NON-DURABLE CONSUMPTION IN RECOURSE AND NON-RECOURSE STATES*

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ABSTRACT

This paper tests whether consumers in states with recourse law have different consumption behavior than their counterparts in states with non-recourse. Housing wealth is one of the most important determinants of consumption and reacts to income shocks differently in recourse and non-recourse states. I find that housing wealth was less affected in recourse states during the great recession and its recovery period (2007-2012). Controlling for housing wealth as a channel, I also find that, although income elasticity of non-durable consumption is positive overall, for recourse states, it is much lower. Specially during the easy credit period (2005-2007), consumption was significantly less income-elastic in recourse states.

Keywords: Recourse law; Non-durable consumption; PSM; nnmatch; CEM, Bartik-like instrument; Nielsen consumer panel data.

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1. INTRODUCTION

In the United States (US), different mortgage laws are adopted in different states and one such mortgage law is recourse mortgage law where the lender has the right of deficiency judgement in case a foreclosure takes place. In such a scenario, there are times when the house goes 'underwater' i.e. the market price of the foreclosing house becomes lower than the actual mortgage and then, even after the house is sold in foreclosure, the entire debt is not paid off. In 'underwater' situations like this, lenders in recourse state can apply their right of deficiency judgement which cushions them from absorbing the loss of the remaining balance. The right of deficiency judgement allows the lender to collect the remaining balance of the mortgage from the other assets or future income of the borrower. But lenders in the states with no recourse in mortgage only get the house back which they foreclose and lose the rest of the remaining amount and the borrower can walk away with it. This has considerable significance of the borrowers i.e. the homeowners who are paying the mortgage. The ones in recourse states know from the beginning of the contract that irrespective of the situation, they have to keep paying the mortgage in full. On the other hand, the ones in non-recourse states, know that in case of a significant negative shock which might cause them to go 'underwater', they can walk away just by handing over the house and that gives them a sense of reduced liability in the underwater situations. This difference in liability stemming from the difference in the mortgage law of recourse, one might expect borrowers' budget constraints and lending behavior to be different. And that can lead the borrowers in recourse and non-recourse states to have different consumption pattern over different phase of the business cycle or in other words, they might smooth their consumption during different phases; especially during a negative shock. This paper uses the housing price shock of the great recession where a consequential number of houses went underwater, to test whether homeowners in recourse states react differently to income and house price shocks in their consumption

than their counterparts in non-recourse states.

Household consumption encompasses almost 70 percent of the US GDP and it is of great importance to understand the patterns of household consumption. Drastic plunge in household consumption was the core driver of the great recession Mian and Sufi, 2014 which had a circular effect of causing further recession. And hence, studying the pattern and determinants of household consumption has great importance. Of the many determinants of consumption, housing wealth is considered to be one of the most important one (Demyanyk, Hryshko, Luengo-Prado, and Sørensen, 2019; Mian and Sufi, 2014). And local housing market outcomes determine housing wealth which is heavily affected by the mortgage laws that are practiced in that particular area. Studies have found significant differences in local house prices, house price volatility, foreclosure rate and other housing market outcomes in recourse and non-recourse states to be significantly different (Nam and Oh, 2021; Bao and Ding, 2014; Ghent and Kudlyak, 2011) which eventually affect the housing wealth of the households. So housing wealth being an important determinant of consumption, which also reacts differently to a shock in recourse and non-recourse states, one might ask whether this difference in housing wealth reaction big enough to cause the consumption react differently in these two kinds of states. It is also of importance to know if this difference in consumption reaction different for different phases of business cycle, as household consumption in general behaves differently in different phases of boom, bust, recovery etc (Demyanyk, Hryshko, Luengo-Prado and Sørensen, 2019). And recourse law is particularly plays role during underwater situation, i.e. the bust and recovery period. So one might expect the difference in reaction of consumption in recourse and non-recourse state will be most during this phase too. Figure figure B.1, figure B.2, figure B.3 and figure B.4 show the house price and consumption of recourse and non recourse states in levels and in one-year growth rates over time respectively, and these figures suggest varying differences between the two types of states' house price and consumption patterns.

In this paper, I am testing whether elasticity of consumption with respect to housing wealth and income differ in recourse and non-recourse states. And also, whether that difference too changes during different phases of the business cycle. First, I test whether housing wealth (proxied by house price which is standard in literature) reacts differently to economic shocks in recourse and non-recourse states and also whether the pattern is different in different phases. And after showing differential housing wealth reaction in these two types of states, I test whether consumption also reacts differently there and again, if the pattern is different in different during different subperiods of time representing different phase of the business cycle. Following the housing price crisis of the great recession, I divide my study period in three subperiods- the 'easy credit' period (2005-2006) when the banks were lending highly in subprime mortgages, the 'recession and recovery' period (2007-2012) i.e. the great recession period and the recovery phase together, and the 'back to normal' period (2013-2016) when the economy recovered again. I particularly test if the elasticity of consumption with respect to housing wealth (house price) and income is different among these states and their pattern over the above mentioned subperiods. By consumption, I mean the consumption of non-durables only because non-durable consumption are the most inelastic in nature and in theory, should not be significantly different among states because these are basic needs mostly given the average population in these states are similar. I use household level expenditure data on non-durable goods from Nielsen Consumer Panel to measure consumption of non-durables.

I use an instrumental variable approach to mitigate the issue of measurement error of housing wealth like the mainstream literature of consumption elasticity (Mian, Sufi, and Trebbi, 2015; Saiz, 2010; Glaeser, Gyourko, and Saiz, 2008) and also use matching techniques like propensity score matching, Malahanobis direct matching and coarsened exact matching to reduce the selection problem. As the difference in recourse law is expected to affect the housing wealth first and through this, can affect the consumption, I first test whether this recourse law affect the housing wealth in recourse and non-recourse states

differently. I find that recourse and non-recourse states house price elasticity of income is significantly different during the easy credit period of 2005-2006. And there is significant difference in house prices of recourse and non-recourse states during the recession and recovery period of 2007-2012. During this period, the entire economy faced a steep fall in house prices but in the states where recourse law is practiced, the fall in house prices is significantly smaller. Drawing the evidence of differential effect of economic shocks on housing wealth in recourse and non-recourse states, next, I test whether there is similar differences in consumption behavior. I particularly test consumption of non-durable goods which by nature are basic necessity items including foods (not restaurant or gourmet food) and non-food grocery items. These are very inelastic in nature and hence, people from one state to another, are not expected to have very different reaction to this kind of consumption because of selection issues. For example, one might argue that someone who chose to live in Las Vegas might have a very different consumption bundle than someone who chose to live in Brownsville. Of course, this difference will be much more prominent in their basket of durable and luxury goods and services, but for non-durables, everyone needs these basic things to live and again, nobody buys these items in bulk when their income increase a lot or vice-versa.

I find that elasticity of consumption to changes in income is positive and significant for all the periods and ranges from 0.07 to 0.09. Income growth affects consumption growth positively and significantly in general everywhere. But in recourse states, during the 'easy credit' period, it was 0.03 percent lower than non-recourse states, although still positive. So during the easy lending period, even during the boom phase, recourse states consumption seem to be less elastic to income. Other than that, I don't find significant differences between recourse and non-recourse states' response to housing wealth and income on non-durable consumption.

The remainder of the paper is organized as follows. Section 2 elaborates how recourse law works and the concept of consumption being affected by recourse through the hous-

ing wealth channel. Section 3 discusses the data I used in my analysis. Section 6 presents conclusions.

2. Background and Hypotheses

2.1. Details on recourse law

Recourse on various types of loans are not practised unanimously by all the states in US. Rather, different states practices the right of deficiency judgement to different extent and depending on that, states are classified as having recourse and non-recourse in mortgages and/or commercial loans. There are some states which allows recourse in other commercial loans but not in mortgage. North Carolina is an example where they have recourse for commercial loans but not for mortgages. And then there is a state that was a recourse state initially, but in 2014, it changed its status to a non-recourse state Li and Oswald, 2017. Historically, almost all the states were recourse in mortgage until the crisis of the Great Depression. By the power of this deficiency judgement right, the lender can collect the remaining balance after a foreclosure from other assets or the future income of the borrower in case the house-foreclosure is not enough to raise the money to repay the mortgage. During the great depression in the 1930s, house price fell drastically and an alarming number of houses went underwater where the foreclosures could not cover the owed balance to the lender. On top of that, in most cases, the lenders themselves were the only bidders for those foreclosing houses where they bid prices far-less than the market value. That exacerbated the situation leaving the borrowers with high debt even after losing their houses. Learning from this, many states took the law if deficiency law seriously and made amendments to put restrictions and reduce the power of the lenders' right of deficiency judgement and some states even went farther to completely prohibit the practice of deficiency judgement altogether Li and Oswald, 2017. So those are the states that completely prohibit or marginally give some right of deficiency judgement to the lenders, are considered as the non-recourse states. In a non-recourse state, during an

underwater situation, the lender takes over the house and after foreclosure, if the price doesn't cover the owed amount, s/he cannot go after the borrower's other assets or future income. Foreclosing the house is the only compensation they get. So, in a non-recourse state, homeowners with mortgages i.e. the borrowers, have less liability in case of a default happens and the house price falls lower than the original price.

Almost all the states in US practice recourse law in mortgage. The extent of the right of deficiency judgement of the lenders vary across states and depending on that extent, Ghent and Kudlyak, 2011 classified 11 states as recourse states and this classification has been widely used in the recourse mortgage literature (Ghent and Kudlyak, 2011; Nam and Oh, 2021; Bao and Ding, 2014). Alaska, Arizona, California, Iowa, Minnesota, Montana, North Carolina, North Dakota, Oregon, Washington, and Wisconsin- these 11 states have little to no rights of deficiency judgement rights and have been classified as non-recourse states and the rest of the states of US are classified as recourse states. The recourse status of the states have been pretty consistent since the great depression except for the case of Nevada. Nevada changed its statute of deficiency judgement and turned into a state that is non-recourse in mortgage in 2014 from being a recourse state earlier. But because this change took place after the great recession and the previous classification has been unchanged (except for the new case of Nevada) for a long time since the great depression in 1930s, I stick to the old classification that remained unchanged for this entire time to avoid errors in estimation. I have also dropped Nevada from my set of recourse states and my study includes the years before and after 2014 to avoid convolution by the change in Nevada's recourse status. The above mentioned classification by Ghent and Kudlyak, 2011 fully matches with the classification of USFN (Americaís Mortgage Banking Attorneys) and for the states classified as non-recourse, USFN stated that deficiency judgement is highly impractical or not available in these states (2004, pp. 5-5 - 5-7). Non-recourse states, statistically, show to have higher probability of default Ghent and Kudlyak, 2011. Some studies argue these defaults and foreclosures to be strategic due to the lower li-

ability characteristic of non-recourse states. However, this paper do not dive into that literature and only limits itself to the differential housing market and consumption outcomes of recourse and non-recourse states.

2.2. *Hypotheses of recourse law affecting consumption through housing wealth*

There is a growing interest in the literature of housing-wealth impacting real outcomes like consumption and aggregate economy in general. There's also a large literature that trails the determinants and pattern of household consumption over different phases of the business cycle. I connect the two strands and test whether recourse law affect housing wealth and if that effect is big enough to affect the consumption of households in recourse states, as housing wealth is one of the significant determinants of consumption. Non-durable consumption includes mostly food and grocery items which are very inelastic in nature. So this particular type of consumption might not react too much due to a shock because these are mostly basic needs. Because of a difference in mortgage law (recourse law particularly) in two states, it is unlikely to have much difference in the elasticity of consumption of non-durables due to a shock in those two states. However, due to the difference in this law in these two states, other variables can be affected so much, which might affect the consumption.

House price channel

Recourse impacts house prices directly (Bao and Ding, 2014,Reed, LaRue, and Ume, 2018) and the prices are found to be more volatile in non-recourse states (Nam and Oh, 2021) and also higher as the demand side plays stronger role Reed, LaRue and Ume, 2018. Because the borrowers can walk away without any additional liability in case their house go 'underwater', houses in non-recourse states are more risky for the lenders and have less value as collateral. So, compared to houses in non-recourse states, recourse states houses have higher value as collateral and entails higher probability of getting loans when used as collateral. So homeowners in recourse states are expected to have higher probability of

getting a loan and smooth their consumption during any economic shock. As house price increases consumption through increased housing-wealth effect Mian, Sufi and Trebbi, 2015, I expect homeowners in recourse state to have some additional cushion during a shock as their houses have more credibility to be used as a collateral to smooth their consumption. So I assume consumption to react less in recourse states to a shock. That being said, this difference in reaction of consumption could be more significant for durables or luxury items whereas, for non-durables, this difference might be very small or insignificant as these are very inelastic in nature.

Income channel

The other channel of difference is through income. In a recourse state, borrowers cannot simply walk away from their mortgage liability in case of an 'underwater' situation without having additional liability of paying the balance from their other assets or future income. This makes it a binding constraint for them and hence, even during very bad economic conditions with very low house price, foreclosing is not a desirable option. In this kind of scenario, foreclosing will not only take away the house from them, but also they'll end up with credit/ payable from their existing other assets or future income. So unless its a dire situation where the borrower has no other way than foreclosing, they do not go for default and foreclosure and it is confirmed by studies too that just having the recourse status corresponds to lower likelihood of foreclosures Ghent and Kudlyak, 2011. Given this situation, during a bad shock, unless the house goes completely 'underwater', the borrowers i.e. the homeowners will keep paying the mortgages. And in such scenario, the household is already experience lower income due to the bad economic shock and on top of that, they keep paying the mortgage, rather than simply give up and walk away like their counterparts in non-recourse states. This causes their disposable income to have a sharper fall and hence they end up having a much tighter budget constraint than the non-recourse homeowners. Knowing this, I assume, homeowners in recourse states would be more risk averse and will not increase their consumption as much as their

counterparts when income rises, in order to save for the probability of going underwater. So even during good times with positive income shocks, homeowners in recourse states might not be as spontaneous as the non-recourse homeowners who have limited liability and have the luxury to act impulsively to increase consumption. Rather, homeowners in recourse state might still supress their consumption during good times showing a lower lower income elasticity or MPC than the ones in non-recourse states. In the non-recourse states, I suspect that homeowners in similar situation have the 'luxury' of announcing foreclosure, give up the house and walk away without paying the remaining balance which puts them in a less constrained situation with less tighter budget constraint. And usually, people who move or change houses, do not move to other states that much unless its for job or education purpose Reed, LaRue and Ume, 2018. So I am assuming, although these people gave up the house in foreclosure, they still live in the same state and hence, their consumption is still accounted in the same state. Having this differences in the budget constraint that arose from the same economic distress for these homeowners in these two types of states, I suspect their consumption smoothing will be different. I suspect the homeowners in recourse states, being more budget constrained for the entire mortgage-paying period, will be less responsive to changes in income to save up for the mortgage. However, this assumption makes more sense during a positive income shock. For a negative income shock, I suspect the consumption sensitivity will be more for recourse state homeowners as there disposable income is now even less, unless they saved up before for the mortgage payment.

3. DATA

To test my hypotheses, I have used data from multiple sources. I used consumption data from the Nielsen Consumer Panel data set. For my analysis, I use the data at household-year level and using the years from 2004 to 2016. I have aggregated the purchases of all types of product for my initial analysis here but have also analyzed by different prod-

uct categories which is currently not in this paper but will be added soon. There are almost 1.5 million different products in the data set which basically falls into the criteria of different types of food, health and beauty products and non-food grocery products. This dataset has been widely used in literature (Stroebel and Vavra, 2019, Kaplan, Mitman, and Violante, 2020 and consumption growth of this dataset has been shown to be consistent with the non-durable consumption growth from National Accounts Data (Graham and Makridis, 2018). Nielsen has a wide variety of household demographics which I use as controls and also to construct the PSM, Malahanobis and CEM samples. Also, because recourse law affects consumers through the house price channel mainly, I keep only the homeowners in the sample. Unfortunately, Nielsen does not have the information whether a household is homeowner or not, but it provides the information on which type of house they live in. I categorize the households living in a single family house or condo/coop to be homeowner which is a standard practice in the literature Graham and Makridis, 2018.

To measure house price growth, I use house price index (HPI) as a proxy for house price from Federal Housing Finance Agency (FHFA). The FHFA measures the movement of single-family house prices as HPI which is a weighted and repeat-sales index. It measures average changes in price in repeat sales or refinancings on the same properties. FHFA reviews repeat mortgage transactions on single-family properties whose mortgages have been purchased or securitized by Freddie Mac or Fannie Mae and they have this documentation from January 1975. House price having the chance of high endogeneity and also measurement error, it is common practice in literature to instrument house price while estimating impact on consumption. I use the 'Bartik-like' instrument for house price introduced by Graham and Makridis, 2018.

I have household level income data in Nielsen. But that income is categorical and I converted into continuous by taking the mid-points. The problem with this is that when calculating income growth, may observations were dropped simply because within a

year, its not a common phenomenon that people's income rise/ fall so much that it would move to a different income bracket. So, for another view, I use county level income data that come from Bureau of Economic Analysis (BEA). BEA counts income as wages, proprietors' income, interest, rents, dividends and government benefits. Also, one's income is counted in the county where they live, even if they work elsewhere. I utilize employment data from U.S. Bureau of Labor Statistics (BLS) which is at county level. Data on county level labor force and unemployment rate is used from BLS.

I adjust house prices and income for inflation using Consumer Price Index data from the website of Federal Reserve Bank of St. Louis where index $1982 - 1984 = 100$ and the data is seasonally adjusted. To gauge each county's credit health, I use percentage of population with a credit score lower than 660. This data is found at the website of Federal Reserve Bank of St. Louis and the primary source of this data in Equifax [1] This dataset contains the percentage of population in each county whose credit score is lower than 660, indicating a below average credit health. Counties with fewer than 20 people were dropped from the sample. I also use county level debt-to-income ratio data from the Board of Governor for the Federal Reserve System. The data is available from 1999 and here, they calculate this variable using household debt data from Equifax/ FRBNY Consumer Credit Panel Data and also income from BLS.

4. Estimation approach

Consumption reaction in recourse and non-recourse states to differ, the housing wealth has to react differently as this is the channel that connects the law of recourse mortgage to consumption. So before checking the consumption pattern, I first test whether housing wealth reacts differently in recourse and non-recourse states.

1. Equifax and Federal Reserve Bank of New York, Equifax Subprime Credit Population for New York County, NY [EQFXSUBPRIME036061], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/EQFXSUBPRIME036061, November 6, 2022.

4.1. Testing house price reaction

As my argument of consumption being affected by recourse law highly depends on the house price channel, I first test the hypothesis that house prices react differently in recourse and non-recourse states. And I also address the hypothesis of this difference in price reaction is also different in different phases of business cycle.

I use the following regression to see whether housing wealth reacts differently in recourse and non-recourse states to income in different phases of business cycle.

$$\Delta HPI_{jt} = \beta_0 + \beta_1 \Delta Income_{jt} + \beta_2 R + \beta_3 R \times \Delta Income_{jt} + \gamma Z_{jt} + \epsilon \tag{1}$$

where, j denotes county and t denotes year. ΔHPI is the growth rate of house price index (HPI) which is a standard proxy for local house price growth. R is a dummy variable that takes value of 1 if the county falls into a recourse state and 0 otherwise. $\Delta Income$ is one year growth rate of per capita real income and Z contains the one year growth rates of other county level variables like unemployment, debt-to-income ratio and population.

4.2. Testing consumption reaction

After testing the house price reactions and having the claim of recourse affecting house price differently, the next step is to test the consumption reaction in recourse and non-recourse states. In order to asses the differences in consumption reaction of a change in house price or income in recourse and non-recourse states, I use the following specification.

$$\begin{aligned} \Delta C_{ijt} = &\alpha_0 + \alpha_1 \Delta HPI_{jt} + \alpha_2 R \times \Delta HPI_{jt} + \alpha_3 R + \alpha_4 \Delta Inc_{ijt} + \alpha_5 R \times \Delta Inc_{ijt} \\ &+ \Psi HHDemog_{ijt} + \Omega CountyChars_{jt} + \nu_t + \epsilon \end{aligned} \tag{2}$$

where, i is an individual household, j is county and t is year. ΔC_{ijt} is 1 year growth rate

of per capita real consumption of non-durable goods. R is a dummy taking the value of 1 if the household falls within a recourse state and 0 otherwise. HPI in house price index, and Inc is household level per capita real income from Nielsen. HHDemog is a vector of control variables containing household demographics like age of the household head, age square, education, household size, house type, presence of children, marital status etc.CountyChars is another vector of control variables that includes county level factors like unemployment rate, debt-to-income ratio, Equifax subprime ratio etc.

4.2.1. Instrumenting house price index

As the hypothesis of non-durable consumption being different in recourse and non-recourse status highly depends on the household channel (see section 2.2), how I estimate the effect of house price on consumption is of particular importance. House price and consumption have the problem of endogeneity problem and also, as I do not have the household level housing wealth or house price data for my sample and using the generic county level HPI, it also has the problem of measurement error. Literature on this field has tackled this problem by using cross-sectional variation in housing supply elasticity as instrument for house price changes (Mian, Sufi and Trebbi, 2015; Saiz, 2010; Glaeser, Gyourko and Saiz, 2008). However, several studies noted the problems of housing supply elasticities as instrument including this being correlated with unobserved factors and also only having cross sectional variation for a highly aggregated geographic area as the MSA. In a recent study by Graham and Makridis, 2018, the authors constructed a novel set of Bartik instrument which they termed as 'Bartik-like' instrument and exploited both the cross-sectional and time-series variation. They first measure cross-sectional variation in the composition of local (e.g. county-level) housing characteristics, such as age of the house, number of bathroom, number of bedrooms etc and combine this with time-series variation in the marginal prices of these housing characteristics. They estimate this through hedonic pricing regressions on housing transaction data grouped by US Census regions. Where geographic areas vary in the composition of housing characteristics, the instru-

ment produces differential local exposures to regional changes in the prices of different house types. For example, if San Francisco consists mostly of two-bedroom houses built prior to the 1940s, while Las Vegas has mostly four-bedroom houses built in the early 2000s, then an increase in the price of larger and newer houses in the Western US would result in relatively faster house price appreciation in Las Vegas.

I use the Bartik-like instrument for house price index from Graham and Makridis, 2018 to estimate the impact of house price growth on consumption growth. So my model for estimating consumption growth showed in equation (2) is actually instrumented and should look like the following:

$$\begin{aligned}\Delta C_{ijt} =& \alpha_0 + \alpha_1 \Delta \widehat{HPI_{jt}} + \alpha_2 R \times \Delta \widehat{HPI_{jt}} + \alpha_3 R + \alpha_4 \Delta Inc_{ijt} + \alpha_5 R \times \Delta Inc_{ijt} \\ &+ \Psi HHDemog_{ijt} + \Omega CountyChars_{jt} + \nu_t + \epsilon\end{aligned} \tag{3}$$

where, $\widehat{HPI_{jt}}$ is HPI instrumented by Bartik-like instrument which is also at county-year level.

4.2.2. Using matching methods

Another significant concern of estimating the difference in the reaction of consumption growth in recourse and non-recourse state is that, there can be significant selection problem. People choosing to live in non-recourse states can be very different than people who choose to live in recourse states and hence their consumption behavior can be vastly different in the first place. One reason to particularly examine non-durable consumption is to somewhat reduce this problem. The problem of selection leading to choosing different bundles of consumption is most severe for luxury items or big purchases. This problem is also present very starkly in the consumption of services like tourism, cosmetic surgeries or even the services from the restaurants and the wellness industries like having spas. However, when it comes to non-durable consumption that basically captures food and non-food grocery items, it is less likely to find significant difference in the consump-

tion behavior as these are basic need items with very low elasticity. People living in bay area might not necessarily have a very different eating habit than the people living in the south. Still there is the issue of selection again by how the food is grown. For example, people choosing certain areas to live in (for amenities reason or those places to be a hub for their job like Silicon Valley) can also follow a certain pattern of food habit (like preferring vegan or organic etc). While this study is not looking into that, but from Nielsen, that can be examined as Nielsen have detailed product level data and it is in the future plan of this study. However, for now, this study do not look at particular type of food items consumption differences between states which still might carry a significant selection problem, but in general, if we don't have evidence for people living in certain area are more likely to consume particular products like vegan/ organic, we can safely say, for non-durable consumption, people all over the country should have more similar consumption patterns and hence the difference I'm examining is also expected to be very little. So here, its not about the size of the difference, but more about the presence-whether there is any difference even if it is little. Having said the argument for choosing non-durables to mitigate the selection problem, it is still not enough. In order to tackle this problem further, I use several matching methods to match households from recourse and non-recourse states who have similar demographic characteristics and group them together and then estimate equation (3) on these refined samples again. For matching, I use Propensity Score Matching (PSM), Nearest Neighbor Matching with Malahanobis Distance and Coarsened Exact Matching (CEM) techniques.

5. RESULTS

5.1. House price reaction

Table 5.1 shows the estimates for equation (1) for three different phases of the recent business cycle: 'easy credit' period i.e. 2005-2006 in column (1), 'recession and recovery' period i.e. 2007-2012 in column (2) and 'back to normal' period i.e. 2013-2016 in column (3).

As per the hypotheses in section 2.2, the β_0s (the constants) for all three period follow the expected sign and are significant.

In column (1), for the 'easy credit' period, β_0 is very high and statistically significant indicating the sharp soar in house prices all over the country. Then β_2 (coefficient of recourse dummy R) is negative indicating that in recourse states, this price growth is lower than the non-recourse state. During easy credit period, there may be the case that many new borrowers entered the market who previously did not have access to this credit before because of banks' stricter policy. But during this housing bubble period with banks being more liberal and allowing lending to subprime mortgages, a new set of borrowers entered the market which raised overall housing demand. And supply being inelastic in the short run, the prices rose significantly. And non-recourse states having lesser liability, are expected to have more demand, especially from this marginal group who did not have access to credit before because of poor credit health. So having this additional demand pull in non-recourse states, house price growth is expected to be higher in non-recourse states and the sign of β_2 is as I expected; however not statistically significant. The coefficient of $RInc$ i.e. β_3 also suggests similar story where increase in income (during this period, income growth was positive) raises overall house price growth through increased demand, but in recourse states, its higher. What this means? It means, just by being in a recourse state, the house price is not as much growing from other factors but only when income is growing, house prices in recourse states are growing more. So the demand pull in the recourse states are coming from credible increase in income, not from other factors that are jumbled up in β_0 and its statistically significant as well. These other factors also include those increased demand by the new pool of people who got access because of the 'easy credit' policy of the banks, not because they have credible income growth which increases their payability. And the negative recourse dummy coefficient suggests that those factors play less role in recourse states leading to a lower house price growth in recourse state.

TABLE 1
HOUSE PRICE GROWTH ON INCOME AND RECOURSE

	(1) 2005-2006	(2) 2007-2012	(3) 2013-2020
ΔInc	0.0423	0.197***	0.0784*
	(0.59)	(6.50)	(2.44)
R	-0.385	**0.396****	-0.0232
	(-1.13)	(2.73)	(-0.15)
R X ΔInc	0.202*	-0.0453	0.0497
	(2.46)	(-1.33)	(1.47)
Constant	6.572***	-1.411***	2.961***
	(21.22)	(-10.72)	(20.38)
N	1517	5044	5933
adj. R^2	0.059	0.240	0.070
F	11.37	43.95	26.28

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

β_0 for the 'recession and recovery' period (column 2) being negative, captures the sharp overall decline in house price growth. And finally, the most interesting result here, is the value of β_2 (coefficient of recourse dummy R) during this period is starkly positive and statistically significant. This suggests that, during the crisis period, house price growth fell sharply all over, but in recourse states, the fall was less and this result is statistically significant. As per the hypothesis of house price in recourse states being less affected seems to have some backup here. Just by being in recourse state, during the 'recession and recovery' period, house prices growth fell less and the coefficients have the expected sign too. The the signs of β_1 and β_3 also aligns with the hypotheses that during this period, income growth fell and with the falling income growth, house price growth also fell (a positive β_1) overall, but for recourse states, this fall is less (β_3, the coefficient of $RInc$ being negative).

In the 'back to normal' period (column 3), the signs and rationale for the signs are exactly like the 'easy credit' period but with a slight tightness and less difference between

the two types of states. β_0 is again positive and statistically significant but much smaller than the 'easy credit' period indicating lower pull of demand from factors other than income. And a positive and significant β_1 refers to the house-price growth to be significantly driven by demand that induced from increased income. And also, this time, the magnitude of this coefficient is larger than that of the 'easy credit' period which means, during this period, income growth played larger role in the house price growth than compared to the 'easy credit' period.

The intuition of the negative sign of recourse dummy, β_2 is the same as 'easy credit' period but again, the absolute value of this coefficient in this period is smaller than 'easy credit' period. This indicates the initial difference between recourse and non-recourse state house price growth has reduced during this 'back to normal' period. β_3 i.e. the coefficient of $RInc$ also follows the same pattern of having the same sign as 'easy credit' period but the magnitude is smaller. So income growth in recourse state do not increases house price growth difference between the two types of states as much as before. However, β_2 and $beta_3$ during this period are not statistically significant in spite of having the expected signs that support the hypotheses.

5.2. Non-durable consumption reaction

The reaction of house price shock and income on non-durable consumption of recourse and non-recourse state is estimated using equation (2). To be more precise, house price is instrumented with the Bartik-like instrument which take account of the different characteristics of houses and exploits both the cross-sectional and across-time variations as explained in equation (3). Then to minimize the selection problem, matching techniques like PSM, MDM and CEM is also applied. Table 5.2 shows the results for these estimations for the entire period of 2005 to 2016.

For all the columns, the regressand is the one year growth rate of per capita consumption of non-durable goods, ΔC_{it}. Column (1) shows the result for equation (2) except for

TABLE 2

CONSUMPTION GROWTH ON HPI (INSTRUMENTED), INCOME AND OTHER CONTROLS

	(1)	(2)	(3)	(4)	(5)	(6)
ΔHPI	0.193	0.0758*	0.0640*	0.0978*	0.0964*	0.0692
	(1.74)	(2.15)	(2.00)	(2.34)	(2.30)	(1.73)
ΔInc	0.0653***	0.0916***	0.0861***	0.0667***	0.0665***	0.0530***
	(11.56)	(15.96)	(15.26)	(9.79)	(9.77)	(3.63)
R	1.181	0.491	0.217	-0.310	-0.360	-0.106
	(1.61)	(0.60)	(0.29)	(-0.31)	(-0.36)	(-0.09)
R X ΔInc	-0.00218	-0.0240***	-0.0233***	-0.0154*	-0.0156*	0.0109
	(-0.36)	(-3.99)	(-3.91)	(-2.14)	(-2.16)	(0.69)
R X ΔHPI	0.0235	0.0247	0.0186	0.0567	0.0566	0.0429
	(0.38)	(1.04)	(0.85)	(1.67)	(1.67)	(0.10)
Constant	2.160	-4.542	20.73***	20.39***	20.89***	24.63
	(1.61)	(-1.33)	(4.86)	(3.32)	(3.40)	(1.20)
Instrument	No	Yes	Yes	Yes	Yes	Yes
Sample	All	All	All	PSM	Malahanobis	CEM
HH demog	No	No	Yes	Yes	Yes	Yes
Cnty demog	No	No	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	112434	87031	81150	55529	55317	5077

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

the fact that no household demographics or county level characteristics are controlled here. So the model for column (1) here is:

$$\Delta C_{ijt} = \alpha_0 + \alpha_1 \Delta HPI_{jt} + \alpha_2 R \times \Delta HPI_{jt} + \alpha_3 R + \alpha_4 \Delta Inc_{ijt} + \alpha_5 R \times \Delta Inc_{ijt} + \nu_t + \epsilon \quad (4)$$

Column (2) reports the results for equation (3) where house price is instrumented and no household level or county level characteristics are controlled for whereas, column (3) is the same, but controlled for household and county level characteristics. Column (4), (5) and (6) report the results for the same instrumented specification of equation (3) for the samples matching by PSM, MDM and CEM respectively. All the columns control for year fixed effects. Except for α_3, the coefficient for the recourse dummy R, almost all the coefficients have consistent signs for all the specifications, although not statistically significant in all cases.

House price growth and income growth has positive and significant impact on the overall growth of non-durable consumption during the entire time-frame of 2005 to 2016. This confirms the generic finding of literature that housing wealth (proxied by house price) and income influence household consumption positively. In the literature, the elasticity of non-durable consumption to house prices using instrumental variables varies from 0.09 to 0.38 Graham and Makridis, 2018; Campbell and Cocco, 2007; Kaplan, Mitman and Violante, 2020; Gan, 2010. My estimates range from 0.06 to 0.19 for different specification which consistent with the literature but a bit on the lower end. So a 10 percent increase in housing wealth seems to increase the non-durable consumption by 0.6 to 1.9 percent. In all the specifications, the elasticity of consumption to housing wealth is positive and statistically significant except for specification (1) and (6).

But for recourse states, these estimates could be higher, as α_2, the coefficient for the interaction term of house price growth with recourse dummy ($RHPI$) is positive for each specification. But none of these are statistically significant at 10 percent or lower significance level. So we cannot credibly argue that the response of house price shock to

consumption in recourse state is significantly different for the overall period of 2005 to 2016.

Income on the other hand, shows some difference among recourse and non-recourse states. The coefficient of income growth α_4 follows the hypothesis and has the expected positive and statistically significant coefficients for each of the specification signifying that growth in income affects growth in non-durable consumption positively in non-recourse states. The estimate here ranges from 0.05 to 0.09 for the elasticity of consumption to income which means a 10 percent increase in income leads to 0.5 to 0.9 percent increase in the consumption of non-durable goods.

However, for recourse states, these estimated might be a bit lower as α_5, the coefficient for the interaction term of income growth with recourse dummy ($RInc$) is negative and statistically significant for all the specification except for specification (1) and (6) again. This suggests that in recourse states, similar increase in income growth leads to higher consumption growth but less than that of the non-recourse states and the difference is around 0.02. So for the similar 10 percent increase in income leads to an approximate increase in non-durable consumption of 0.3 to 0.7 percent in recourse states, whereas, for non-recourse states, this estimate ranges from 0.5 to 0.9 percent. This completely confirms the hypotheses of income channel discussed in section 2.2 where income growth is expected to affect consumption growth positively, but for recourse states, borrowers having additional liability, need to secure for future and hence, they will be less spontaneous and show a lower elasticity of consumption than their counterparts, because they need to save for future shocks to smooth out their mortgage payments.

From all these specifications, I choose specification (3) for now, to test the hypothesis of differential reaction to different phases of business cycle, as it controls for all the additional information at household level and county level, instruments the house price and also have a good number of observations. Later, for more robustness, I will add the similar exercise for the subsamples derived from PSM and Malahanobis (MDM) match-

ing. Table 5.2 reports specification (3) for the entire sample timeline from 2005 to 2016 in column (1) from 5.2. And then the results for the same specification for the 'easy credit' period (2005-2006), 'recession and recovery' period (2007-2012) and 'back to normal' period (2013-2016) are reported in column (2), (3) and (4) respectively.

TABLE 3
CONSUMPTION GROWTH ON HPI (INSTRUMENTED), INCOME AND OTHER CONTROLS

	(1) All	(2) 2005-2006	(3) 2007-2012	(4) 2013-2016
ΔHPI	0.0640*	0.0214	-0.1540	0.0194
	(2.00)	(0.17)	(-0.73)	(0.35)
R X ΔHPI	0.0186	0.0330	-1.942	-0.0835
	(0.85)	(0.18)	(-1.20)	(-0.99)
R	0.217	-0.910	-42.98	3.899
	(0.29)	(-0.08)	(-1.19)	(1.06)
ΔInc	0.0861***	0.0955***	0.0713***	0.0941***
	(15.26)	(5.43)	(5.30)	(12.16)
R X ΔInc	-0.0233***	-0.0399*	-0.0182	-0.0134
	(-3.91)	(-2.21)	(-1.33)	(-1.62)
Constant	20.73***	64.41***	152.1	39.01***
	(4.86)	(3.50)	(1.62)	(8.22)
Instrument	Yes	Yes	Yes	Yes
Sample	All	All	All	All
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	81150	9453	41642	30055

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

During easy credit period, banks were lending liberally to subprime mortgages which induced higher demand in the housing market stemming from borrowers entering the market who previously didn't have the access to credit like this. As per my hypothesis, this phenomena should be more seen in non-recourse states due to the lower future liability on the borrowers and hence house prices should soar higher in non-recourse states which my data confirms in table 5.1. So, during this phase when house prices soar in both

the states but more in non-recourse states, my hypothesis was that consumption growth will increase due to increase in housing wealth more in non-recourse states. The coefficients of house price growth and its interacting term with recourse dummy in column (2) in 5.2 is seen to be positive which says that during this period, a house price rise of 10 percent increased non-durable consumption in non-recourse states by 0.2 percent and in recourse states it was even higher, somewhat like 0.5 percent which goes completely against my hypothesis. However, none of these are statistically significant and I cannot claim during this period, recourse and non-recourse states' homeowners' consumption reacted differently to the rapid house price increase. However, for income, the hypothesis holds. A 10 percent increase in income raises consumption by 0.9 percent in non-recourse states and in recourse states, this increase in consumption is almost 0.4 percent lower than the non-recourse states and both the estimates are statistically significant. So, these coefficients are consistent with the hypotheses of income increase during this easy credit period increases consumption overall but in recourse states, this increase in a little bit suppressed but still positive. The constant is also very high and statistically significant suggesting that consumption grew a lot during this phase.

During the recession and recovery period (column 3), house prices and income fell steeply. Recourse states houses having more credibility as collateral and hence higher likability of getting loans against, homeowners of recourse states are expected to be able to smooth out consumption better than the non-recourse counterparts from a housing-wealth shock like this. The negative sign of the coefficient of the interaction term α_2 of house price and recourse dummy kind of aligns with the hypothesis that in recourse states, consumption growth is affected less than the recourse state, but this do not make much sense as the coefficient of house price growth is also negative. This suggests during this recessionary period, a 10 percent decrease in house prices raised the consumption by 1.5 percent in non-recourse states and almost 20 percent in recourse states which completely goes against my hypotheses and also the literature. But all these are statistically

insignificant too. So I cannot make any claim of my hypotheses of house prices impacting consumption of recourse and non-recourse states during the recession and recovery period. For income though, it has the similar pattern as before suggesting positive relationship to consumption for both states, but a little bit lesser for the recourse states. To be more precise, a 10 percent decrease in income during this recession and recovery period, consumption falls by 0.7 percent in non-recourse states and 0.6 percent in recourse states indicating that consumption is less elastic and better smoothed out in recourse states. However, the argument of recourse states having lower elasticity and being less impacted by the reduced income of this period does not hold strong because the coefficient is not statistically significant.

Finally, in the back to normal period (column 4), again, there is no significant result for the impact of house prices increase on the consumption of either recourse and non-recourse states. But for income, it aligns with the hypotheses of increased income leading to increased consumption in both type of states but less for the recourse states. Again, like the recession and recovery period, although the positive coefficient of overall income elasticity of consumption is statically significant at 1 percent level, the claim of recourse states to have a difference of 0.01 percent less, is not statistically significant and hence I cannot make that claim of these two types of states reacting differently to income changes.

Similar exercise is implemented on more refined samples derived from different matching techniques. Appendix reports the results for regressing Equation (3) on PSM, MDM and CEM samples respectively. The samples drawn using PSM and Malahanobis matching reports similar pattern in the result reported in 5.2. But the sample drawn using CEM gives very different results but still maintains the core pattern of having overall house price and income elasticity of consumption to be positive but no significant difference between recourse and non-recourse states. More details will be added.

6. Conclusion

Consumption being one of the biggest component of national accounting, impacts economy at a large scale and hence one of the focal points of research among economists. This study investigates whether a particular mortgage law i.e. recourse mortgage law which is adopted by some states and not by other, impacts the consumption of those states differently. In other words, whether difference in a certain kind of mortgage law causes the consumers to react differently to income and house price changes. Also, whether these reactions differ during different phases of business cycle. One significant determinant of consumption is housing wealth channel which is being studied widely and a common practice is to proxy housing wealth with local house price, which again is instrumented to correct for endogeneity and measurement error problems (Mian and Sufi, 2014; Kaplan, Mitman and Violante, 2020; Campbell and Cocco, 2007). In the very recent study of Graham and Makridis, 2018, they compared various widely used instruments and their novel Bartik-instrumetn that they constructed utilizing both the cross-sectional and time-series variation of housing-characteristics. The novel Bartik-like instrument outperformed the other instruments and hence, in this study, I used that Bartik-like instrument for house prices.

As housing wealth channel plays a big role in consumption pattern and also, the mortgage law affects housing wealth itself, my first exercise here is to examine whether this mortgage law affects housing wealth i.e. local house prices differently. If not, then there is not much essence in assuming the consumption to be different in these states as the main channel for this recourse law to affect consumption is through the housing wealth or house prices. I find that house prices vary significantly in recourse and non recourse states which conforms with the current literature (Bao and Ding, 2014) and also across different phases. During the easy credit period, the income elasticity of housing wealth was significantly higher in recourse states indicating the demand pull in the recourse states

mainly stemmed from income increase. Whereas, the pull of demand in non-recourse state was not from higher income, rather other ways including the excess demand from the subprime mortgage borrowers who got access to loan during this period. During the recession and recovery period, house prices fell sharply but in recourse states this fall was much lower compared to non-recourse states. The result also suggests that during the post-crisis period when economy came back to normal, the difference in house price reaction between recourse and non-recourse states minimized with no statistical significance and also, house price growth is tamed at a much lower level than the easy credit period. And also, even in the non-recourse states, the house price growth was explained more by income growth rather than outside excess demand from availability of subprime loan. These house price results assures the housing wealth channel of recourse law to consumption and then I tested the impact of recourse law on the consumption elasticity of housing wealth (house price) and income. I estimate different specifications at household level controlling for household and county characteristics. I find that for the entire timeline of 2005 to 2016, income elasticity and house price elasticity of income are statistically significant for non-recourse states. Although house price elasticity of consumption in recourse state is not significantly different than non-recourse states, income elasticity of consumption in recourse states are significantly lower than their non-recourse counterpart. This results holds consistent when the timeline is divided in different phases of boom and bust but the difference of recourse and non-recourse states is significant only during the easy credit period.

This work is not complete yet and I am testing this again with more balanced samples that use matching techniques like PSM, MDM and CEM and will update soon. I also plan to instrumentize income to refine the estimates further. Further research on this topic can explore the behavior of durable goods and luxury services where it is more expected to find significant difference between recourse and non-recourse states.

REFERENCES

Bao, Te and Li Ding (2014). Non-recourse mortgage and housing price bubble, burst and recovery. *Burst and Recovery (May 17, 2014)*.

Campbell, John Y and Joao F Cocco (2007). How do house prices affect consumption? Evidence from micro data. *Journal of monetary Economics*, 54(3), 591–621.

Demyanyk, Yuliya, Dmytro Hryshko, María José Luengo-Prado, and Bent E Sørensen (2019). The rise and fall of consumption in the 2000s: A tangled tale. *Economica*, 86(343), 495–531.

Gan, Jie (2010). Housing wealth and consumption growth: Evidence from a large panel of households. *The review of financial studies*, 23(6), 2229–2267.

Ghent, Andra C and Marianna Kudlyak (2011). Recourse and residential mortgage default: evidence from US states. *The Review of Financial Studies*, 24(9), 3139–3186.

Glaeser, Edward L, Joseph Gyourko, and Albert Saiz (2008). Housing supply and housing bubbles. *Journal of urban Economics*, 64(2), 198–217.

Graham, James and Christos Makridis (2018). House prices and consumption: a new instrumental variables approach. *Available at SSRN*, 3285263.

Kaplan, Greg, Kurt Mitman, and Giovanni L Violante (2020). The housing boom and bust: Model meets evidence. *Journal of Political Economy*, 128(9), 3285–3345.

Li, Wenli and Florian Oswald (2017). Recourse and residential mortgages: The case of Nevada. *Journal of Urban Economics*, 101, 1–13.

Mian, Atif and Amir Sufi (2014). What explains the 2007–2009 drop in employment? *Econometrica*, 82(6), 2197–2223.

Mian, Atif, Amir Sufi, and Francesco Trebbi (2015). Foreclosures, house prices, and the real economy. *The Journal of Finance*, 70(6), 2587–2634.

Nam, Tong-yob and Seungjoon Oh (2021). Non-Recourse Law, House Prices, and Household Consumption Volatility. *Available at SSRN 3963634*.

Reed, Robert R, Amanda LaRue, and Ejindu S Ume (2018). Mortgage recourse provisions and housing prices. *Regional Science and Urban Economics*, 73, 99–111.

Saiz, Albert (2010). The geographic determinants of housing supply. *The Quarterly Journal of Economics*, 125(3), 1253–1296.

Stroebel, Johannes and Joseph Vavra (2019). House prices, local demand, and retail prices. *Journal of Political Economy*, 127(3), 1391–1436.

APPENDIX A: CONSUMPTION GROWTH WITH MATCHED SAMPLES

TABLE A.1
CONSUMPTION GROWTH ON HPI (INSTRUMENTED), INCOME AND OTHER CONTROLS ON PSM SAMPLE

	(1) All	(2) 2005-2006	(3) 2007-2012	(4) 2013-2016
g1_hpi	0.978*	-0.320	-0.00120	0.328
	(2.34)	(-0.18)	(-0.00)	(0.46)
recHPI	0.567	-0.338	-4.241	-0.329
	(1.67)	(-0.12)	(-0.77)	(-0.25)
rec	-0.310	2.411	-9.269	1.868
	(-0.31)	(0.16)	(-0.87)	(0.33)
g1_inc_nielsen	0.0667***	0.0965***	0.0476***	0.0734***
	(9.79)	(5.16)	(5.05)	(6.96)
1.recc.g1_inc_nielsen	-0.0154*	-0.0412*	-0.0122	0.0196
	(-2.14)	(-2.15)	(-1.24)	(1.64)
_cons	20.39***	72.95**	89.22**	43.11***
	(3.32)	(3.09)	(3.10)	(6.42)
Instrument	Yes	Yes	Yes	Yes
Sample	All	All	All	All
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	55529	9092	32901	13536

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

APPENDIX B: FIGURES

TABLE A.2

CONSUMPTION GROWTH ON HPI (INSTRUMENTED), INCOME AND OTHER CONTROLS ON MALAHANOBIS SAMPLE

	(1) All	(2) 2005-2006	(3) 2007-2012	(4) 2013-2016
g1_hpi	0.964*	-0.373	0.0287	0.298
	(2.30)	(-0.21)	(0.02)	(0.42)
recHPI	0.566	-0.516	-3.602	-0.256
	(1.67)	(-0.19)	(-0.67)	(-0.19)
rec	-0.360	3.562	-8.248	1.501
	(-0.36)	(0.23)	(-0.78)	(0.26)
g1_inc_nielsen	0.0665***	0.0962***	0.0463***	0.0737***
	(9.77)	(5.12)	(4.95)	(6.99)
1.recc.g1_inc_nielsen	-0.0156*	-0.0411*	-0.0116	0.0180
	(-2.16)	(-2.14)	(-1.19)	(1.51)
_cons	20.89***	73.62**	88.53**	43.80***
	(3.40)	(3.07)	(3.15)	(6.48)
Instrument	Yes	Yes	Yes	Yes
Sample	All	All	All	All
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	55317	9062	32767	13488

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE A.3

CONSUMPTION GROWTH ON HPI (INSTRUMENTED), INCOME AND OTHER CONTROLS ON CEM SAMPLE

	(1) All	(2) 2005-2006	(3) 2007-2012	(4) 2013-2016
g1_hpi	0.692	0.201	-0.369	5.071***
	(1.73)	(0.41)	(-0.74)	(3.44)
recHPI	0.0429	0.847	-1.387	-1.726
	(0.10)	(1.09)	(-0.25)	(-0.34)
rec	-0.106	-7.789	-1.065	8.092
	(-0.09)	(-1.31)	(-0.08)	(0.38)
g1_inc_nielsen	0.0530***	0.226***	0.0243	0.285**
	(3.63)	(4.73)	(1.80)	(3.15)
1.recc.g1_inc_nielsen	0.0109	-0.0994	0.0420**	-0.243**
	(0.69)	(-1.95)	(2.93)	(-2.61)
_cons	24.63	31.35	28.60	-22.44
	(1.20)	(0.88)	(1.01)	(-0.35)
Instrument	Yes	Yes	Yes	Yes
Sample	All	All	All	All
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5077	1092	2986	999

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

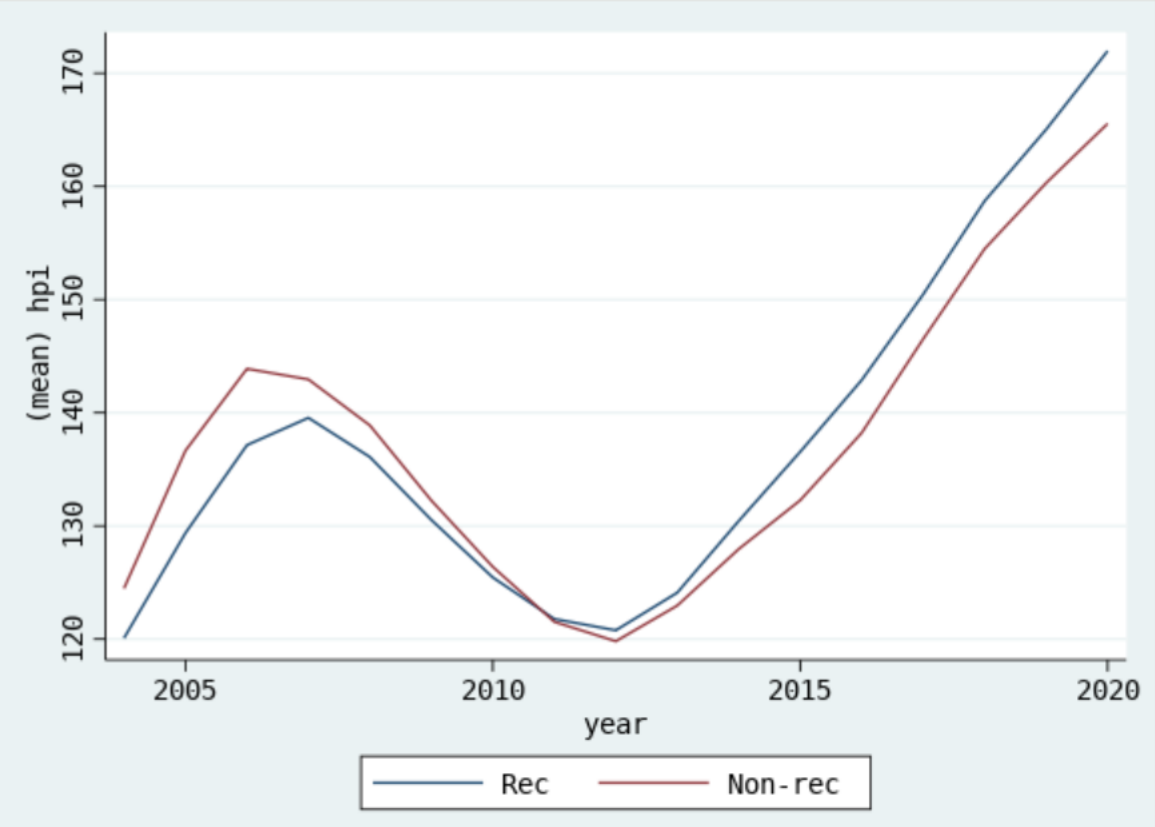

FIGURE B.1
HOUSE PRICE IN RECOURSE AND NON-RECOURSE STATES

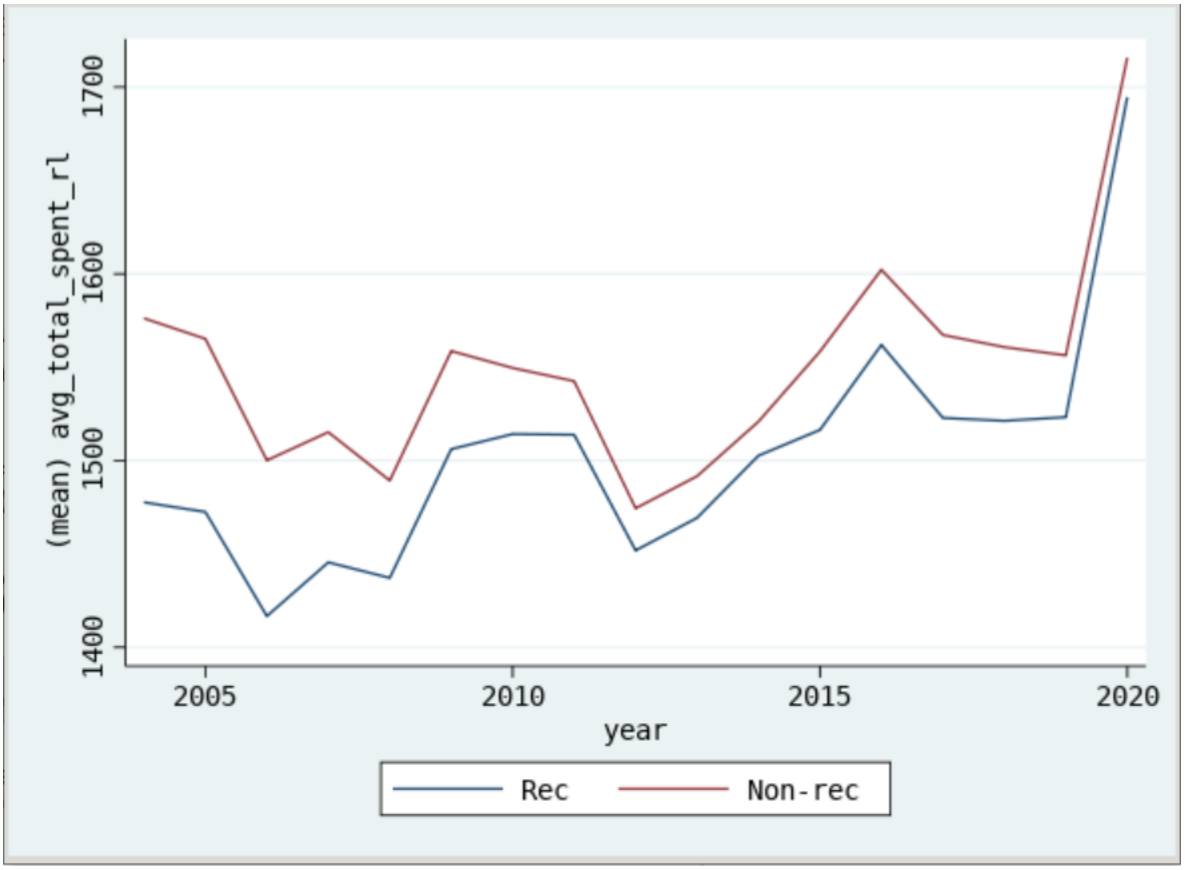

FIGURE B.2
TOTAL CONSUMPTION IN RECOURSE AND NON-RECOURSE STATES

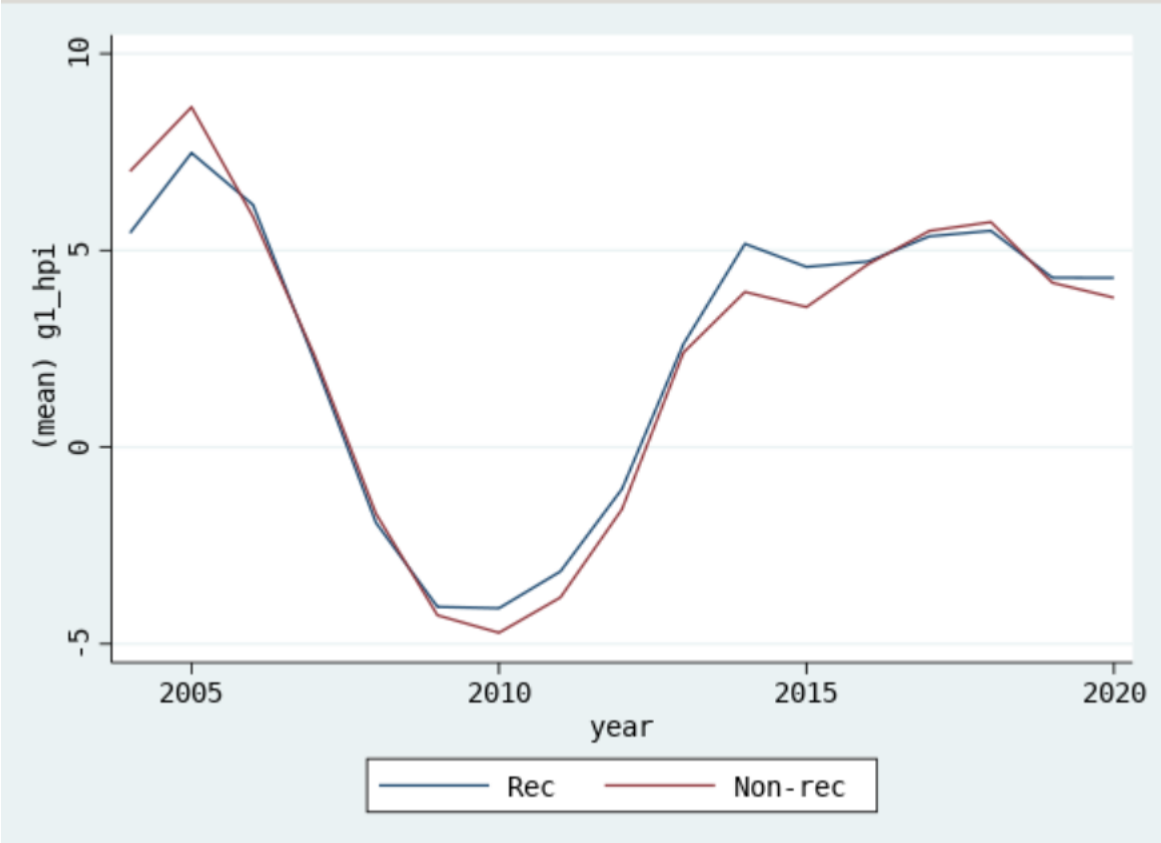

FIGURE B.3
HOUSE PRICE GROWTH IN RECOURSE AND NON-RECOURSE STATES

FIGURE B.4
CONSUMPTION GROWTH IN RECOURSE AND NON-RECOURSE STATES