ECONOMIC COMMENTARIES

Analyses of effects of the residential mortgage loan regulation

Preliminary analyses based on house prices, housing transactions and debt in 2017 and taxdata for 2013-2015

NORGES BANK

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1 Introduction

This article analyses the effects of the regulation on residential mortgage loans issued in 2017. The analyses are preliminary as tax data for 2017 are not yet available. Residential mortgage loan requirements were laid down in the form of a regulation in 2015 and tightened on 1 January 2017. The current regulation applies until summer 2018. The Ministry of Finance requested Finanstilsynet (Financial Supervisory Authority of Norway) to provide an assessment of developments in house prices and household debt in Norway and how these developments have been affected by the regulation. The Ministry also asked Finanstilsynet to obtain assessments and factual data from Norges Bank. Norges Bank sent its response to Finanstilsynet on 9 February, and Finanstilsynet submitted its conclusions to the Ministry on 28 February.

The main requirements in the current regulation are: 1) a maximum loan-to-value (LTV) ratio of 85 percent, 2) a borrower's total debt must not exceed five times gross annual income (debt-to-income (DTI) ratio), 3) a borrower's debt-servicing capacity to meet a 5 percentage point increase in interest rates must be tested, 4) principal payments must be required for loans with an LTV ratio above 60 percent and 5) an additional requirement specific to Oslo that LTV ratios for secondary home mortgages must not exceed 60 percent. Up to 10 percent of the total value of a bank's loans granted per quarter can be loans that do not meet one or more of the requirements, referred to as the "speed limit". For mortgages on homes in Oslo, the speed limit is 8 percent. The DTI limit and the requirements specific to Oslo were not included in the first regulation issued in 2015. Furthermore, the principal payment requirement was tightened in 2017 to apply to loans with an LTV ratio above 60 percent, as opposed to the previous limit of 70 percent.

According to figures from Finanstilsynet's 2017 mortgage lending survey, the share of loans that do not meet the required standards has decreased compared with the previous year, with the largest decrease in loans breaching the DTI limit (Table 1).[1] This is in line with Norges Bank's lending survey, which shows that banks' tightened credit standards in the first quarter of 2017 and that banks consider that the introduction of a limit on the DTI ratio has had the strongest impact on

[1]See Finanstilsynet's 2017 mortgage lending survey.

Table 1: Share of amortising loans that do not comply with current regulatory requirements according to Finanstilsynet's 2017 mortgage lending survey

	2014	2015	2016	2017
LTV above 85 percent	19%	16%	15%	12%
LTV above 85 percent including additional collateral	10%	7%	5%	3%
Inadequate debt-servicing capacity (5 pp interest rate rise)	4%	2%	4%	1%
Interest-only above 60 percent LTV	12%	9%	7%	4%
DTI above 500 percent	8%	6%	9%	2%

household borrowing.[2] Finantilsynet's mortgage lending survey also indicates that the share of new loans that do not meet the required standards has decreased most in 2017 among younger borrowers (aged below 30).

The first section of this article presents an analysis of the effect on house prices of the introduction of the DTI limit. The second section analyses the change in the number of homebuyers in 2017 compared with previous years, and the third section analyses developments in debt.

2 DTI limit and regional developments in house prices

The DTI limit is the same throughout the country, but the share of households with a high DTI ratio varies geographically and is highest for homebuyers in urban areas.[3] The DTI limit may therefore have had a stronger impact in areas with a large share of homebuyers with high DTI ratios. We divide Norway into 57 areas and calculate the share of homebuyers in 2014 that would have exceeded the current DTI limit using tax data from Statistics Norway and information about housing transactions from Ambita.[4,5,6] Each area's "exposure" is calculated as the share of homebuyers that would have exceeded the DTI limit in 2014 when the speed limit for the area in 2017 is subtracted.[7]

Chart 1 (a) shows the twelve-month change in house prices from January 2016 to December 2017 for areas with positive "exposure" and areas with "exposure" below zero. House prices increased at a somewhat sharper rate in areas with positive "exposure" in 2016, while the decline in house prices in 2017 was considerably sharper in areas with positive "exposure". There is a clearly negative

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[2]See Norges Bank's lending survey 3/2017.

[3]See Anundsen and Mæhlum, "Regional differences in house prices and debt", *Economic Commentaries* 4/2017. Norges Bank.

[4]The analyses are based on house prices obtained from Real Estate Norway, Eiendomsverdi and the Finn.no classified advertisements website, calculated by the old method. Revised house prices are only available for a small number of larger areas.

[5]The 57 areas include 15 districts in Oslo and the following areas: "Fredrikstad", "Moss", "Sarpsborg", "Remaining Østfold", "Asker", "Bærum", "Follo", "Nedre Romerike", "Øvre Romerike", "Hamar", "Hedmark without Hamar", "Lillehammer", "Oppland without Lillehammer", "Drammen", "Buskerud without Drammen", "Larvik", "Sandefjord", "Tønsberg", "Vestfold without Tønsberg, Sandefjord og Larvik", "Porsgrunn", "Skien", "Telemark without Skien og Porsgrunn", "Aust-Agder", "Kristiansand", "Vest-Agder without Kristiansand", "Sandnes", "Stavanger", "Haugesund", "Rogaland without Stavanger, Sandes og Haugesund", "Bergen", "Hordaland without Bergen", "Sogn og Fjordane", "Ålesund", "Møre og Romsdal without Ålesund", "Trondheim", "Sør-Trøndelag without Trondheim", "Nord-Trøndelag", "Bodø", "Nordland without Bodø", "Tromsø", "Troms without Tromsø" and "Finnmark".

[6]The analysis is limited to households that have purchased a property with a house on the open market. For the calculation of a household's DTI ratio, debt is measured as the household's total debt, and income is the household's total income. For robustness, the analysis is based on the household's highest income in 2014 and 2015.

[7]The area's speed limit is subtracted to adjust for the difference in speed limit between Oslo and the rest of the country.

Chart 1: House price change and "exposure" to the DTI limit[1]
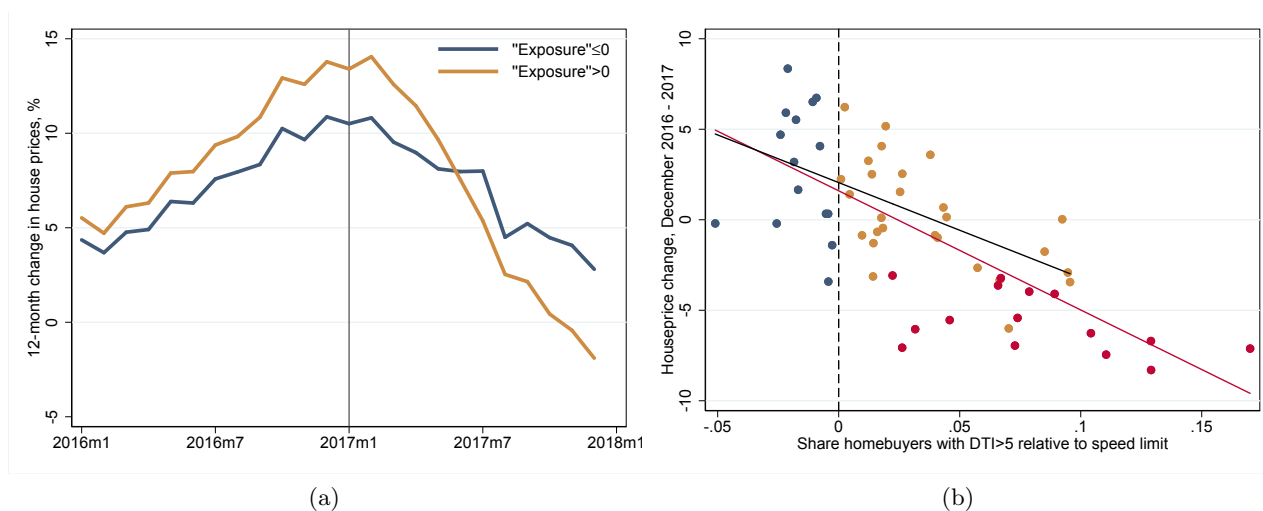
(a)　　　　　　　　　　　　　　　　　　(b)

relationship between "exposure" and the twelve-month change in house prices in December 2017 (Chart 1 (b)). The relationship is somewhat less pronounced, though still negative, if districts in Oslo (red dots) are excluded from the sample.

The relationship between changes in house prices in 2017 and the share of homebuyers with a DTI ratio of more than five could also be the result of other factors. Table 2 shows a regression where selected factors are controlled for across the columns. In the regression, the 57 areas are divided into two groups based on whether the share of homebuyers with a DTI ratio of more than 5 after subtraction of the area's speed limit is greater or smaller than zero, cf. Chart 1. The equation estimated is

$$\Delta_{12}houseprice_i = \beta_0 + \mathbf{X}_i'\beta_1 + EXP_i + \epsilon_i,$$

where EXP_i indicates whether area i has positiv "exposure" and $\mathbf{X}_i$ is a vector of control variables for area i. Column I in the table gives the result of the estimation without control variables and shows that in 2017 house prices rose 4.7 percent less in the "exposed" areas compared with the other areas (which are the base group and are therefore not shown in the table). Column II shows the result when the following control variables are included for each area i: the 12-month change in unemployment at the county level, the 12-month change in the "supply" of existing homes for sale in the area, and expected output for the region as reported by Norges Bank's regional network. The "supply" of existing homes is the sum of unsold homes at the beginning of the month and homes put on the market in that month. Comparing columns I and II, we find that owing to the control variables, the effect of belonging to the "exposed" group of areas is smaller and has a slightly lower level of significance. In column III, Oslo is not included in the data. The effect on the results is small, but the level of significance is even lower.

In columns IV-VII, the size of the area is also controlled for (using dummy variables), with "city"

Table 2: Effect of "exposure" on house prices between December 2016 and December 2017[1]

	I	II	III	IV	V	VI	VII
"Exposure">0	-4.703***	-2.310**	-1.698*	-2.459**	-2.486**	-1.820*	-2.150**
	(1.118)	(0.921)	(0.918)	(0.992)	(1.005)	(0.940)	(1.051)
$\Delta HP_{2010:2016}$					-0.011		
					(0.036)		
Share 3<DTI<4						-0.417***	
						(0.135)	
Share DTI>6							-0.158
							(0.176)
Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
City/town/rural area	No	No	No	Yes	Yes	Yes	Yes
N	57	57	42	57	57	57	57
adj. R^2	0.230	0.586	0.360	0.648	0.641	0.699	0.646

[1]Standard deviation in brackets. *, **, *** indicate significance at the 10, 5 and 1 percent levels.
Sources: Real Estate Norway, Eiendomsverdi, Finn.no, Statistics Norway and Norges Bank

referring to districts of Oslo, Bergen, Trondheim, Stavanger and Brum, "town" referring to other towns in the sample and "rural areas" referring to the remaining areas. The results in column IV show that including the dummy variables has little effect on the results compared with column II. A sharper fall in house prices in an area may reflect a preceding sharper rise in that area. Column V also includes house price inflation in the area between January 2010 and December 2016, but with virtually no effect on the results. The effect of being "exposed" may capture a generally high debt ratio among homebuyers in an area and that the share of homebuyers with a debt ratio of more than five after subtraction of the area's speed limit has little effect on house prices. To allow for this, column VI includes the share of homebuyers with a debt ratio of between three and four (as a percentage), while column VII includes the share of homebuyers with a debt ratio of more than six (as a percentage). The effect of belonging to the "exposed" group is still significant, but the level of significance is somewhat lower when the share of homebuyers with a debt ratio of between three and four is included. On the other hand, the effect is virtually unchanged when the share of homebuyers with a debt ratio of more than six is included.

If the introduction of a maximum DTI ratio of five in 2017 is an important driver of the results above, the effect on house prices of a high share of households with a debt ratio of more than five should be stronger in 2017 than in 2016. This is precisely the effect in monthly terms for 2016 and 2017 that is shown in Chart 2, based on a regression equation similar to the equation in column II in Table 1, but with time fixed effects (a time dummy for each month, τ_t) and $EXP_i * \tau_t$ measuring the difference between house price developments in areas with positive "exposure" relative to other

areas month by month:

$$\Delta_{12}houseprice_{it} = \beta_0 + \mathbf{X}'_{it}\beta_1 + EXP_i + \tau_t + EXP_i * \tau_t + \epsilon_{it},$$

where $\mathbf{X}_{i,t}$ includes the following control variables for each area i at time t: the 12-month change in unemployment at county level and the 12-month change in the "supply" of existing homes in the area. Chart 2 shows that the difference between house price developments in areas with positive "exposure" relative to other areas was close to zero in 2016, but increasingly negative in 2017.

Chart 2: Time-varying effect of being "exposed"[1]
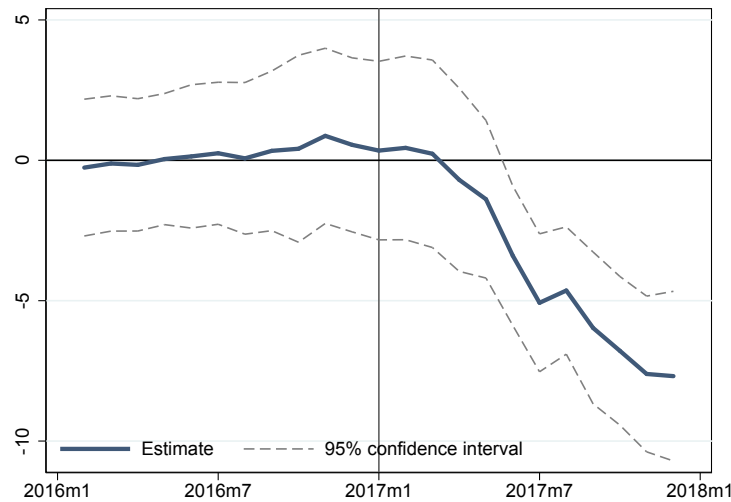
[1]The 57 areas are divided into two groups based on whether the "exposure" of the area is greater or smaller than zero.
Sources: Real Estate Norway, Eiendomsverdi, Finn.no, Statistics Norway and Norges Bank

3   Developments in number of homebuyers

The analyses of changes in the number of homebuyers apply data on property registration in the period 2010 to end-November 2017 provided by Ambita.[8] As some time elapses between the purchase of a property and until the transfer of ownership is registered, it is reasonable to expect that some time elapsed before the regulatory change affected the number of homebuyers in 2017 as measured here. Based on housing transactions in 2016, Statistics Norway has estimated that the transfer of ownership of a home is registered approximately two to three months after the contract between buyer and seller has been signed, although this time period can vary considerably.

Statistics from Real Estate Norway show that although house prices fell in 2017, the number of transactions remained steady. This is confirmed by the property registration data. The number of homebuyers is at the same level as in previous years (Chart 3). Chart 4 shows the number of homebuyers by age group. The share of homebuyers in the youngest age group, aged between 20 and 24, is slightly lower in 2017. The share of homebuyers in the oldest age group, aged over 60, is

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[8]Private individuals that have purchased more than 25 percent of a residential property on the open market are classified as homebuyers.

somewhat higher in 2017, although the share of homebuyers in this group has been increasing for several years.

Chart 3: Number and share of homebuyers per month. 2010-2017
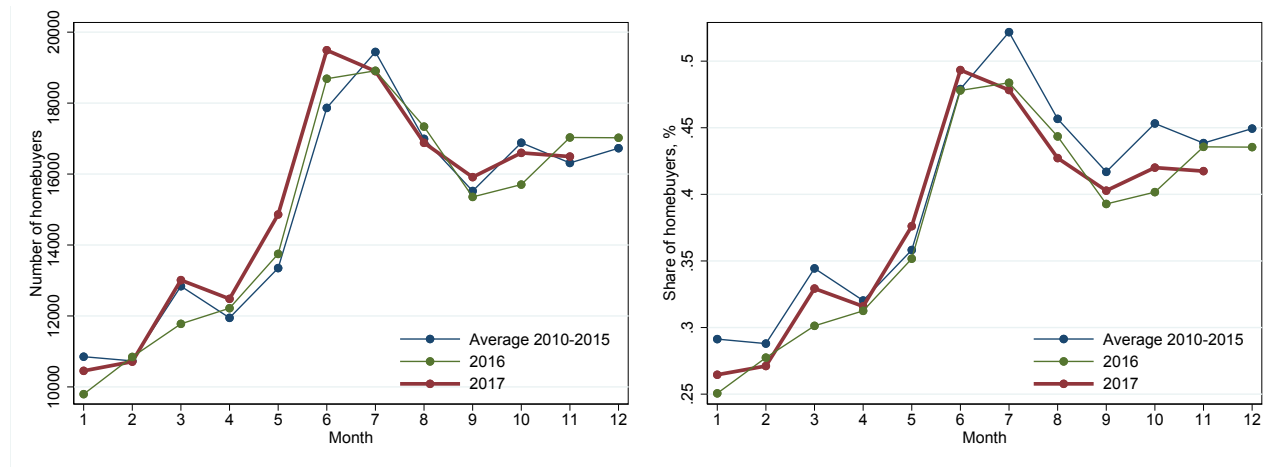
(a) Number of homebuyers

(b) Homebuyers as a percentage of the population aged 20-90
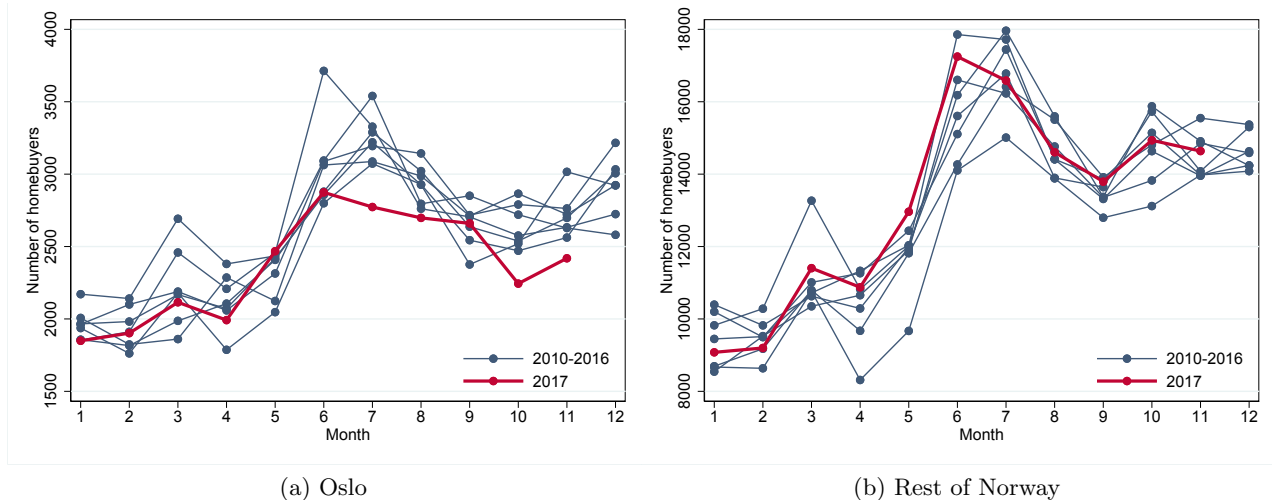
Sources: Ambita and Norges Bank

In Oslo, where house prices fell most in 2017, the decrease in the number of homebuyers is somewhat more pronounced (Chart 5). Again, the decrease is sharpest in the youngest age group. However, as this group of purchasers in the housing market is small, the decline is small in terms of the number of homebuyers (Chart 6). In Oslo, there is also some decrease in the number of homebuyers in the 30-59 age group, which account for a large share of the housing market. Oslo is one of the areas with a high share of homebuyers with a DTI ratio of more than five (see analysis above).

Chart 4: Share of homebuyers per month by age group. Percent. 2010-2017

(a) Aged 20-24

(b) Aged 25-29
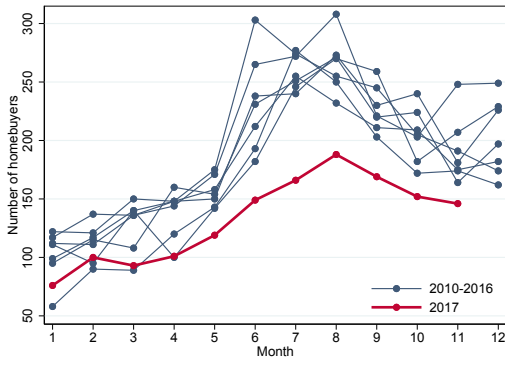
(c) Aged 30-59

(d) Aged 60+
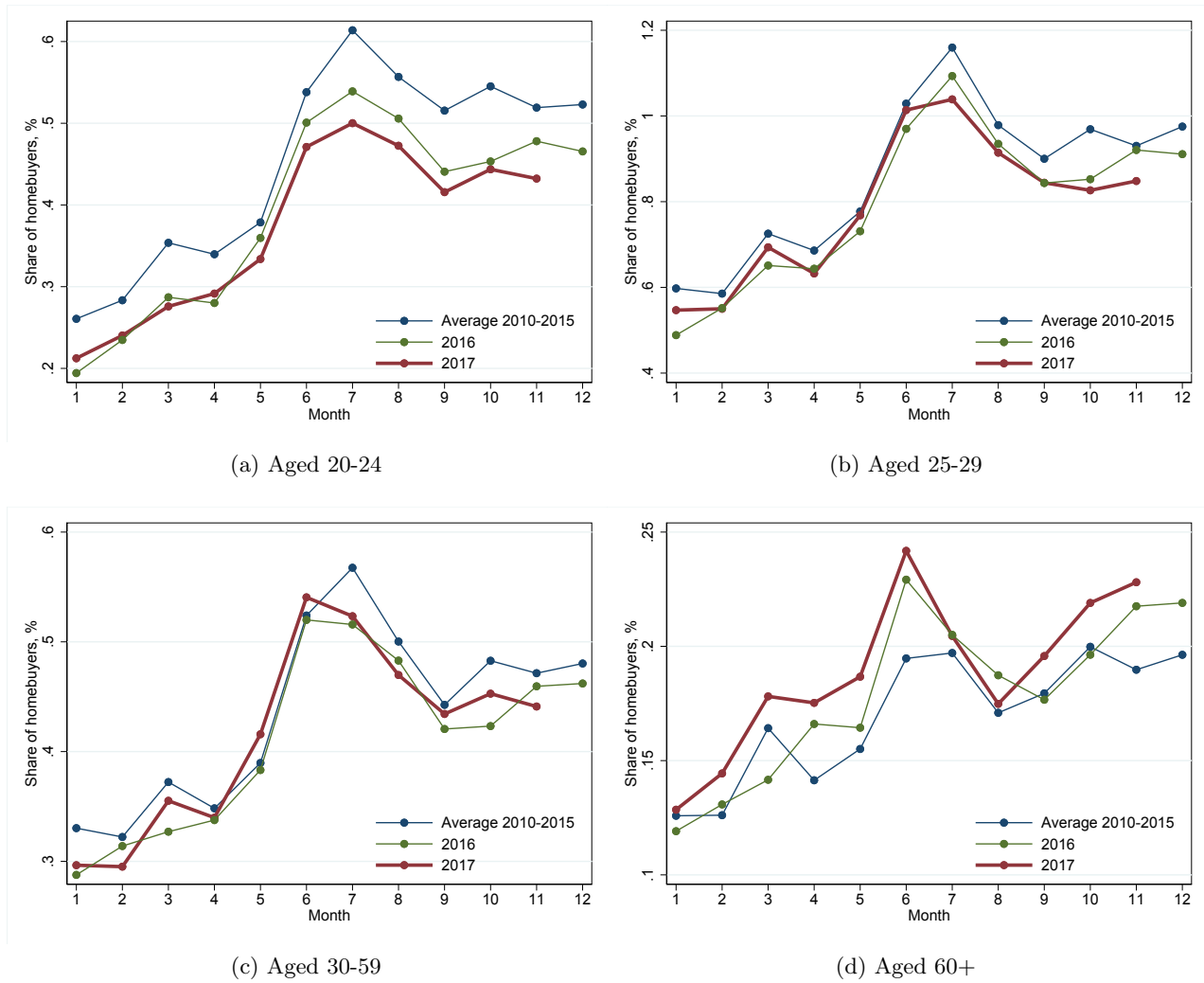
Sources: Ambita and Norges Bank

Chart 5: Number of homebuyers per month by area. 2010-2017
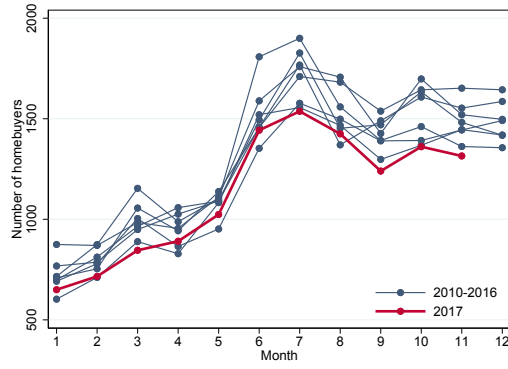

(a) Oslo

(b) Rest of Norway
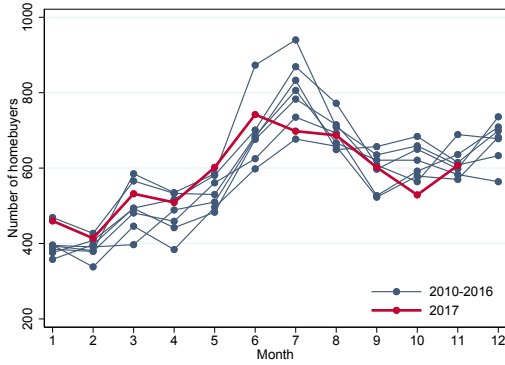
Sources: Ambita and Norges Bank

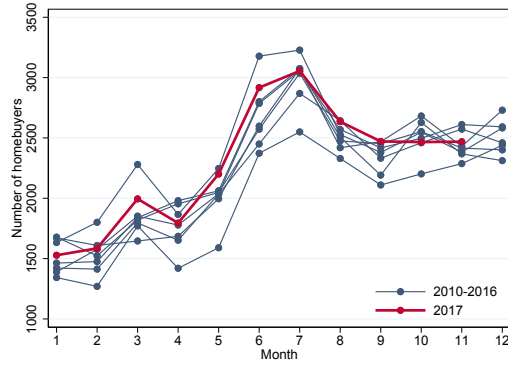# Chart 6: Number of homebuyers per month by area and age. 2010-2017
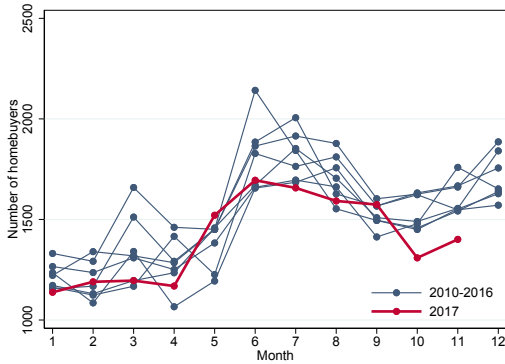

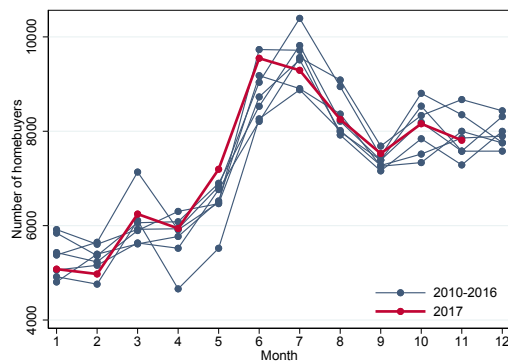(a) Oslo, aged 20-24
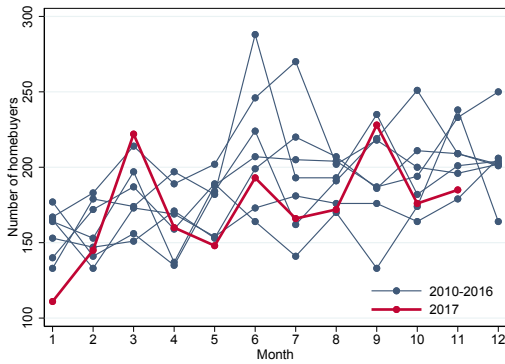
(b) Rest of Norway, aged 20-24

(c) Oslo, aged 25-29

(d) Rest of Norway, aged 25-29

(e) Oslo, aged 30-59

(f) Rest of Norway, aged 30-59

(g) Oslo, aged 60+

(h) Rest of Norway, aged 60+

Sources: Ambita and Norges Bank
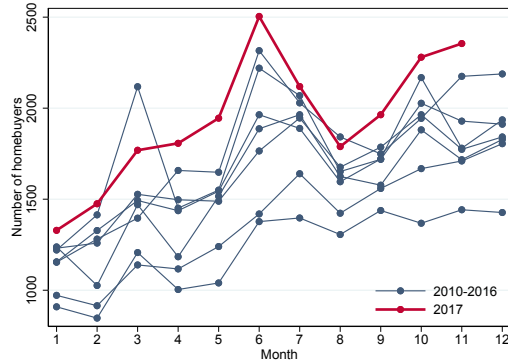
The change in the number of homebuyers may also be the result of factors other than the change in the regulation on mortgage loans. A simple regression analysis shows that the decrease in the number of homebuyers measured relative to a historical average was somewhat larger in municipalities (and districts of Oslo) with a higher share of homebuyers with a DTI ratio of more than five after subtraction of the area's speed limit (Chart 7).[9] The municipalities (and the districts of Oslo) are divided into 30 groups of equal size according to the share of homebuyers with a DTI ratio of more than five after subtraction of the area's speed limit ("exposure"). The chart shows the average "exposure" and the number of homebuyers in the period May-November 2017 relative to the historical average for the same period in the years 2010-2016 for each group. For the groups with positive "exposure", Chart (b), there is a negative relationship between the change in the number of homebuyers and the degree of "exposure". For the group with negative "exposure", Chart (a), there is no relationship between the change in the number of homebuyers and the degree of "exposure".

Chart 7: Number of homebuyers per municipality/city district relative to a historical average and "exposure" to the DTI limit[1)]

(a) "Exposure" ≤ 0 (b) "Exposure" > 0
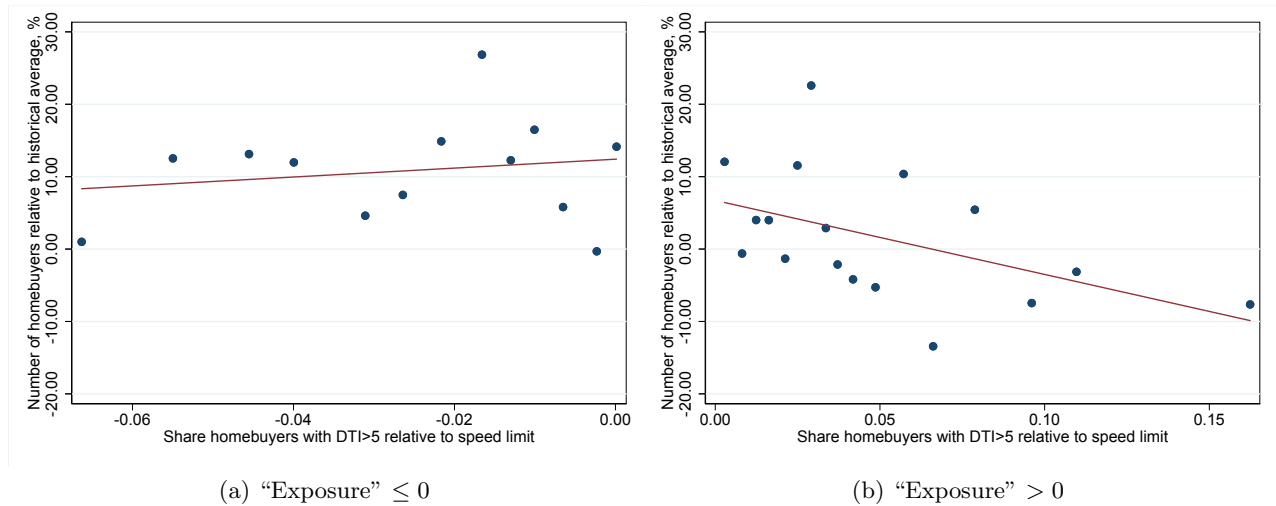
[1)]In the chart, Norway is divided into municipalities and districts of Oslo. The areas are subdivided into 30 groups of equal size by "exposure". The number of homebuyers is calculated for the period May to November, and the historical average is calculated for the same period in the years 2010-2016. Each blue dot represents the mean within the group.
Sources: Ambita, Statistics Norway and Norges Bank

4 Developments in debt

The analyses of developments in household debt are based on Norwegian Tax Administration data for total debt per age group and homebuyer status in each municipality for the years 2014 to 2017. The population in each municipality is divided into ten groups: five age groups (20-29, 30-39, 40-49. 50-59 and 60+), and each age group is divided into "homebuyers", ie those who have purchased a home in the municipality, and "non-homebuyers", ie those who have not purchased a home in the

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[9]Municipalities with fewer than 50 homebuyers in the period MayNovember 2017 are excluded. The area's exposure is calculated as the number of homebuyers with a DTI ratio of more than five for the years 2013 and 2014. The sample comprises 261 municipalities/city districts where 153 have positive "exposure".

municipality.[10] Total debt is calculated for each group. The Norwegian Tax Administration has omitted some municipalities from the data sample to preserve anonymity.[11] To ensure that changes in debt are comparable over time, we only include municipalities for which we have data for all ten groups each year, giving a sample of 127 municipalities.[12] Total debt in the sample constitutes about 75 percent of aggregate household loan debt (C2 households), and this share was stable for the four-year period.

Chart 8 shows the correlation between debt per person per municipality in 2017, relative to the average for the period 2014 to 2016, and the share of homebuyers with a DTI ratio of more than five after subtraction of the area's speed limit ("exposure").[13] For municipalities with positive "exposure", debt has risen less in municipalities with higher "exposure", but there is no significant correlation between debt growth and "exposure" for municipalities with negative "exposure".

Chart 8: Debt per person per municipality relative to historical average and "exposure" to the DTI limit.[1] By exposure
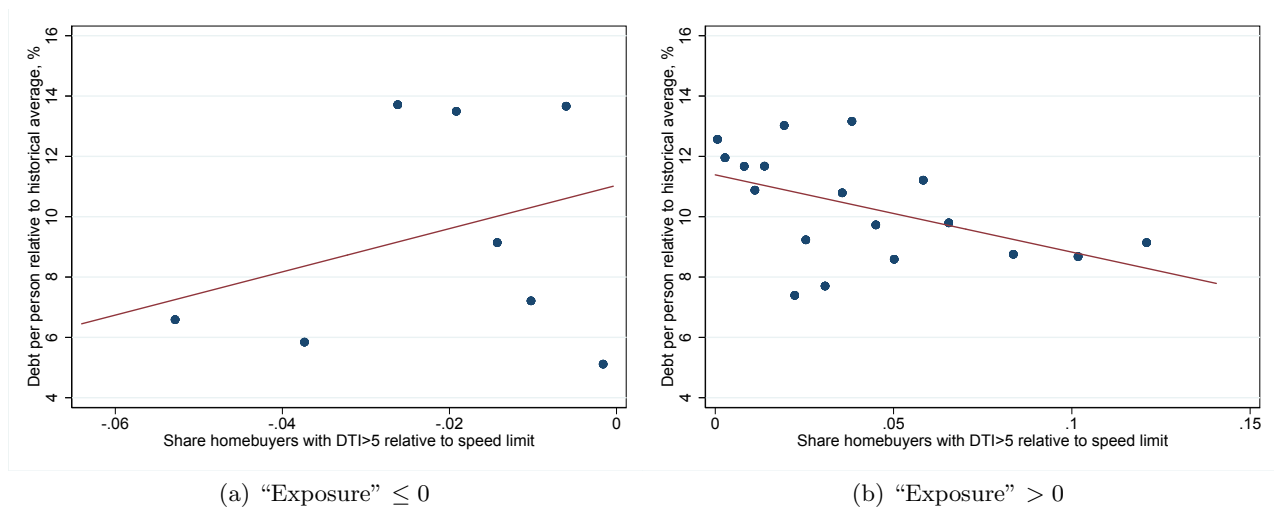
(a) "Exposure" ≤ 0 (b) "Exposure" > 0

[1] In the chart, Norway is divided into municipalities, and the municipalities are divided into 26 groups of equal size by "exposure" (five municipalities per group). The historical average is calculated for the years 2014-2016. The correlation is not significant for municipalities with negative exposure (p-value=0.22), but the negative correlation is significant for municipalities with positive exposure (p-value=0.08).
Sources: Norwegian Tax Administration, Ambita, Statistics Norway and Norges Bank

The negative correlation between debt growth (debt in 2017 relative to 2014-2016) and "exposure" is particularly high for homebuyers (Chart 9) and for the 20-39 age group (Chart 10).

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[10] See definition of homebuyer above.

[11] The Norwegian Tax Administration has omitted municipalities where a group during the period numbers fewer than five persons or where one person in the group holds more than 33 percent of the group's total debt. Further, there has been added noise to total debt of about ten percent, and the total has been rounded to the nearest hundred thousand.

[12] The municipalities included are larger in terms of population, and with a larger share of the population living in urban areas, compared with the municipalities that were excluded.

[13] In small municipalities, debt per person per year can vary widely, particularly in some of the groups. The analyses are therefore based on debt in 2017 relative to the average for the years 2014 to 2016.

Chart 9: Debt per person per municipality relative to a historical average and "exposure" to the DTI limit.[1] By homebuyer status, for municipalities with positive "exposure"
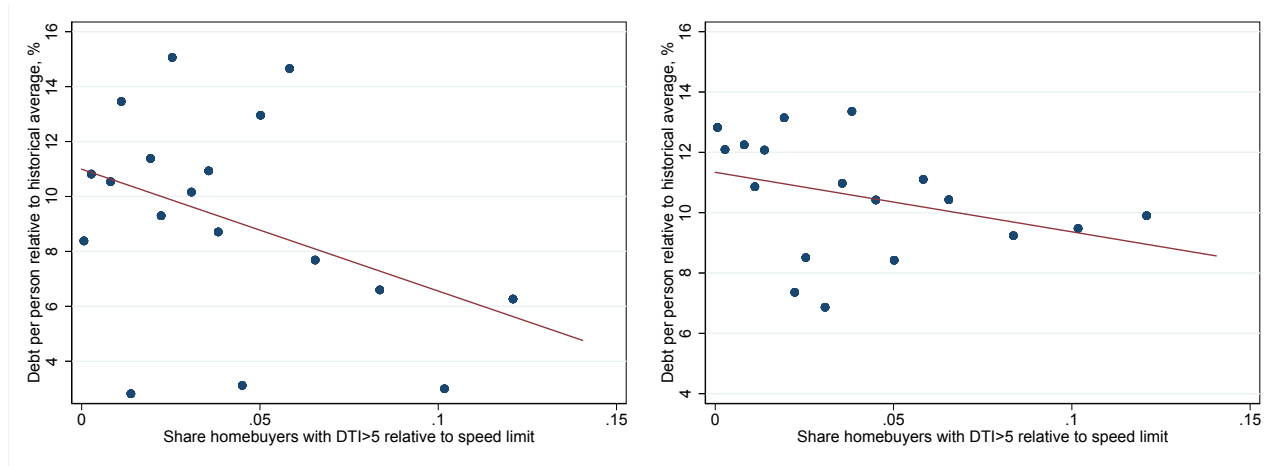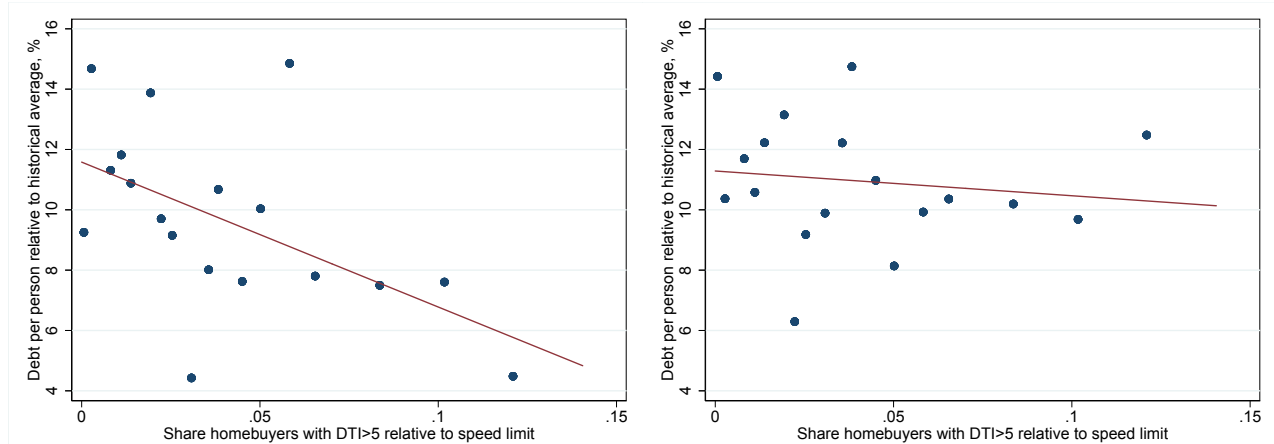

(a) "Homebuyers", "exposure" > 0

(b) "Non-homebuyers", "exposure" > 0

[1]In the chart, Norway is divided into municipalities, and the municipalities are divided into 18 groups of equal size by "exposure" (5 municipalities per group). A historical average is calculated for the years 2014-2016. The negative correlation is significant for "homebuyers" (p-value=0.09), but not for "non-homebuyers" (p-value=0.19). Sources: Norwegian Tax Administration, Ambita, Statistics Norway and Norges Bank

Chart 10: Debt per person per municipality relative to a historical average and "exposure" to the DTI limit.[1] By age group, for municipalities with positive "exposure"

(a) aged 20-39, "exposure" > 0

(b) aged 40 and above, "exposure" > 0

[1]In the chart, Norway is divided into municipalities, and the municipalities are divided into 18 groups of equal size by "exposure" (5 municipalities per group). A historical average is calculated for the years 2014-2016. The negative correlation is significant for the 20-39 age group (p-value=0.08), but not for the 40 and above age group (p-value=0.58). Sources: Norwegian Tax Administration, Ambita, Statistics Norway and Norges Bank

5   Concluding remarks

The preliminary analyses find a relationship between house price inflation in 2017 in an area and the area's share of homebuyers with a DTI ratio of more than five after subtraction of the area's speed limit (the flexibility quota for mortgages that do not comply with the requirements of the regulation).

House price inflation in 2017 was lower in areas with a high share of homebuyers with high DTI ratios. The analyses also show that the number of homebuyers generally remained steady, with the exception of some decline in the number of homebuyers in Oslo and among young homebuyers throughout Norway. Analyses of developments in debt show that debt growth in municipalities with a high share of homebuyers with DTI ratios of more than five, after subtraction of the area's speed limit, was lower in 2017.