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

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SEPTEMBER 28, 2023

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ABSTRACT

This paper studies the impact of different mortgage laws across states in the United States on consumers' income elasticities of consumption. Specifically, I examine whether consumers residing in states with recourse mortgage laws demonstrate different income elasticities of consumption compared to those living in non-recourse states. Using a comprehensive household-level panel dataset, I find significant variations in income elasticities of consumption for non-durable goods among homeowners in recourse and non-recourse states. However, no significant difference is observed for non-homeowners which conforms to the hypothesis that mortgage law shouldn't affect non-homeowners. Homeowners in recourse states exhibit 0.07 to 0.1 lower income elasticities of consumption for non-durable goods, indicating a relatively better ability to smooth their consumption patterns. I attribute this phenomenon to increased credit availability in recourse states, driven by reduced risk to lenders. Furthermore, the findings demonstrate that the impact of recourse is more pronounced among homeowners with lower credit scores, implying that recourse offers greater benefits to credit-constrained individuals. Thus, recourse appears to benefit the marginal consumer by enhancing credit accessibility, particularly in regions with lower credit scores.

Keywords: Recourse law; Non-durable consumption; PSM; Nielsen consumer panel data.

*I am immensely grateful to Bent Sørensen and Fan Wang for their valuable guidance, time, unconditional support, and immense patience! I would also like to convey my heartfelt gratitude to Kei-Mu Yi, Steven Craig, Jose Mota, Liu Mendoza Perez and Mehedi Hasan Oni for their constant support and all the priceless suggestions. All errors herein are my own.

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1. INTRODUCTION

In the United States (US), mortgage laws differ across states. Some states have recourse and some do not. In a recourse state, if the house is being foreclosed at a lower price than the actual mortgage price, the lender can collect the remaining balance by taking over other assets or future income of the borrower. In a non-recourse state, lenders cannot do that and the borrowers can walk away without paying the remaining balance after giving up the house in foreclosure.

Whether a state has recourse or non-recourse in the mortgage, can have considerable significance for the homeowners who are still paying the mortgage. The ones in recourse states know from the beginning of the contract that they must keep paying the mortgage in full even at times of significant income loss to avoid further losses. However, the ones in non-recourse states, know that in case of a significant income 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.

Lenders are aware of these differential incentives to foreclose and are likely to restrict lending more to the marginal borrower in non-recourse states due to higher risk.

This impacts the ability of the borrowers differently and this difference in borrowing ability makes their budget constraints different. This eventually impacts how they smooth their consumption when faced with income shocks. Thus, homeowners in recourse states and non-recourse states can have different consumption smoothing patterns and it adds to the strand of literature that suggests heterogeneity in the marginal propensity to consume (MPC) through differences in mortgage law.

Studies show that housing wealth is an important determinant of consumption. Studies have also shown that housing wealth reacts differently to income shocks in recourse and non-recourse states. In recourse states, with laws being stricter, housing wealth is affected less negatively compared to non-recourse states during economic downturns. As

recourse law affects housing wealth and housing wealth affects consumption smoothing, it is of interest to see whether the effect of recourse law on housing wealth is big enough to have a differential impact on the consumption smoothing of these states. Studies looked into how recourse law affects housing wealth differently and studies also looked into determinants of non-durable household consumption smoothing behavior. But to my knowledge, this is the first attempt to study whether recourse law induces a large enough difference in the housing wealth or house market outcome that it can translate into different consumption smoothing behavior among the homeowners of these two types of states.

In this paper, I test whether the elasticity of consumption with respect to income differs in recourse and non-recourse states. I regress income elasticity of consumption on income, recourse dummy, and their interaction with various control variables. I also refine the result by matching the households of recourse states with the ones in non-recourse states using propensity score matching.

Recourse law being a mortgage law, should only impact the consumers who own a home. Hence, non-homeowners in recourse and non-recourse states should behave similarly, indicating no impact of recourse law on them. So, to make sure this is the case, I first analyze the income elasticity of consumption for homeowners and non-homeowners separately to see whether the recourse law has any impact on homeowners and non-homeowners. To address the problem of selection, I use propensity score matching (PSM). I also separate homeowners into two groups by their credit score signifying high and low access to credit and test whether their consumption behavior differs.

Household consumption encompasses almost 70 percent of the US GDP and it is of great importance to understand the patterns of household consumption. A drastic plunge in household consumption was a core driver that worsened the great recession Mian and Sufi (2014) which had a circular effect of causing further recession. For this paper, I am

particularly looking into the consumption of non-durable goods. 15 percent[1] of US real GDP accounts for non-durable goods and these goods are mostly the basic needs of people in their day-to-day life. Food, medicines, basic grocery items, health and beauty products, etc., and these goods usually have a very low-income elasticity of demand. I am analyzing the perturbation of this type of consumption because any significant change in the consumption of these inelastic products will reflect people's deviation from their smoothed consumption pattern and hence we will be able to make a strong claim about the deviation of consumption smoothing. Also, it is very standard in the literature to study non-durable goods for analysis of household consumption.

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)), which gives homeowners the power to borrow against their houses by using them as collateral. Or in general, housing wealth is an important determinant of one's overall credit profile and hence, their borrowing ability. So, laws that affect housing wealth can have a significant impact on the credit profiles of homeowners, which eventually impact their loan-ability and to what extent they can smooth their consumption with that loan.

Studies have found local house prices, house price volatility, foreclosure rates, 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 affects the housing wealth of the households. The house-prices in recourse states are much less volatile over time. During economic crises, these houses in recourse states didn't lose value as much as the houses in non-recourse states. And foreclosure rates are also found to be significantly lower in recourse states.

This stricter recourse law is correlated with better housing market outcomes, which make the houses in recourse states look like better assets, controlling for the other char-

1. https://apps.bea.gov/scb/issues/2022/04-april/0422-gdp-economy.htm

acteristics of the houses. And these make the houses in recourse states more credible to the lenders when the homeowners use these as collaterals, as they deem these houses to be less risky, again due to the strict nature of the law. Hence, getting loans using these houses in recourse states can be easier than getting loans using similar houses in non-recourse states. And with that loan, a homeowner living in a recourse state can smooth his consumption better and have less income elasticity of consumption than his counterpart living in a non-recourse state with very similar characteristics like income, age, family size, home-style, etc.

I use the Nielsen consumer panel data set which has rich household level data for non-durable consumption along with detailed demographics of the households. I also use county-level data from the Federal Housing Finance Agency (FHFA), Bureau of Labor Statistics (BLS) and Federal Reserve Bank of St. Louis.

I find that homeowners in recourse and non-recourse states react very differently to an income shock in terms of consumption. The income elasticity of consumption is significantly lower for homeowners in recourse states compared to homeowners in non-recourse states. This suggests that homeowners in recourse states can smooth their consumption better than their counterparts in non-recourse states. Also, for non-homeowners, there is no difference in the income elasticity of consumption whether they live in a recourse state or non-recourse state, which essentially shows that the difference in consumption reaction of recourse and non-recourse states is only faced by the homeowners and it has something to do with their housing.

The rationale behind this phenomenon can be the fact that consumers in recourse states have a higher probability of getting loans to smooth their consumption because the housing market outcomes in recourse states are much less volatile (Nam and Oh (2021)). Because housing market outcomes in recourse states are much more stable during income shock periods, those houses might have higher credibility to be used as collateral. And those houses being more credible, the credit score or general access to credit should be

higher for homeowners of recourse state. Hence, homeowners of recourse states can possibly get loans during those income shock periods and smooth their consumption which the non-recourse state homeowners cannot.

I also find this result to be consistent for homeowners having different credit scores. Among the homeowners living in the counties that have low average credit scores (high subprime areas), the ones that live in recourse states have significantly lower income elasticity of consumption compared to other homeowners living in low credit scores (high subprime) areas in non-recourse states. And similarly, among all the homeowners living in higher credit score counties (low subprime areas), the ones that fall in recourse states have a lower income elasticity of consumption compared to other low subprime area homeowners living in non-recourse states. So the result is consistent even when I divide the homeowners into groups with different credit scores. Clearly, homeowners living in recourse states seem to be able to smooth their consumption much better in all scenarios. And this higher ability of smoothing consumption is highest among the homeowners living in lower credit score counties (high subprime areas). This means that although homeowners living in recourse states smooth their consumption better in all groups, the homeowners with lower credit scores seem to have benefitted the most by living in a recourse state, as their income elasticity of consumption seems to be the lowest, indicating higher consumption smoothing. So, if recourse helps in smoothing consumption for the homeowners, it benefits the ones who are more credit constraints i.e. the ones with lower credit scores more.

The remainder of the paper is organized as follows. Background and hypotheses (2) elaborates how recourse law works and the concept of consumption being affected by recourse through the housing wealth channel. Data (3) discusses the data I used in my analysis andresults (5) discusses the findings of the study. And finally in section (6) I present my conclusion.

2. Background and Hypotheses

2.1. Details on recourse law

Lenders have different magnitudes of right of deficiency judgment in different states. Depending on the extent, states are classified as having recourse and non-recourse states. In some states, lenders have almost zero or very limited right of defieciency judgment. Those states are termed as non-recourse states. And in other states, lenders have significant right of deficiency judgment and those states are regarded as recourse states. There are also some states which have recourse in commercial loans but not in mortgages, and vice-versa. North Carolina is an example where they have recourse for commercial loans but not for mortgages. Because I am studying the impact of mortgage law on consumption smoothing, I consider the definition of recourse which is related to mortgage. To be more precise, I am considering the states to be a recourse state only when it has recourse in mortgage, and non-recourse otherwise.

Historically, almost all the states were recourse in mortgage until the crisis of the Great Depression. By the power of this deficiency judgment 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 prices 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 deficiency judgment law seriously and made amendments to include restrictions and reduce the power of the lenders' right of deficiency judgment. Some states even went further to completely prohibit the practice of deficiency judgment altogether Li and Oswald (2017). So those states

that prohibit entirely or marginally give little right of deficiency judgment to the lenders, and are considered as the non-recourse states. The status of the states being recourse and non-recourse in mortgage remained historically consistent until 2014. In 2014, Nevada became a non-recourse state by reducing the right to deficiency judgment drastically Li and Oswald (2017).

Almost all the states in US practice recourse law in mortgage. The extent of the right of deficiency judgment 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 judgment rights and have been classified as non-recourse states and since 2014, Nevada has also declared to have no recourse in mortgage. 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 judgment 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 (America's Mortgage Banking Attorneys) and for the states classified as non-recourse, USFN stated that deficiency judgment 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 liability 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*

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, he losses the remaining balance. They cannot go after the borrowers' 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 default takes place and its riskier for the lenders to lend in these states because of this probability of losing money if an underwater situation occurs.

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. As lending to these homeowners is less risky for the lenders, they'll be more likely to lend to homeowners in the recourse states. Through this

housing wealth channel, I assume consumption to react less in recourse states to a shock. So, if this channel is stronger, then the homeowners in recourse states should have lower income elasticities of consumption indicating higher ability to smooth consumption.

The other channel 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 a scenario, the household will be already experiencing 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. So if this channel is stronger, then the homeowners in recourse states should have higher income elasticities of consumption indicating lower ability to smooth consumption.

So, from this channel, it seems like that the homeowners in recourse states are more budget constraint and hence their consumption has to be suppressed or reduced more when faced with a negative shock. So, in theory, this suggests that homeowners will have a higher income elasticity of consumption compared to non-recourse state homeowners as they'll react a lot to income deviations.

So in the end, whether there is a difference between recourse and non-recourse states' income elasticity of consumption and which homeowners are more elastic to income changes, depends on which of these two channels is stronger.

3. DATA

I combine data from different sources to test my hypothesis and describe the variable constructions along with the sources below.

3.1. Consumption Data

I test household consumption of non-durable goods of recourse and non-recourse states. To measure this consumption, I used consumption data from the Nielsen Consumer Panel data set. This data set is collected and provided by Kilts Center for Marketing at the University of Chicago Booth School of Business and NielsenIQ.

The data set has household-level spending data from a representative panel of households that continually provide information about their purchases in a longitudinal study in which panelists stay on as long as they continue to meet NielsenIQ's criteria. NielsenIQ consumer panelists use in-home scanners to record all of their purchases (from any outlet) intended for personal, in-home use. Consumers provide information about their households and what products they buy, as well as when and where they make purchases.

Nielsen reports on approximately 1.5 million unique goods, which account for approximately 30 percent of all household consumption categories (Nielsen, 2016). These goods are largely non-durables from the following categories: health and beauty, dry grocery, frozen foods, dairy, deli, packaged, meat, fresh produce, non-food grocery, alcohol, general merchandise. The average age of a household head is 53, average family size is 2.6 persons, average annual income was $\$68,000$, and average annual expenditure is $\$7,489$.

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)).

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 product 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.

Nielsen has a wide variety of household demographics which I use as controls and also to construct the PSM sample by matching each homeowners of recourse state with a counterpart in non-recourse states that possess very similar characteristics, using propensity score matching. Table 1 summarizes the mean values of income, consumption and various demographic variables in each type of states i.e. in recourse and non-recourse states and also their differences.

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 homeowners which is a standard practice in the literature (Stroebel and Vavra (2019) Graham and Makridis (2018)). Details about the data cleaning and creation of various variables from the Nielsen dataset is elaborated in the appendix section.

3.1.1. Other controls

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

TABLE 1

SUMMARY TABLE FOR VARIABLES USED GENERATED USING NIELSEN DATASET

	(1) (Recourse)		(2) (Non-recourse)		(3) (Difference)
	Mean	SD	Mean	SD	b
Average					
Per capita income	57232.49	9555.98	57720.06	9585.47	121.57
Per capita consumption	5879.64	978.90	5841.8	992.52	-9.46
	Mean	SD	Mean	SD	b
Growth rates					
Income	1.38	4.30	1.41	5.33	0.03
Consumption	4.40	86.30	3.89	47.65	-0.51
	Mean	SD	Mean	SD	b
Percentage of Population					
Married	0.69	0.46	0.69	0.46	0.00
Have children	0.25	0.43	0.26	0.44	0.01**
Poor (inc $\leq$ \$40,000)	0.32	0.47	0.31	0.46	-0.01***
Middle class (\$40,000 $\leq inc \leq$ \$100,000)	0.53	0.50	0.55	0.50	0.02***
Rich (inc $\geq$ \$100,000)	0.15	0.36	0.15	0.35	-0.00
Asian	0.02	0.13	0.02	0.13	0.00
African American	0.11	0.32	0.09	0.28	-0.03***
Caucasian	0.83	0.37	0.86	0.34	0.03***
Home owner	1.00	0.00	1.00	0.00	0.00
Both spouse college grad	0.17	0.37	0.17	0.37	0.00
No spouse college grad	0.49	0.50	0.48	0.50	-0.01
Hispanic origin	1.95	0.22	1.97	0.17	0.02***
Household has internet connection	1.13	0.33	1.14	0.35	0.02***
Older than 50	0.93	0.26	0.93	0.25	0.00**
Single earner family	0.35	0.48	0.32	0.47	-0.03***
Both spouse blue collar job	0.04	0.18	0.04	0.20	0.01***
Both spouse white collar job	0.16	0.36	0.17	0.37	0.01***

This sample includes the homeowners only

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.

I have household-level income data from Nielsen Consumer Panel data set. But that income variable is categorical and only mentions which income bracket each household falls into. I converted this variable into a continuous one by taking the mid-points of those income brackets. 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[2] 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

2. 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.

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.

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.

4. ESTIMATION APPROACH

I test the consumption reaction to income shocks for recourse and non-recourse states and see whether there is a significant difference. I use the following specification:

$$\begin{aligned}\Delta C_{ijt} =& \alpha_0 + \alpha_1 R_s + \alpha_2 \Delta Inc_{ijt} + \alpha_3 R_s \times \Delta Inc_{ijt} + \psi HHDemog_{it} \\ &+ \omega CountyChars_{jt} + \nu_t + \epsilon_{ijt}\end{aligned} \tag{1}$$

where i is an individual household, j is county, t is year and s refers to the different states of the US. 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. ΔInc is household level per capita real income growth from Nielsen database. HHDemog is a vector of control variables containing various 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 the unemployment rate, debt-to-income ratio, Equifax subprime ratio etc.

The dependent variable is the consumption growth of overall non-durable goods at the household level. The independent variables are recourse dummy R, household income, the interaction between recourse dummy and income, various household demo-

graphics and county demographics. α_3 is the coefficient of interest which shows the difference in the income elasticity of consumption in recourse states compared to non-recourse states.

First, I analyze the coefficient α_3 between homeowners and non-homeowners. α_3 shows the difference in the income elasticity of consumption between recourse and non-recourse states. Recourse being a mortgage law, it should only affect the homeowners and hence, the possibility of having a difference in the income elasticity of consumption between recourse and non-recourse state is more likely for homeowners only. Because homeowners of recourse and nonrecourse states face different mortgage law which might lead to different loan-ability and housing wealth.

For non-homeowners, recourse law should not affect their consumption as it does not affect their budget constraint or access to credit. Hence, I run regression 1 for homeowners and non-homeowners separately and as per the abovementioned hypothesis, α_3 for non-homeowners should not be significant and for homeowners, if there's any difference linked to the recourse status, then α_3 is expected to be significant. However, for homeowners, I expect α_3 to be significant which will mean that for homeowners, the income elasticity of consumption is significantly different in recourse states than the non-recourse state's homeowners.

As recourse only affects the homeowners, its intuitive that non-homeowners are not expected to be affected by this and hence, I expect the non-homeowners of recourse and non-recourse states to react similarly. I find that α_3 is not significant for non-homeowners signifying that the state being recourse or not do not impact the consumption of non-homeowners as recourse mortgage law is strictly related to homeowners.

I also compare the household from counties with better average credit profiles (low subprime or higher credit score) to households from counties with lower credit profiles (high subprime or low credit score). I use the average credit score of a county to group the counties into two: better borrower profile (low subprime counties) and poor borrower

profile (high subprime counties).

Literature shows that the elasticity of consumption with respect to income varies by the level of debt and access to credit. The higher the level of debt, the higher the elasticity. And the results are consistent both at the individual level and also at the state or county level.

I define High subprime borrowing counties to be the counties that have more than 37 percent of people with a less than 660 credit score. And counties having less than 37 percent of population with less than 660 credit score are defined here as the low subprime counties. Similarly, I group counties into high and low debt-to-income ratio (DTI) groups. High DTI counties are the ones that have an average debt to income ratio of 1.6 and higher. And low DTI counties are the ones with a debt-to-income ratio of less than 1.6.

4.1. 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 consumption 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 does not look at a 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 of selection, I use matching techniques which are widely used in observational studies to improve causal inferences (Ho, Imai, King, and Stuart (2007), Muller, Winship, and Morgan (2014), King and Nielsen (2019)). I use Propensity Score Matching (PSM) technique by Rosenbaum and Rubin (1983) to match each household from the recourse state with another household in the non-recourse state based on their various demographic characteristics. Nielsen dataset has a rich set of demographic variables which allow me to match these households from these two types of states.

I match the households with a nearest-neighbor of value 1 which means a $1:1$ match without replacement given I have a large sample size. After matching, I only keep the households that are on support which means, I only keep the households that have a matching household in the counterpart state and then rerun equation 1 again on the restricted sample which only has matched households.

FIGURE 1
PSGRAPH SHOWING SUPPORT OF MATCHING

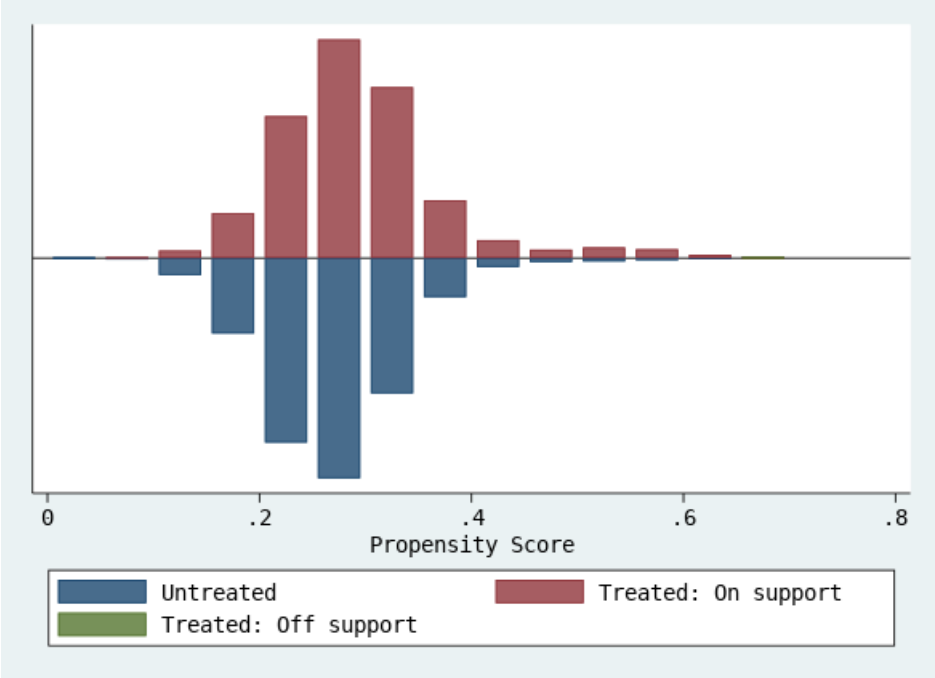

FIGURE 2
PSGRAPH SHOWING OVERLAP OF MATCHING

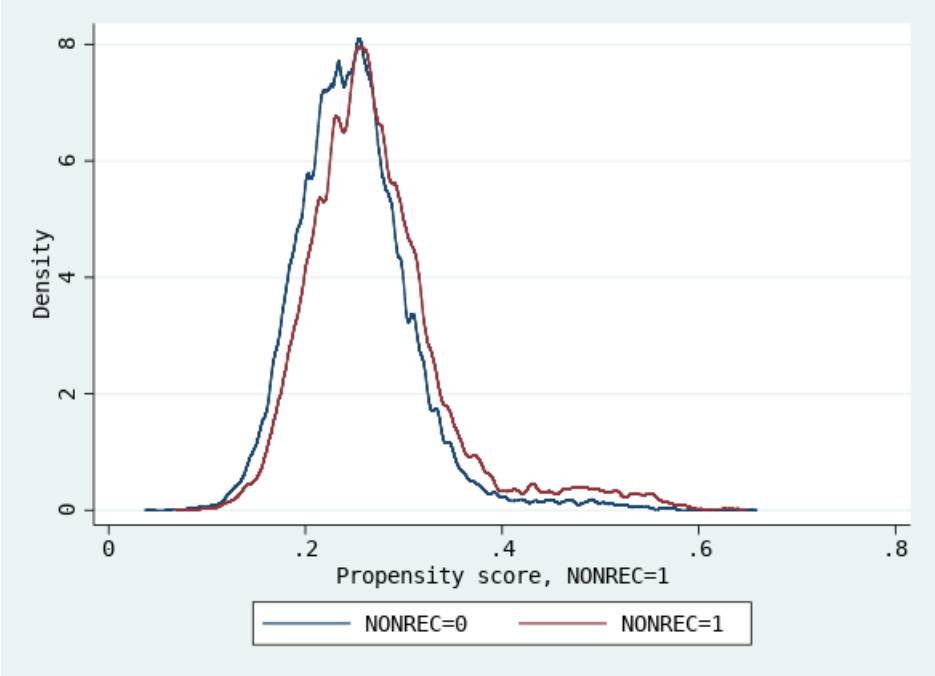

TABLE 2
T-TEST FOR EACH COVARIATE AFTER MATCHING

	Mean		t-test		
Variable	Treated	Control	%bias	t	p>t
Married	0.581	0.579	0.5	0.29	0.77
Have children	0.187	0.183	1.1	0.7	0.483
Both spouse sixty or older	0.888	0.889	-0.3	-0.18	0.858
Homeowner	0.793	0.799	-1.5	-0.92	0.36
Both spouse coll grad	0.138	0.136	0.5	0.33	0.744
One spouse coll grad	0.491	0.49	0.1	0.03	0.974
No spouse working	0.159	0.157	0.5	0.29	0.775
Single earner	0.334	0.331	0.5	0.31	0.759
Only male blue collar	0.186	0.183	0.9	0.54	0.591
Only female blue collar	0.078	0.079	-0.2	-0.15	0.882
Only male white collar	0.277	0.283	-1.3	-0.8	0.422
Only female white collar	0.412	0.412	0.1	0.03	0.974
Both spouse blue collar	0.028	0.029	-0.1	-0.1	0.923
Both spouse white collar	0.146	0.148	-0.7	-0.41	0.684
House style	0.88	0.884	-1.1	-0.65	0.519
Rich	0.114	0.115	-0.5	-0.28	0.782
Middle class	0.493	0.494	-0.2	-0.11	0.911
Caucasian	0.834	0.836	-0.5	-0.28	0.779
African American	0.063	0.063	0	0.03	0.974
Asian	0.046	0.046	-0.2	-0.08	0.939

Figure 1 shows the support of recourse and non-recourse households over the propensity score distribution. And figure 2 shows the density of households from recourse and non-recourse states after matching by propensity scores. Both the graphical measures suggest a good match. For further diagnosis of the match, I run t-tests for each of the covariates and also look for standardized bias among them. Table 2 shows the results for the t-tests and none of the variables show a bias over 5 percent or a p-value less than 0.05 suggesting no significant difference among the households living in these two types of states in terms of these demographic characteristics and hence a strong match. However, we should keep the caveat in mind that PSM often can give very good matching results in terms of these t-tests, however, the match itself can be very poor and this is a major limitation of this technique (King and Nielsen (2019)).

5. RESULTS

Table 3 shows the the values of the parameters of interest, α_3 and also α_2 from regression 1 for homeowners and non-homeowners of the Nielsen sample in columns 1 and 2 respectively. Equation 1 regresses consumption growth on income growth, recourse dummy and their interaction term along with other household and county level controls.

The coefficients for "Income Growth" variable in columns 1 and 2 are the values of α_2, income elasticity of consumption of homeowners and non-homeowners in non-recourse states. Homeowners in non-recourse states seem to be more elastic in consumption (0.154) than the non-homeowners of non-recourse states (0.122). A 1 percent reduction in income leads to 0.154 percent reduction in consumption for the homeowners of non-recourse states compared to a 0.122 percent for the non-homeowners of the same non-recourse states.

Now, for recourse states, we see the income elasticity of consumption for the homeowners is significantly lower (0.0938) than that of the recourse state homeowners in col-

TABLE 3
CONSUMPTION GROWTH FOR HOMEOWNERS AND NON-HOMEOWNERS

	(1) Homeowner	(2) Non-Homeowner
Income Growth	0.154***	0.122*
	(10.58)	(2.41)
Rec X Income Growth	-0.0938***	-0.0227
	(-6.32)	(-0.44)
Sample	All	All
Controls	Yes	Yes
Year FE	Yes	Yes
HO	Yes	No
N	168113	28840

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

umn (1). This suggests that consumption of the homeowners in recourse states are less affected and they have a lesser MPC. A 1 percent reduction in income leads to a 0.062 percent (0.154 minus 0.0938) reduction in consumption compared to a 0.15 percent reduction of the non-recourse homeowners. This suggests that homeowners in recourse states are less prone to consumption shock when faced with an income shock compared to the homeowners in non-recourse states.

In column (2), for non-homeowners, the coefficient for the difference in income elasticity of recourse and non-recourse state is very small (0.02) and negative for *RecXIncomeGrowth*. This means a little lesser impact of income variation for recourse states. But this is very small and not significant which corroborates the assumption that recourse do not affect non-homeowners and hence, there is no significant difference in their consumption elasticity whether they live in recourse states or non-recourse states. This aligns with the hypothesis that recourse being a mortgage law, does not affect the non-homeowners and hence I do not find any effect of income shock particularly for being or not being in a recourse state.

In table 4, I do the same exercise shown in table 3, but this time I match households in

TABLE 4
CONSUMPTION GROWTH FOR HOMEOWNERS AND NON-HOMEOWNERS AFTER USING PSM

	(1) Homeowner	(2) Non-Homeowner
Income Growth	0.130***	0.0224
	(7.6)	(0.08)
Rec X Income Growth	-0.0764***	0.126
	(-4.40)	(0.47)
Sample	PSM	PSM
Controls	Yes	Yes
Year FE	Yes	Yes
HO	Yes	No
N	94281	14447

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

recourse states with households in non-recourse states using Propensity Score Matching (PSM) and ran the regressions only on the matched sample. Here too, I see a similar pattern of recourse homeowners having lower income elasticity of consumption (by 0.07 percent) compared to the non-recourse homeowners in column 1 and also non-homeowners having no effect of recourse on their income elasticity of consumption.

TABLE 5
CONSUMPTION GROWTH ON INCOME FOR DIFFERENT CREDIT SCORES

	(1) High Subprime (Low Credit Score)	(2) Low Subprime (High Credit Score)
Income Growth	0.572***	0.124***
	(3.70)	(7.80)
Rec X Income Growth	-0.513***	-0.0779***
	(-3.32)	(-4.71)
Controls	Yes	Yes
Year FE	Yes	Yes
HO	Yes	Yes
N	8408	7200

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

I run the same regression (model 1) on the households of different counties with dif-

ferent credit scores. Table 4 shows the results for regression 1 for high and low subprime counties in columns 1 and 2. Columns 1 and 2 in table 5 suggest that homeowners in counties with high subprime borrowers have a much higher income elasticity of consumption. So homeowners in high subprime counties having much less credit scores are more constrained and their consumption gets affected very much compared to homeowners in low subprime counties who have better credit scores and hence have better measures to smooth their consumption. A 1 percent income reduction leads to a consumption reduction of 0.57 percent for homeowners in high subprime counties compared to only a reduction of 0.124 percent for homeowners in low subprime counties.

The results for the coefficient of the interaction term of recourse dummy and income growth are the primary focus here as I want to check whether this finding from the literature is consistent for recourse too. This result I compare in two ways. First, I compare the consumption elasticity of recourse state homeowners of low credit profile vs. high credit profile counties and check if the patterns are still consistent with the literature for recourse states. And second, compare the consumption elasticity of recourse and non-recourse states' homeowners for each credit profile category and again, see whether the pattern of more credit-constrained households having higher consumption elasticity holds. As discussed before, houses in recourse states have higher credibility due to the lower risk for the lenders which raises the probability of getting loans for the homeowners of recourse states. Hence, homeowners in non-recourse states having lower average credit profile compared to recourse state homeowners, might be more credit constrained. And as per the pattern from the literature, homeowners in non-recourse states being more constrained should have a higher elasticity of consumption.

Table 3 shows that homeowners in recourse states also follow this pattern and income elasticities are higher for high-subprime counties compared to the homeowners of low-subprime counties of the recourse states. And for each of the categories, the sign of the interaction term is negative indicating that the consumption elasticity of the recourse

state homeowners for each of the categories is lower than the non-recourse homeowners of the corresponding categories. Again, this holds the generic pattern of more credit-constrained households having higher consumption elasticity.

Homeowners of a high subprime group who live in recourse states, are 0.513 percent less sensitive to income shock than the homeowners of high subprime group who live in non-recourse states. This indicates these homeowners in recourse states despite having lower credit scores like their counterparts in non-recourse states, are more able to smooth out their consumption. So column 1 suggests, among the homeowners living in counties with very low average credit scores, the ones living in recourse states smooth out their consumption much more than the ones living in non-recourse states.

Also, recourse states in column 1 have an income elasticity of consumption of 0.059 for homeowners of high subprime areas compared to 0.0461 for the recourse state homeowners of low subprime areas (column 2). Again, we see that homeowners living in high subprime areas have higher consumption elasticity or MPC because they are more constrained, although here both the parties live in recourse states.

Column 2 has the same signs but the magnitude is not as big as the high subprime homeowners. Recourse states homeowner living in low subprime counties, have 0.07 percent lower income elasticity of consumption, meaning less affected by the income shock than the non-recourse homeowners of counties with low average credit scores.

It is found that homeowners in the low-credit score group have higher consumption elasticity than the ones with higher credit score both in recourse and non-recourse states. And for each type of credit profile, non-recourse state homeowners have higher consumption elasticity. This means, recourse reduces consumption elasticity for each credit profile and enables higher consumption smoothing.

And finally, this reduction in consumption elasticity by recourse or increased ability of consumption smoothing is higher for low credit-profiled counties compared to high credit profiled counties. So homeowners in counties with low credit profile benefit more

by recourse.

6. Conclusion

Consumption being one of the biggest components of national accounting, impacts the economy at a large scale. Hence, this is one of the focal points of research among economists. This paper investigates whether differences in a certain kind of mortgage law causes consumers to react differently to income shocks.

Literature suggests that consumers that are more credit constrained, tend to have higher income elasticity of consumption and vice-versa. Any income loss leads to higher consumption reduction for the more credit-constrained consumers because they cannot smooth their consumption by taking more credit. On the other hand, if consumers can borrow easily, then they can borrow and smooth their consumption when faced with an income shock.

Literature explores the effects of recourse law on housing market outcomes and housing wealth. Another set of literature explores how housing market outcome and housing wealth affect household consumption. My contribution here is to connect these two strands and see whether this particular mortgage law, i.e. recourse mortgage law, affects household consumption in a significant manner.

I find that income elasticity of consumption is significantly lower among recourse state homeowners compared to non-recourse state homeowners. As hypothesized earlier, lenders are more likely to lend to recourse state homeowners due to the strictness of the law, which makes it less risky for them. Hence, having this backup of availability of loan to the marginal borrower, recourse state homeowners do not have to reduce their income as drastically as the non-recourse homeowners when faced with an income shock. I also use propensity score matching to match homeowners in recourse state with homeowners in non-recourse states that have similar observable characteristics and I find similar patterns.

I do not find any impact of recourse on the non-homeowners. So non-homeowners in recourse and non-recourse states do not have significant differences in their income elasticities of consumption indicating recourse to have no significant effect on the non-homeowners and only on homeowners.

I also find that recourse helps the homeowners who have lower credit scores, i.e. who are more credit constrained. Homeowners in recourse states have lower income elasticities of consumption both among the low-credit score homeowners and high credit score homeowners. So, recourse reduces income elasticity of consumption universally. However, the homeowners with lower credit scores have the highest reduction in income-elasticity due to recourse. This suggests homeowners with lower credit scores who are less able to get loans and hence are more credit constrained, get higher cushion from recourse, and recourse reduces their income elasticity a lot compared to the ones with higher credit scores.

My findings align with the existing literature in the sense that homeowners living in recourse states are more able to get loans by using their houses as collateral. Because recourse states have this stricter mortgage law, house-market outcomes are much less risky and volatile in these states. Also, defaults are significantly less in recourse states. These in turn, make the recourse state houses more credible as collateral and less risky for the lenders. Hence, homeowners in recourse states are more able to borrow during income shocks and still keep their consumption comparatively smooth.

In non-recourse states, on the other hand, house-market outcomes fluctuate a lot and defaults are significantly higher. This makes the houses in non-recourse states less credible and when faced with an income shock, homeowners in non-recourse states are less able to get loans and smooth their consumption.

So, my finding suggests that homeowners of different states who differ in mortgage law, have different income elasticity of consumption. And this difference is in the direction of the stricter the mortgage law, the lower the income elasticity of consumption.

Stricter mortgage law makes the housing market of those areas less volatile, making the houses more credible as collateral. This helps the homeowners to get loans and smooth their consumption better than their counterparts living in states with less stricter mortgage laws where its easier to get away with a default. This evidence of heterogeneity in income elasticity of consumption stemming from mortgage law differences adds to the argument for using heterogenous income elasticity of consumption or MPCs while measuring or doing policy analysis.

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APPENDIX A: FIGURES

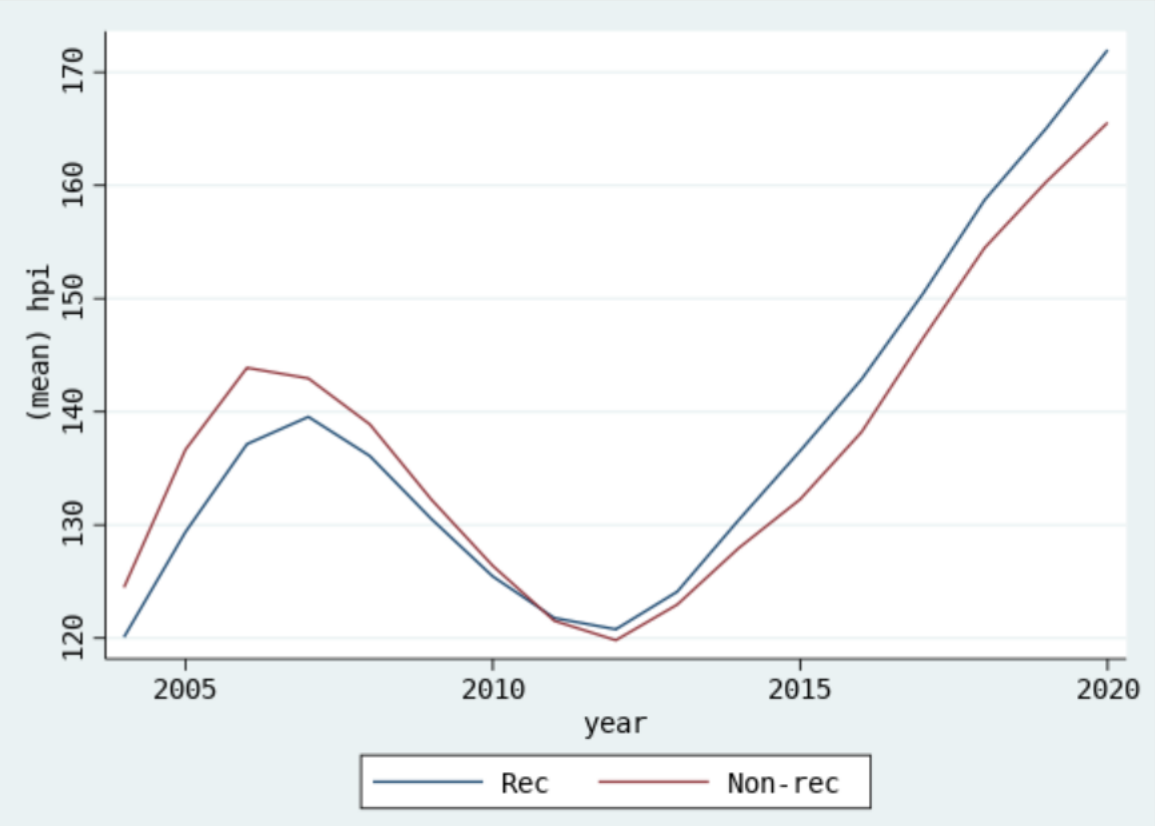

FIGURE A.1
HOUSE PRICE IN RECOURSE AND NON-RECOURSE STATES

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

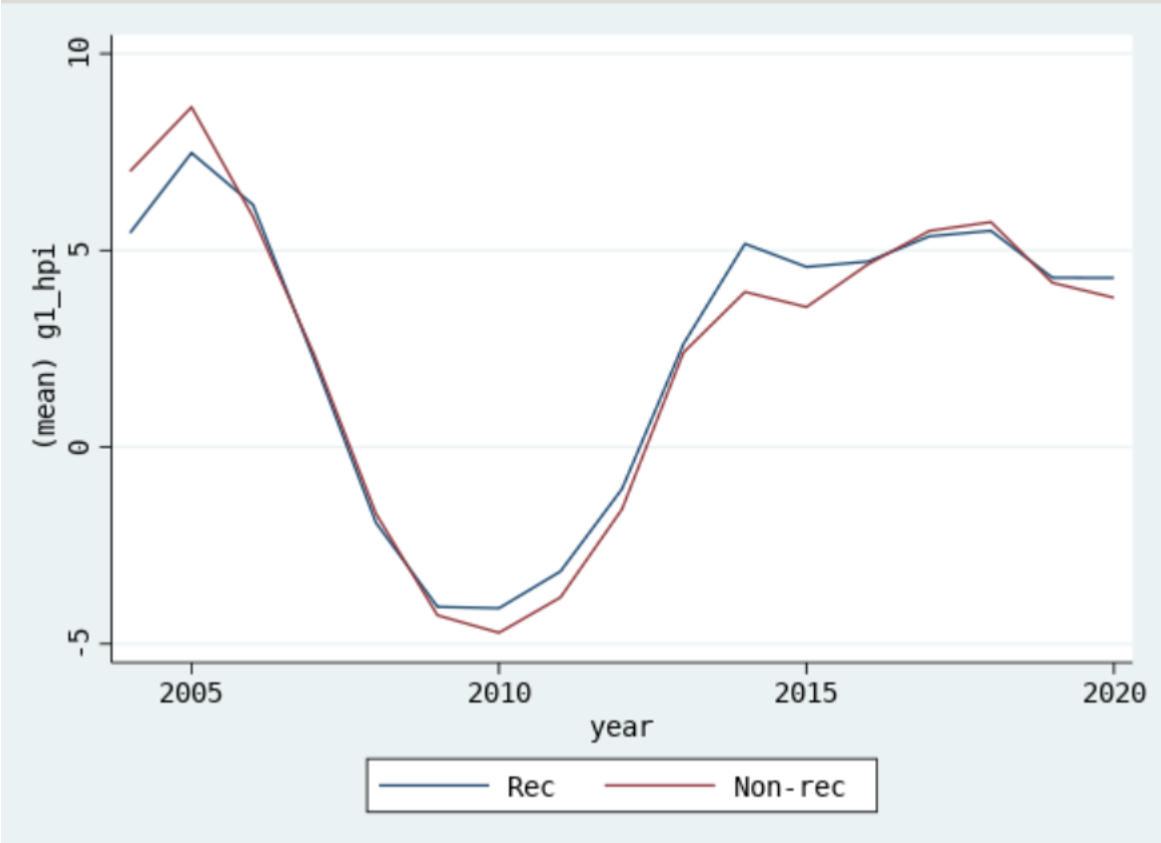

FIGURE A.3
HOUSE PRICE GROWTH IN RECOURSE AND NON-RECOURSE STATES

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