

The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis

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Internet Appendix

This appendix is split into four parts. Part A provides further description of the data and information on how to obtain the data. Part B presents additional tables that examine subprime zip codes with negative income growth from 2002 to 2005. Part C provides further evidence on the importance of within-county variation by showing results without county fixed effects. Part D presents all non-house price results using the full sample of 18,408 zip codes.

A. Further Description of Data

1. Equifax Data

We collect anonymous aggregated data on outstanding consumer credit amounts and defaults from the Analytical Services group at Equifax. Equifax is a leading global provider of information solutions for consumers and businesses. In their U.S. consumer business, they collect, organize, and manage credit information on roughly 170 million individuals. To ensure the confidentiality of consumers' credit information, Equifax only provides the aggregated credit information based on a 5% zip code-level sample. Equifax produced the aggregated information on an annual basis from 1991-1997, but shifted to a quarterly frequency beginning in Q1 1998 and running through Q4 2007.

We therefore have aggregate debt composition and defaults of every U.S. zip code at a quarterly frequency from 1998 through the fourth quarter of 2007, and at an annual frequency from 1991 through 1997. The outstanding consumer credit and delinquency data at the zip code level are broken down by type of consumer loans (credit cards, mortgages, home equity lines, auto loans, student loans, and consumer loans), as well as consumer credit score data. In particular, the Equifax data contain information on the number of consumers below and above credit scores of 620, 640, and 660. These data allow us to construct our key right hand side variable of interest: the fraction of consumers in a zip code with a score below 660 as of 1996Q4.

We construct aggregate measures of mortgage debt, home equity debt, and non-home consumer debt. The latter category aggregates credit card debt, consumer loans, student loans, and auto loans. The Equifax data record default amounts for the following varying degrees of default: 30 days late, 60 days late, 90 days late, 120 days late or collections, severe derogatory, and bankruptcy. In our core analysis, we define defaults as broadly as possible: default amounts include any amounts 30 days late or more. The main reason for this choice is that many defaults are recent. All of our specifications are run in first-differences, which mitigates concerns about the average level of default for different default categories. Our results are materially unchanged if we use an alternative definition of default such as 60 plus days late or more.

For more information on the purchase of these data, please contact Jim Powers at Equifax at: Jim.Powers@equifax.com.

2. Home Mortgage Disclosure Act (HMDA) Data

We leverage the "Home Mortgage Disclosure Act" (HMDA) for loan origination data sets. These sets provide information on the flow of new mortgage and home equity loans being originated. In order to supervise and enforce fair lending practices across that U.S., the U.S. Congress mandates that all loans applications related to home purchase, refinancing, and home improvement be reported to the federal government. The loan application information is publicly available through HMDA from 1990 through 2007. For every loan application, the public data record its status (denied / approved / originated), purpose (home purchase / refinancing / home improvement), loan amount, and applicant characteristics including race, sex, income and home ownership status. It also reports lender information, including the lender's reasons for applicant denial, type of lender, and whether the loan originator sold the loan to the secondary market within a year. Since 2004, HMDA has also recorded the initial interest rate spread of loan originations, and lien status. HMDA does not provide information on the maturity structure of a loan, or whether the loan has a fixed rate mortgage or ARM. Nonetheless, with millions of loan applications recorded every year, HMDA remains one of the best sources for understanding loan origination patterns. The data are available at: <http://www.ffiec.gov/hmda/>.

Since our unit of analysis is a zip code, we aggregate the application-level HMDA data to census tracts, which are the smallest available geographical identifiers in the data. The census tract level HMDA data are then aggregated into zip codes using the census tract to zip code match provided by *Geolytics* (<http://www.geolytics.com/Services.asp#s>). Census tracts are smaller than zip codes on average, with about 60,000 census tracts for approximately 40,000 zip codes. Consequently, the quality of the match from census tract to zip code is excellent. For example, 85% of matched census tracts in our final sample have over 90% of their population living in the zip code to which they are matched.

3. Fiserv Case Shiller Weiss Data

Our primary data source for zip code level house price indices is Fiserv Case Shiller Weiss. FCSW uses same house repeat sales data to construct house price indices at the zip code level. The zip code level house price data we utilize in this study underlies the MSA level S&P/Case Shiller indices, upon which futures are traded on the Chicago Mercantile Exchange. The data set includes house price indices through the first quarter of 2008.

As mentioned in the text of our core analysis, the FCSW house price data is only available for 3,014 zip codes with a large enough number of repeat sales to accurately measure the evolution of prices. These zip codes make up 30% of all U.S. households and 45% of total U.S. mortgage debt. The last section of this appendix shows the differences between zip codes based on the availability of FCSW data. The last section also shows that all of our core results that do not use house price data are robust to the use of the full sample of zip codes in the Equifax-HMDA intersection (18,408 zip codes representing 90% of the U.S. population).

4. Census, Business Statistics, IRS Data, and CapIndex crime statistics

Zip code level demographic attributes such as population, race, poverty, mobility, unemployment and education come from the Decennial 2000 Census (available at:

<http://factfinder.census.gov/home/saff/main.html?lang=en>). We also collect annual measures of business opportunities available in a given zip code through the Business Statistics published by the U.S. Census Bureau (available at http://www.census.gov/epcd/www/zbp_base.html). These statistics provide data on wages, employment, and number of establishments at the zip code level. Given a lag in the reporting of information, the business opportunity data are available from 1996 through 2006. Finally, we collect zip code level average “adjusted gross income” as reported by the IRS (available at:

<http://www.irs.gov/taxstats/indtaxstats/article/0,,id=96947,00.html>). The IRS currently provides these data for 1991, 1998, 2001, 2002, 2004, 2005, and 2006. The income variable from the IRS is important because it tracks the income of consumers living inside a given zip code, as opposed to Business Statistics which provide wage and employment statistics for individuals working, but not necessarily living, in a zip code.

Since a potentially important neighborhood determinant of house prices and credit market conditions is crime, we also collect zip level statistics on total crime from 2000 to 2007. These data are from CAP Index, Inc., a firm specializing in providing crime data. See <http://www.capindex.com/> for more information on the CAP Index crime data.

B. Additional tables on subprime zip codes with negative income growth

These tables focus on mortgage origination and house price patterns in 26 subprime zip codes for which income growth from 2002 to 2005 is negative in absolute terms.

Negative Income Growth Zips Table I
Subprime Zip Codes with Negative Income Growth and
Prime Zip Codes with Positive Income Growth

Subprime Zip code	County	Income Growth 2002 to 2005			Mortgage origination growth 2002 to 2005		
		This zip code	Prime zips in county	Difference	This zip code	Prime zips in county	Difference
93905	Monterey, CA	-0.001	0.126	-0.130	0.789	0.164	0.625
07801	Morris, NJ	-0.001	0.071	-0.076	0.339	0.019	0.320
48227	Wayne, MI	-0.005	0.014	-0.030	0.318	0.026	0.292
48141	Wayne, MI	-0.008	0.014	-0.040	0.277	0.026	0.251
92083	San Diego, CA	-0.051	0.074	-0.232	0.399	0.154	0.245
02149	Middlesex, MA	-0.003	0.074	-0.081	0.285	0.078	0.206
48235	Wayne, MI	-0.003	0.014	-0.024	0.224	0.026	0.197
38141	Shelby, TN	-0.024	0.045	-0.118	0.296	0.109	0.187
28212	Mecklenburg, NC	-0.029	0.060	-0.148	0.275	0.123	0.152
89106	Clark, NV	-0.012	0.069	-0.105	0.337	0.200	0.137
38115	Shelby, TN	-0.006	0.045	-0.062	0.244	0.109	0.135
48219	Wayne, MI	-0.003	0.014	-0.023	0.156	0.026	0.129
97266	Multnomah, OR	-0.003	0.064	-0.074	0.356	0.230	0.126
94509	Contra Costa, CA	-0.003	0.086	-0.095	0.195	0.098	0.096
43227	Franklin, OH	-0.003	0.025	-0.035	0.108	0.019	0.089
07060	Union, NJ	-0.045	0.055	-0.193	0.190	0.106	0.084
33801	Polk, FL	-0.034	0.070	-0.174	0.405	0.351	0.053
30213	Fulton, GA	-0.002	0.078	-0.084	0.135	0.084	0.051
28215	Mecklenburg, NC	-0.008	0.060	-0.085	0.146	0.123	0.023
43232	Franklin, OH	-0.004	0.025	-0.037	0.008	0.019	-0.011
01841	Essex, MA	-0.008	0.066	-0.091	0.160	0.186	-0.026
07001	Middlesex, NJ	0.000	0.044	-0.044	0.016	0.052	-0.036
94585	Solano, CA	-0.029	0.049	-0.136	0.316	0.353	-0.037
48340	Oakland, MI	-0.003	0.059	-0.068	-0.012	0.033	-0.046
48237	Oakland, MI	-0.002	0.059	-0.064	-0.036	0.033	-0.070
32808	Orange, CA	-0.015	0.112	-0.156	0.341	0.472	-0.130
AVERAGE:		-0.012	0.056	-0.092**	0.241	0.124	0.117**

In this table, we isolate the sample to subprime zip codes that have negative nominal income growth from 2002 to 2005 and prime zip codes with positive nominal income growth from 2002 to 2005. Subprime and prime zip codes are defined to be the highest and lowest quartile zip codes in the national distribution based on the fraction of residents with a credit score below 660 as of 1996. All growth rates are annualized. **, *Statistically distinct from 0 at the 1% and 5% levels, respectively

Negative Income Growth Zips Table II
Can Productivity/Income Growth Explain Subprime House Price Growth
from 2002 to 2005?

Subprime Zip code	County	Income Growth 2002 to 2005			House price growth 2002 to 2005		
		This zip code	Prime zips in county	Difference	This zip code	Prime zips in county	Difference
1841	Essex, MA	-0.008	0.066	-0.091	0.123	0.063	0.060
94509	Contra Costa, CA	-0.003	0.086	-0.095	0.192	0.143	0.049
93905	Monterey, CA	-0.001	0.126	-0.130	0.227	0.191	0.036
92083	San Diego, CA	-0.051	0.074	-0.232	0.203	0.167	0.036
48219	Wayne, MI	-0.003	0.014	-0.023	0.062	0.031	0.031
48141	Wayne, MI	-0.008	0.014	-0.040	0.062	0.031	0.030
48227	Wayne, MI	-0.005	0.014	-0.030	0.061	0.031	0.029
2149	Middlesex, MA	-0.003	0.074	-0.081	0.086	0.057	0.028
7060	Union, NJ	-0.045	0.055	-0.193	0.160	0.133	0.027
48235	Wayne, MI	-0.003	0.014	-0.024	0.053	0.031	0.021
7801	Morris, NJ	-0.001	0.071	-0.076	0.127	0.109	0.018
7001	Middlesex, NJ	0.000	0.044	-0.044	0.156	0.140	0.016
48237	Oakland, MI	-0.002	0.059	-0.064	0.044	0.035	0.009
48340	Oakland, MI	-0.003	0.059	-0.068	0.041	0.035	0.005
94585	Solano, CA	-0.029	0.049	-0.136	0.190	0.186	0.005
33801	Polk, FL	-0.034	0.070	-0.174	0.214	0.211	0.004
97266	Multnomah, OR	-0.003	0.064	-0.074	0.140	0.138	0.002
89106	Clark, NV	-0.012	0.069	-0.105	0.252	0.254	-0.002
38141	Shelby, TN	-0.024	0.045	-0.118	0.038	0.040	-0.002
38115	Shelby, TN	-0.006	0.045	-0.062	0.032	0.040	-0.008
43227	Franklin, OH	-0.003	0.025	-0.035	0.038	0.048	-0.009
43232	Franklin, OH	-0.004	0.025	-0.037	0.036	0.048	-0.012
28212	Mecklenburg, NC	-0.029	0.060	-0.148	0.044	0.058	-0.014
32808	Orange, FL	-0.015	0.112	-0.156	0.210	0.228	-0.017
30213	Fulton, GA	-0.002	0.078	-0.084	0.037	0.057	-0.020
28215	Mecklenburg, NC	-0.008	0.060	-0.085	0.032	0.058	-0.026
AVERAGE:		-0.012	0.057	-0.092**	0.110	0.099	0.011**

This table isolates the sample to subprime zip codes that have negative nominal income growth from 2002 to 2005 and prime zip codes with positive nominal income growth from 2002 to 2005. Subprime and prime zip codes are defined to be the highest and lowest quartile zip codes in the national distribution based on the fraction of residents with a credit score below 660 as of 1996. All growth rates are annualized. **, *Statistically distinct from 0 at the 1% and 5% levels, respectively

C. Additional tables showing results without county fixed effects.

The following tables replicate Tables II, III, IV, and V without county fixed effects.

No County Fixed Effects Table II

Can Productivity/Income Growth Explain Subprime Credit Expansion from 2002 to 2005?

	(1) Mortgage origination growth 2002 to 2005	(2) Income growth 2002 to 2005	(3) Employment growth 2002 to 2005	(4) Establishment growth 2002 to 2005
Fraction subprime borrowers, 1996	0.648** (0.052)	-0.096** (0.011)	-0.010 (0.016)	0.005 (0.011)
N	2946	2946	2946	2946
R ²	0.15	0.09	0.01	0.01

This table presents the correlation between measures of income growth, employment growth, and business growth and the fraction of subprime borrowers across zip codes. Standard errors are clustered by county. **, *Statistically distinct from 0 at the 1% and 5% levels, respectively.

No County Fixed Effects Table III
Historical Mortgage Credit Growth and Income Growth Correlations

	Dependent variable: Mortgage originations for home purchase growth, annualized							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2002-2005	1991-1998	1998-2001	2001-2002	2002-2004	2004-2005	2005-2006	2006-2007
Income growth, annualized	0.089 (0.198)	0.862** (0.198)	0.485* (0.230)	0.432 (0.336)	0.055 (0.188)	0.318* (0.159)	0.408** (0.122)	1.081** (0.093)
N	3014	2809	3014	3014	3014	3014	3014	3014
R ²	0.00	0.02	0.01	0.00	0.00	0.00	0.01	0.04

This table presents the correlation between mortgage origination for home purchase growth and income growth for different periods of our sample. Income growth and mortgage origination growth are measured for the exact same period for all specifications except the specification reported in column (7). We do not have income data available for 2007; as a result, in column (7) we examine the correlation between mortgage origination growth from 2006 to 2007 and income growth from 2005 to 2006. Standard errors are clustered by county. **, * Coefficient estimate statistically distinct from 0 at the 1% and 5% levels, respectively.

No County Fixed Effects Table IV
Mortgage Credit Expansion in Subprime Zip Codes

	(1)	(2)	(3)	(5)	(6)
	Annualized mortgage origination for home purchase growth, 2002 to 2005			Mortgage debt growth, 2002 to 2005	Non- Mortgage debt growth, 2002 to 2005
Fraction of subprime borrowers, 1996	0.712** (0.054)	0.719** (0.055)	0.710** (0.055)	-0.003 (0.025)	-0.079** (0.021)
Income growth, 2002 to 2005	0.721** (0.176)	0.738** (0.178)	0.713** (0.163)	0.366** (0.071)	0.121* (0.058)
Establishment growth, 2002 to 2005	0.793** (0.209)	0.714** (0.200)	0.672** (0.214)	0.738** (0.076)	0.533** (0.061)
Employment growth, 2002 to 2005	0.033 (0.065)	0.025 (0.064)	0.015 (0.063)	-0.025 (0.031)	0.004 (0.024)
Crime growth, 2002 to 2005		0.569 (0.435)	0.944* (0.427)	0.098 (0.139)	-0.164 (0.128)
House price elasticity with respect to income			-0.019** (0.006)		
House quantity elasticity with respect to income			0.003 (0.005)		
Fraction of housing units vacant, 2000			0.273* (0.108)		
Fraction of housing stock built last 2 years, 2000			0.208 (0.433)		
Fraction of housing stock built 2 to 5 years ago, 2000			-0.125 (0.116)		
N	2946	2946	2782	2946	2946
R ²	0.19	0.19	0.22	0.11	0.09

This table presents coefficient estimates from specifications relating the growth in mortgage originations for home purchase from 2002 to 2005 to the fraction of subprime borrowers in 1996. Column (5) examines the growth in total mortgage debt, and column (6) examines the growth in non-home consumer debt. The measure of house price elasticity (house quantity elasticity) uses changes in median house value (number of owner occupied housing units) from 1990 to 2000 from the decennial census, and changes in household income from 1991 to 2001 from the IRS. All growth rates are annualized. Standard errors are clustered by county. **, * Coefficient estimate statistically distinct from 0 at the 1% and 5% levels, respectively.

**No County Fixed Effects Table V
Evidence of a Securitization Channel**

Panel A: Secondary mortgage sales and subprime zip codes						
	(1)	(2)	(3)	(4)	(5)	(6)
	Change in applicant denial rate 2002-05	Change during 2002- 05 in the fraction sold to non-GSE investors	Change during 2002-2005 in the fraction sold to non-GSE investors who are:			
			Affiliates	Commercial Banks	Securitized Pools Of Mortgages	Non-Commercial Bank Fin. Firms
Fraction of subprime borrowers, 1996	-0.144** (0.017)	0.060* (0.025)	-0.046** (0.017)	-0.005 (0.007)	0.124** (0.010)	0.090** (0.011)
N	2946	2946	2946	2946	2946	2946
R ²	0.19	0.05	0.05	0.03	0.26	0.21

Panel B: Mortgage sales and changes in default rate					
	(1)	(2)	(3)	(4)	(5)
	Change in mortgage default rate from 2005 to 2007				
Change during 2002-05 in the fraction sold to non-GSE investors		0.088** (0.034)			
Change during 2002-2005 in the fraction sold to non-GSE investors who are:					
Affiliates			-0.247** (0.057)		
Commercial Banks				-0.029 (0.098)	
Securitized Pools of Mortgages					0.565** (0.051)
Non-commercial Bank Financial Firms					0.408** (0.050)
N		2946	2946	2946	2946
R ²		0.07	0.09	0.05	0.22

Panel A presents coefficient estimates relating the change in the fraction of originated mortgages sold in a zip code from 2002 to 2005 to the share of subprime borrowers as of 1996. Panel B presents estimates relating default rates from 2005 to 2007 to the fraction of loans sold by originators to investors from 2002 to 2005. All regressions include control variables for income, wage, employment, establishment, and crime growth. Standard errors are clustered by county.

**, * Coefficient estimate statistically distinct from 0 at the 1% and 5% levels, respectively.

D. All tables and figures (except for house price analysis) using the full sample of zip codes.

The following tables and figures replicate all non-house price results on the full sample of 18,408 zip codes. Full Sample Table 0 examines the differences between zip codes with and without available house price data.

Full Sample Table 0
Characteristics of Zip Codes With and Without House Price Data

	House price data available	House price data not available
Fraction urban, 2000	0.920	0.466
Households, 2000	10,421	4,963
Median household income (thousands), 2000	56	39.6
Poverty rate, 2000	0.091	0.129
Fraction of housing units built in last 5 years, 2000	0.082	0.113
Fraction of households that have moved in last 5 years, 2000	0.350	0.333
Mortgage default rate, 1996	0.030	0.028

This table compares the 3,014 zip codes for which FCSW collects house price data to the 15,394 zip codes for which house price data are unavailable.

Full Sample Table I: Panel A
Summary Statistics

	Mean	SD	Between county SD	Within county SD
<i>Equifax Data</i>				
Mortgage debt annualized growth, 1996 to 2002	0.115	0.092	0.059	0.070
Non-home debt annualized growth, 1996 to 2002	0.074	0.062	0.036	0.051
Mortgage debt annualized growth, 2002 to 2005	0.125	0.102	0.062	0.082
Non-home debt annualized growth, 2002 to 2005	0.043	0.072	0.040	0.060
Mortgage default rate, 1996	0.029	0.035	0.018	0.030
Non-home default rate, 1996	0.071	0.046	0.027	0.037
Mortgage default rate change, 1996 to 2005	0.007	0.044	0.024	0.036
Non-home default rate change, 1996 to 2005	0.001	0.043	0.024	0.036
Mortgage default rate change, 2005 to 2007	0.024	0.045	0.024	0.038
Non-home default rate change, 2005 to 2007	0.012	0.031	0.015	0.026
Subprime consumer fraction (under 660), 1996	0.332	0.128	0.085	0.096
<i>HMDA Data</i>				
Mortgage origination for home purchase ann. growth 1996 to 2002	0.140	0.105	0.080	0.068
Mortgage origination for home purchase ann. growth 2002 to 2005	0.200	0.181	0.112	0.137
Fraction sold to non-agency investors, 1996	0.241	0.103	0.087	0.056
Change in fraction sold, 1996 to 2002	0.032	0.103	0.084	0.060
Change in fraction sold, 2002 to 2005	0.197	0.084	0.070	0.047
<i>IRS and Census Statistics of U.S. Business</i>				
Income annualized growth, 1991 to 1998	0.047	0.020	0.011	0.017
Income annualized growth, 1998 to 2002	0.021	0.018	0.010	0.015
Income annualized growth, 2002 to 2005	0.044	0.031	0.018	0.025
Income annualized growth, 2005 to 2006	0.040	0.046	0.026	0.037
Employment annualized growth, 2002 to 2005	0.016	0.050	0.022	0.044
Establishment annualized growth, 2002 to 2005	0.014	0.027	0.016	0.021

This table presents summary statistics for the 18,408 zip codes in the full sample.

Full Sample Table I: Panel B
Subprime Versus Prime Zip Codes

	Prime zip codes	Subprime zip codes
<i>Measures of mortgage credit availability</i>		
Fraction of subprime borrowers in 1996 (under 660)	0.238	0.456**
Fraction of loans backed by FHA in 1996	0.077	0.169**
Fraction of mortgage applications denied, 1996	0.200	0.318**
Homeownership rate, 2000	0.713	0.556**
<i>Demographic variables from Census 2000</i>		
Median household income (\$000)	55.1	35.5**
Poverty rate	0.080	0.184**
Fraction with less than high school education	0.124	0.275**
Fraction unemployed	0.043	0.085**
Fraction non-white	0.124	0.396**

This table presents characteristics of prime and subprime zip codes in our sample. Prime and subprime zip codes are determined by splitting zip codes into four quartiles based on the national distribution of the fraction of subprime borrowers (credit score less than 660) as of 1996. Prime zip codes are the lowest quartile and subprime zip codes are the highest quartile. **, * Difference between prime and subprime statistically distinct from 0 at the 1% and 5% levels, respectively.

Full Sample Table II
Can Productivity/Income Growth Explain Subprime Credit Expansion from 2002 to 2005?

	(1) Mortgage origination growth 2002 to 2005	(2) Income growth 2002 to 2005	(3) Employment growth 2002 to 2005	(4) Establishment growth 2002 to 2005
Fraction subprime borrowers, 1996	0.265** (0.014)	-0.078** (0.002)	-0.035** (0.005)	-0.033** (0.002)
N	17654	17654	17654	17654
R ²	0.42	0.40	0.23	0.37

This table presents the correlation between measures of income growth, employment growth, and business growth and the fraction of subprime borrowers. All growth rates are annualized. All regressions include county fixed effects. **, * Difference between prime and subprime statistically distinct from 0 at the 1% and 5% levels, respectively.

Full Sample Table III
Historical Mortgage Credit Growth and Income Growth Correlations

	Dependent variable: Mortgage originations for home purchase growth, annualized							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	2002-2005	1991-1998	1998-2001	2001-2002	2002-2004	2004-2005	2005-2006	2006-2007
Income growth, annualized	-0.271** (0.044)	0.461** (0.053)	0.518** (0.040)	0.425** (0.086)	-0.217** (0.059)	0.008 (0.041)	0.129** (0.044)	0.554** (0.042)
N	18337	9560	18335	18345	18339	18350	18351	18349
R ²	0.43	0.70	0.41	0.54	0.35	0.37	0.41	0.42

This table presents the correlation between mortgage origination for home purchase growth and income growth for different periods of our sample. Income growth and mortgage origination growth are measured for the exact same period for all specifications except the specification reported in column 7. We do not have income data available for 2007; as a result, in column 7 we examine the correlation between mortgage origination growth from 2006 to 2007 and income growth from 2005 to 2006. All specifications include county fixed effects. **, * Coefficient estimate statistically distinct from 0 at the 1% and 5% levels, respectively

Full Sample Table IV
Mortgage Credit Expansion in Subprime Zip Codes

	(1)	(2)	(3)	3-square-mile-block fixed effects (4)	(5)	(6)
	Annualized mortgage origination for home purchase growth, 2002 to 2005				Mortgage debt growth, 2002 to 2005	Non- Mortgage debt growth, 2002 to 2005
Fraction of subprime borrowers, 1996	0.416** (0.012)	0.417** (0.012)	0.460** (0.014)	0.335** (0.048)	0.031** (0.007)	-0.024** (0.005)
Income growth, 2002 to 2005	0.268** (0.046)	0.268** (0.046)	0.208** (0.050)	0.087 (0.152)	0.452** (0.028)	0.237** (0.020)
Establishment growth, 2002 to 2005	0.018 (0.057)	0.013 (0.058)	0.094 (0.066)	-0.695** (0.231)	0.552** (0.035)	0.444** (0.025)
Employment growth, 2002 to 2005	-0.003 (0.027)	-0.004 (0.027)	-0.000 (0.028)	-0.134 (0.084)	0.010 (0.016)	0.020 (0.012)
Crime growth, 2002 to 2005		0.046 (0.115)	0.013 (0.129)	0.186 (0.482)	0.439** (0.069)	0.369** (0.050)
House price elasticity with respect to income			-0.003 (0.002)	0.000 (0.005)		
House quantity elasticity with respect to income			0.001 (0.001)	0.000 (0.005)		
Fraction of housing units vacant, 2000			0.188** (0.022)	0.723** (0.124)		
Fraction of housing stock built last 2 years, 2000			-0.104 (0.091)	-0.625 (0.332)		
Fraction of housing stock built 2 to 5 years ago, 2000			0.022 (0.036)	0.399** (0.122)		
N	17646	17633	15898	15898	17598	17684
R ²	0.47	0.47	0.50	0.92	0.39	0.34

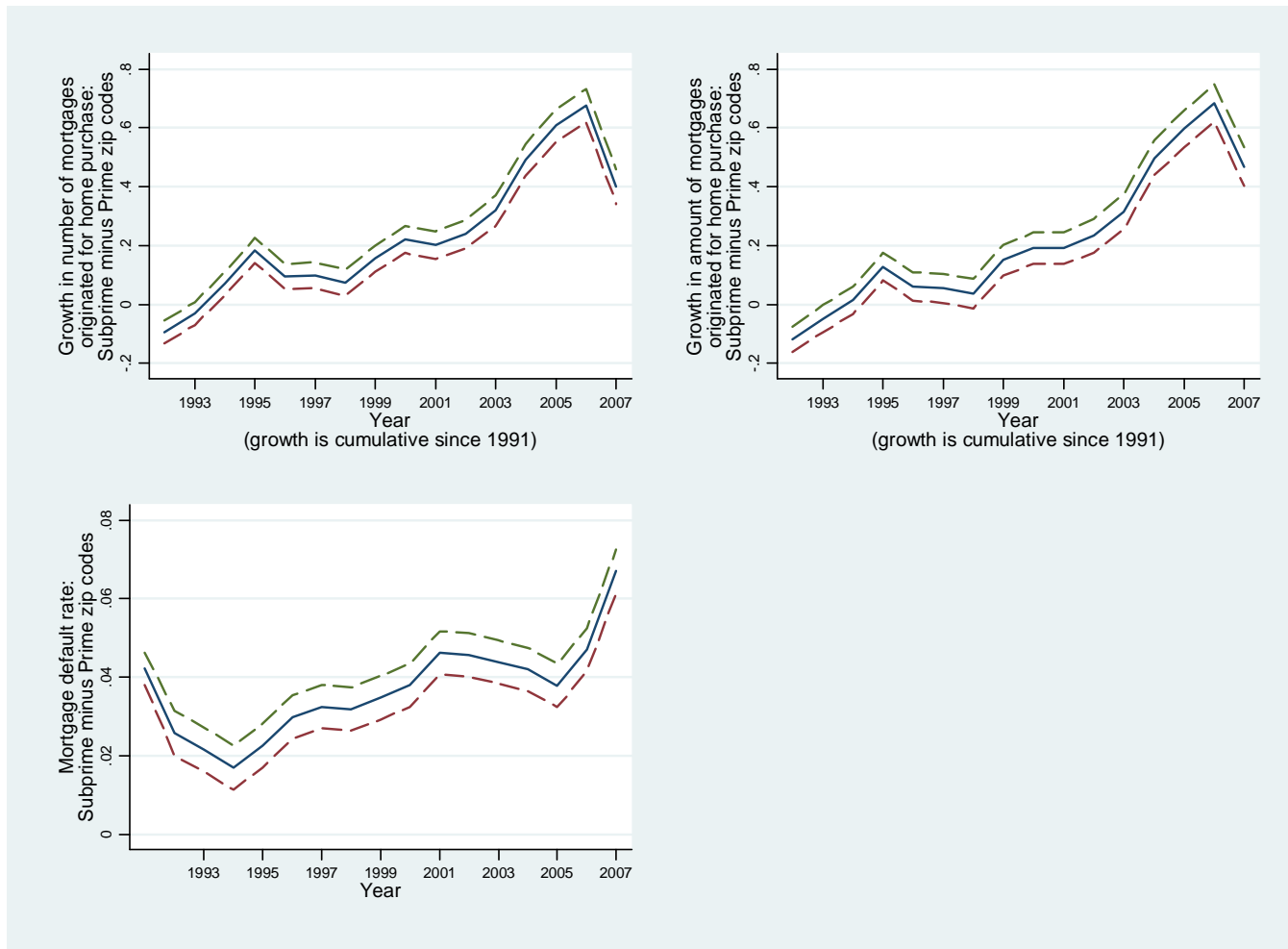
This table presents coefficient estimates from specifications relating the growth in mortgage originations for home purchase from 2002 to 2005 to the fraction of subprime borrowers in 1996. Column 5 examines the growth in total mortgage debt, and column 6 examines the growth in non-home consumer debt. The measure of house price elasticity (house quantity elasticity) uses changes in median house value (number of owner occupied housing units) from 1990 to 2000 from the decennial census, and changes in household income from 1991 to 2001 from the IRS. All growth rates are annualized. All specifications include county fixed effects except for the specification reported in column 4, which includes 3 square mile fixed effects. **, * Coefficient estimate statistically distinct from 0 at the 1% and 5% levels, respectively.

Full Sample Table V
Evidence of a Securitization Channel

Panel A: Secondary mortgage sales and subprime zip codes						
	(1)	(2)	(3)	(4)	(5)	(6)
	Change in applicant denial rate 2002-05	Change during 2002-05 in the fraction sold to non-GSE investors	Change during 2002-2005 in the fraction sold to non-GSE investors who are:			
			Affiliates	Commercial Banks	Securitized Pools Of Mortgages	Non-Commercial Bank Fin. Firms
Fraction of subprime borrowers, 1996	-0.098** (0.003)	-0.003 (0.004)	-0.048** (0.002)	-0.012** (0.001)	0.086** (0.002)	0.052** (0.002)
N	17684	17684	17684	17684	17684	17684
R ²	0.56	0.70	0.61	0.65	0.69	0.72

Panel B: Mortgage sales and changes in default rate					
	(1)	(2)	(3)	(4)	(5)
	Change in mortgage default rate from 2005 to 2007				
Change during 2002-05 in the fraction sold to non-GSE investors		0.025** (0.007)			
Change during 2002-2005 in the fraction sold to non-GSE investors who are:					
Affiliates			-0.100** (0.012)		
Commercial Banks				-0.049* (0.021)	
Securitized Pools of Mortgages					0.289** (0.015)
Non-commercial Bank Financial Firms					0.172** (0.014)
N		17626	17626	17626	17626
R ²		0.32	0.32	0.32	0.34

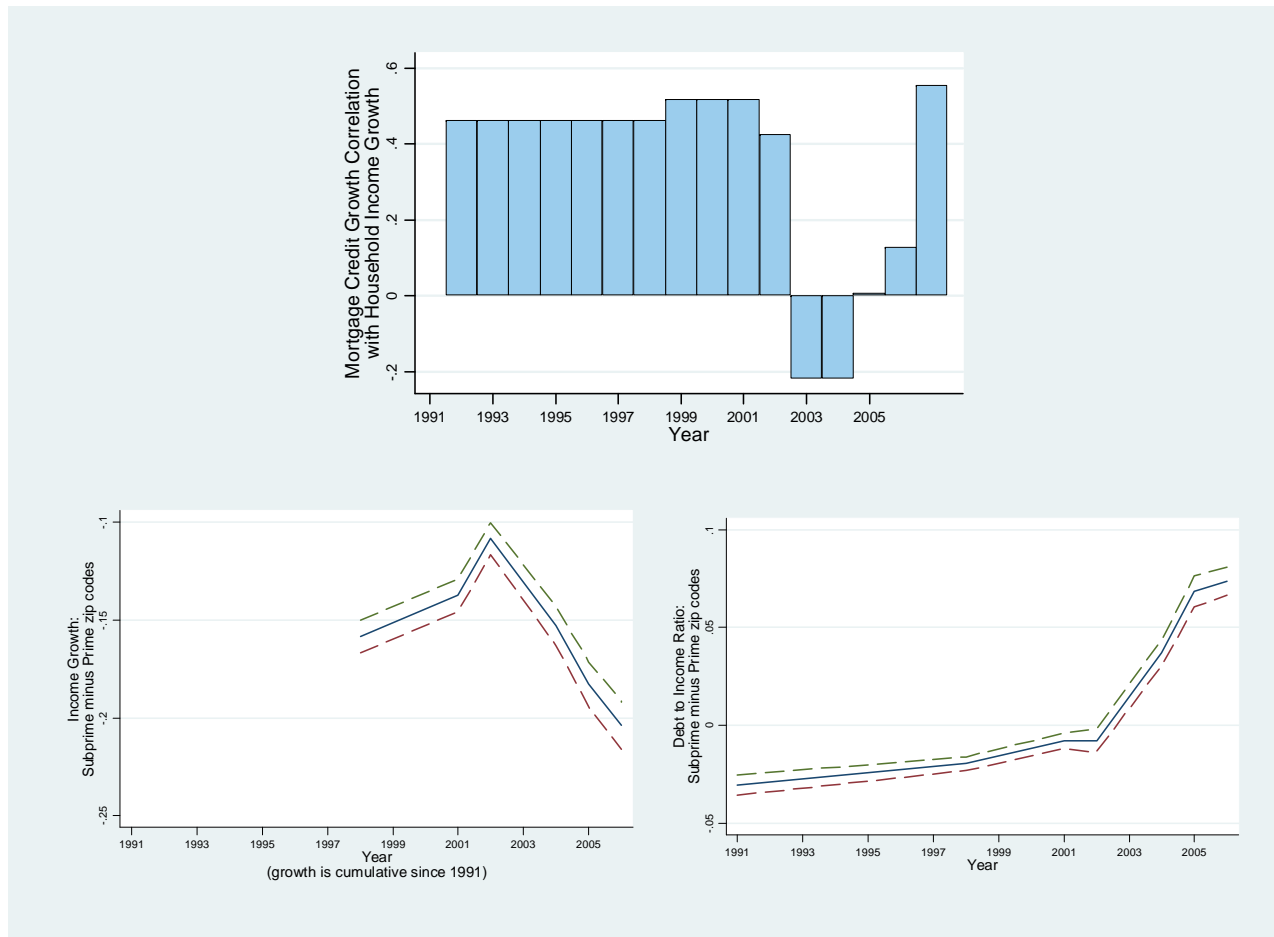
Panel A presents coefficient estimates relating the change in the fraction of originated mortgages sold in a zip code from 2002 to 2005 to the share of subprime borrowers as of 1996. Panel B presents estimates relating default rates from 2005 to 2007 to the fraction of loans sold by originators to investors from 2002 to 2005. All specifications include county fixed effects and control variables for income, wage, employment, establishment, and crime growth. **, * Coefficient estimate statistically distinct from 0 at the 1% and 5% levels, respectively.



Full Sample Figure II

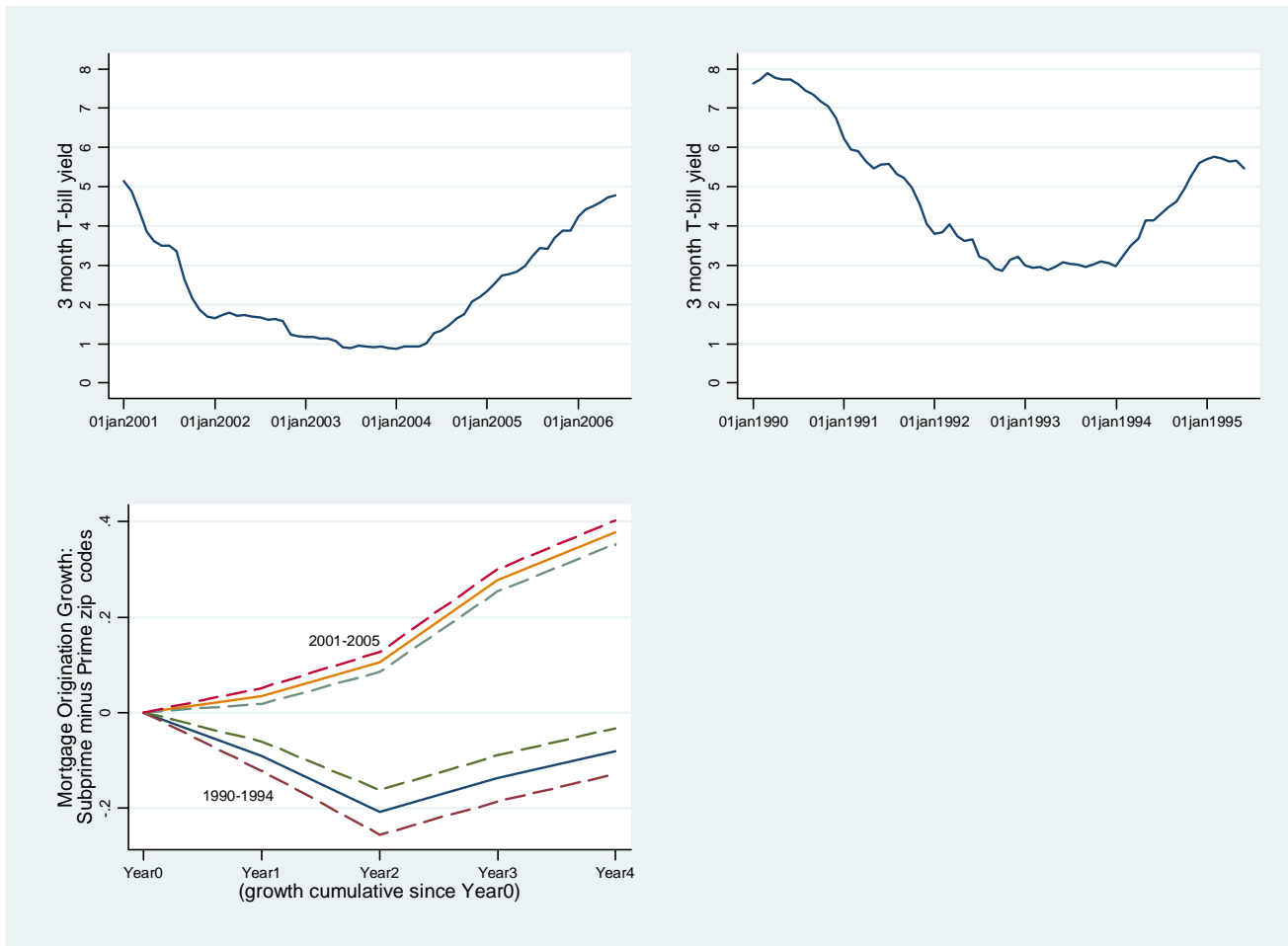
Mortgage Credit Growth and Default Rates: Subprime Relative to Prime Zip Codes

This figure plots the growth in the number (top left panel) and amount (top right panel) of originated mortgages and the mortgage default rate (bottom left panel) for subprime relative to prime zip codes in the same county. Subprime and prime zip codes are defined to be the highest and lowest quartile zip codes in the national distribution based on the fraction of residents with a credit score below 660 in 1991.



Full Sample Figure III
Mortgage Credit Growth and Income Growth Over Time

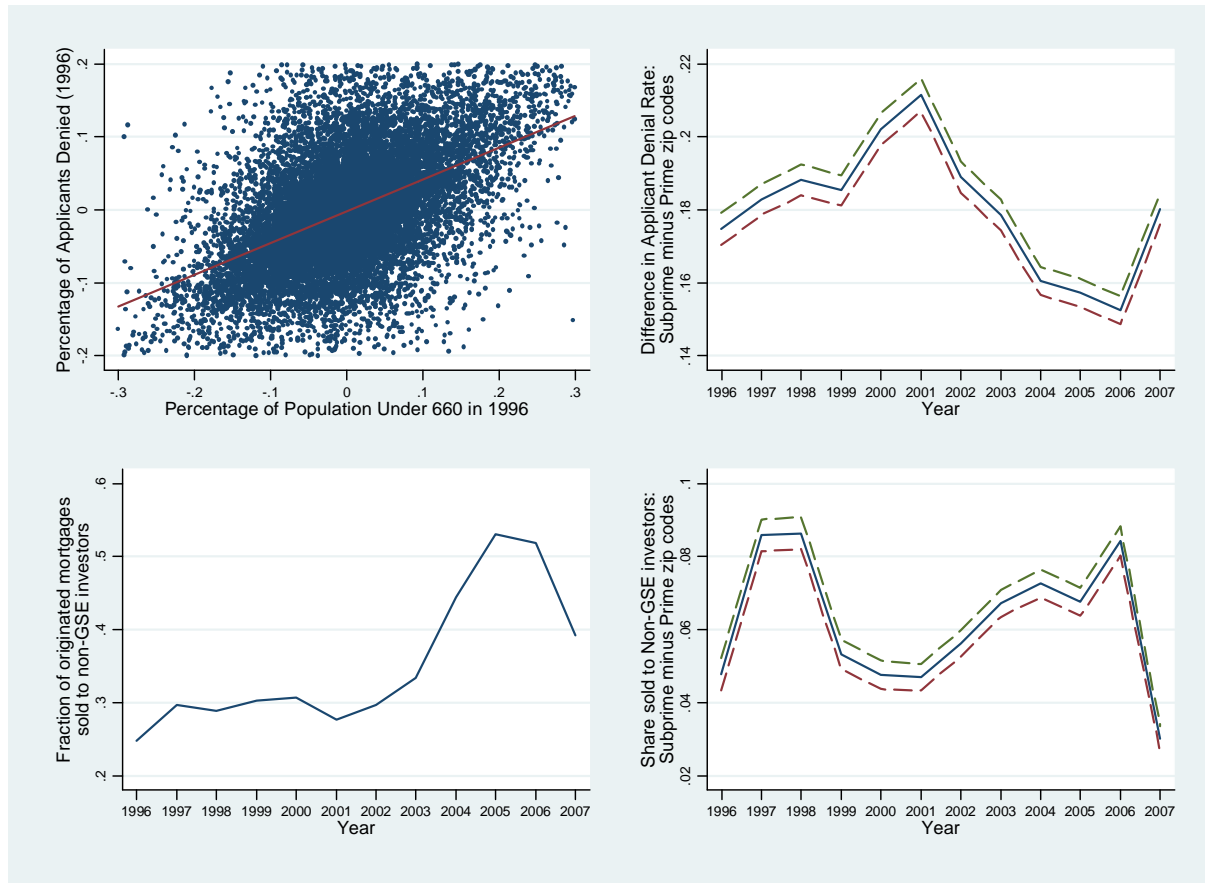
The top panel in this figure plots the correlation across zip codes between income growth and mortgage credit growth over time, after deviating from county means. The bottom left plots the relative income growth for subprime relative to prime zip codes in the same county, and the bottom right plots the relative debt to income ratio for subprime relative to prime zip codes in the same county. The debt to income ratio is defined as total originated mortgages for home purchase in a zip code scaled by the total income of the zip code. Subprime and prime zip codes are defined to be the highest and lowest quartile zip codes in the national distribution based on the fraction of residents with a credit score below 660 in 1991.



Full Sample Figure IV

Relative Mortgage Origination Growth for Subprime Zip Codes: Falling Interest Rate Periods

The top left and right panels show the evolution of the 3-month Treasury bill yield during the 5 year period from 1990 to 1994 and 2001 to 2005, respectively. The bottom panel shows the growth in the amount of originated mortgages for subprime relative to prime zip codes in the same county for these two 5 year periods. Subprime and prime zip codes are defined to be the highest and lowest quartile zip codes in the national distribution based on the fraction of residents with a credit score below 660 as of the first year of the respective 5 year period.



Full Sample Figure V
Relaxation in Borrower Credit Constraints

The top left panel shows the correlation across zip codes between the mortgage application denial rate and the fraction of residents with a credit score below 660, both as of 1996. The data are deviated from county means. The top right panel shows the denial rate for mortgage applications for prime relative to subprime zip codes in the same county. The bottom left panel shows the fraction of all originated mortgages for home purchase that are sold to non-GSE investors, and the bottom right panel shows the relative fraction sold to non-GSE investors for subprime versus prime zip codes in the same county. Subprime and prime zip codes are defined to be the highest and lowest quartile zip codes in the national distribution based on the fraction of residents with a credit score below 660 as of 1996.