0091757	−0.151048***	0.0087216
2012	−0.0800736***	0.0095586	−0.077002***	0.0089118
2013	−0.0556351***	0.0097185	−0.0521436***	0.0089828
2015	0.1049001***	0.0118251	0.1311175***	0.0095438
2016	0.2790965***	0.0124776	0.187274***	0.0076368
2017	0.385367***	0.0372792	0.3991025***	0.0355094
Constant	10.78862***	0.0054925	10.75152***	0.0054041
R^2				
Within	0.9379		0.9365	
Between	0.6687		0.6893	
Overall	0.8045		0.8163	
Rho	0.78730285		0.72523422	
Number of obs.	13,265		13,265	
Number of groups	6752		6752	

Notes: The DiD equals 1 if the treatment is in place in the treatment group s in year t. The year dummies have a baseline in 2014. Min. (avg.) max. obs. per group: 1 (2) 11. Dependent variable: natural logarithm of transaction prices per square metre.
***Significant at $p < 0.01$; **Significant at $p < 0.05$; *Significant at $p < 0.1$.

districts of Grünerløkka and Sagene, where house prices seem to have increased compared with the rest of the city. To exclude the possibility of our results being driven by a special price development in Grünerløkka and Sagene and not by the event of historic preservation, we rerun the regression solely for the city districts of Grünerløkka and Sagene. The results are presented in Table 7. Two of the three coefficients are negative, and neither historic preservation nor historic preservation by the acts of legislation are significant.

Table 6. Historic preservation and transaction prices, fixed and random effects model.

	Model 7	
	Coef.	Std. Err.
DiD (Cultural Heritage Act)	0.0364417***	0.0125782
DiD (Planning and Building Act)	0.0480885***	0.0106361
Constant	10.78753***	0.0056874
Time dummies	Yes	
R^2		
Within	0.9379	
Between	0.6693	
Overall	0.8051	
Rho	0.78684105	
Number of obs.	13,265	
Number of groups	6752	

Notes: The DiD estimator equals 1 if the treatment is in place in treatment group *s* in year *t* for the different acts of legislation (Cultural Heritage Act versus Planning and Building Act). The year dummies have a baseline in 2014. Min. (avg.) max. obs. per group: 1 (2) 11. Dependent variable: natural logarithm of transaction prices per square metre.
***Significant at $p < 0.01$; **Significant at $p < 0.05$; *Significant at $p < 0.1$.

Table 7. Historic preservation and transaction prices in the city districts of Grünerløkka and Sagene, fixed effects models.

	Model 8		Model 9	
	Coef.	Std. Err.	Coef.	Std. Err.
DiD (historic preservation)	−0.0156688	0.0150264		
DiD (Cultural Heritage Act)			−0.0214057	0.0158521
DiD (Planning and Building Act)			0.003034	0.0222987
Constant	10.9095***	0.0135767	10.90627***	0.01387
Time dummies	Yes		Yes	
R^2				
Within	0.9554		0.9554	
Between	0.8099		0.8091	
Overall	0.8828		0.8826	
Rho	0.70057036		0.70151386	
Number of obs.	2693		2693	
Number of groups	1322		1322	

Notes: The DiD variables equal 1 if the treatment is in place in treatment group *s* and year *t* for historic preservation in general (Model 8) and for the different acts of legislation (Model 9). The baseline year for the year dummies is 2014. Min. (avg.) max. obs. per group: 1 (2) 10. Dependent variable: natural logarithm of transaction prices per square metre.
***Significant at $p < 0.01$; **Significant at $p < 0.05$; *Significant at $p < 0.1$.

Second, to make the dwellings in the control data set similar to the preserved historical dwellings along the age dimension, we remove dwellings constructed after 1986. The results are presented in Table 8. Here, the different historic preservation coefficients are between 1.5% and 2.1%. Historic preservation is significant at the 5% level, historic preservation by the PBA

Table 8. Historic preservation and transaction prices excluding dwellings constructed after 1986, fixed effects models.

	Model 10		Model 11	
	Coef.	Std. Err.	Coef.	Std. Err.
DiD (historic preservation)	0.0191052**	0.0090285	–	–
DiD (Cultural Heritage Act)	–	–	0.0161548	0.0132689
DiD (Planning and Building Act)	–	–	0.0210924*	0.0111541
Constant	10.8137***	0.0071958	10.81314***	0.0074342
Time dummies	Yes		Yes	
R^2				
Within	0.9401		0.9401	
Between	0.6837		0.6841	
Overall	0.8135		0.8138	
Rho	0.77715528		0.77685507	
Number of obs.	10,553		10,553	
Number of groups	5303		5303	

Notes: The DiD estimators equals 1 if the treatment is in place in treatment group *s* in year *t* for historic preservation in general (Model 10) and for the different acts of legislation (Model 11). The baseline year for the year dummies is 2014. Min. (avg.) max. obs. per group: 1 (2) 11. Dependent variable: natural logarithm of transaction prices per square metre.
***Significant at $p < 0.01$; **Significant at $p < 0.05$; *Significant at $p < 0.1$.

is significant at the 10% level and historic preservation by the CHA is not significantly different from zero.

Finally, we do not have data on the renovation of dwellings. If the event of a historic preservation and the time of renovation are correlated, this might create an omitted variable bias, as discussed in the hedonic result section. We believe that this correlation should be less likely for apartments compared with other dwellings since the historic preservation applies to the entire building, not just to each apartment. Therefore, we re-estimated our regression, including apartments only, and the results indicate minor changes.

Discussion and concluding remarks

In this article, we extend the literature on preserved historical dwellings by, to our knowledge, being the first to distinguish between the policy and omitted bias effects. We introduce a unique panel data set from the Norwegian capital, Oslo, which covers the period 1990–2017. The data set includes transaction prices for 1269 dwellings that were historically preserved. Our panel data set makes it possible to treat the event of historic preservation as a quasi-experiment. We can study the price effect of the event of historic preservation, not just whether preserved historical dwellings have a higher or lower price compared with other dwellings. If we believe that preserved historical dwellings have higher (or lower) architectural and aesthetic quality than non-preserved dwellings, this type of panel data set is necessary to separate the heritage effect from the architectural and aesthetic quality, and the policy effect from the event of the historic preservation.

To study the price effect of the historic preservation event, we apply the method developed by Olaussen et al. (2017). First, we re-estimate the hedonic model from earlier studies and obtain a similar positive historic preservation premium of about 4%. Preserved historical dwellings have a higher price compared with other dwellings sold at the same time within a similar location, and of a similar type, size and age. We then expand upon previous studies by employing a two-way fixed effects model, including a DiD estimator to quantify the policy effect. We are not able to conclude that there is a significant positive policy price premium. The higher prices of preserved historic buildings seem to be caused mainly by qualities in the dwellings that are observable by the buyers, but not included in the model. Some examples include higher ceilings, more elaborate facades and interiors, and other qualities that might have contributed to having the dwelling historically preserved in the first place.

In addition to proving there are no policy effects from historic preservation, our results also reveal there are positive price effects from qualities associated with historic preservation (the heritage effect). We have no reason to believe that Norwegians solely have these preferences. If we are correct in this assumption, our results have policy implications outside the Norwegian context. This is especially true for countries with similar legislation to the Norwegian one, including the countries mentioned in the introduction where studies have indicated that historical persevered dwellings have a higher price.

Historic preservation can be regarded as a principal agent problem. Principal agent theory is central in policy analyses and economics when a person or entity (the agent) make decisions or take actions that affect another person or entity (the principal) (Waterman & Meier, 1998). When the principal designs a contract or a law, in this case, it needs to take into account the incentives the contract or law creates for the agent. The incentives need to influence the agent (dwelling owners) in such a way that the agent acts in the principals' (authorities'/societies') interest.

If we assume that the authorities' main objective with historic preservation is to safeguard qualities with the dwellings for present and future generations, the policy must not create incentives that work against these goals. If dwelling owners believe that a change in juridical status has a positive price effect, they will restore dwellings so that they are effectively historically preserved before official preservation is imposed. On the other hand, if the dwelling owners believe that the historical preservation will have a negative economic impact for them, they can reduce the historical values of the dwellings to prevent preservation. It is important to note that this is not the same as saying that everyone will do so; the incentives only increase the risk if somebody chooses to do so.[3]

To avoid creating harmful incentives, the authorities or society need to cover most—if not all—of the cost of preservation.[4]

We are mainly concerned with the effects of historic preservation on buildings in poor repair. It is not necessarily sufficient that on average, the law does not create negative incentives. Dwellings in need of a more comprehensive renovation or even for which the technical value of the dwelling is negative might experience a larger negative impact from historic preservation compared with the average dwelling in our data set. The worst-case scenario is that the owners in fear of the price implications of historic preservation will damage or destroy properties of the dwellings that may give them historic preservation status. Our findings reveal the need for future studies to examine the price effects of historic preservation for low-quality dwellings. This includes both the dwellings where historic preservation can maximise value by safeguarding dwelling qualities for present and future generations, as well as dwellings where the policy could give incentives to damage or destroy the landmark properties of the dwelling.

Notes

1. Koziot and Einen (2016) conducted the survey based on a national representative sample of 1067 respondents in Norway.
2. Hausman specification test statistics: χ^2 (28) $= 275.60$. Prob. $> \chi^2 = 0.0000$.
3. That some owners might be willing to act on the incentives that are created by the law might here be seen as an extension of the rationale behind the law, where the lawmakers have decided that it is necessary to safeguard dwellings historical qualities from destruction from its owners.
4. This study does not aim to propose administrative solutions, but we want to stress that policymakers and those that administrate the historical preservation policy need to think about the possible negative conclusions the law could create.

Disclosure statement

No potential conflict of interest was reported by the authors.

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