This is a separate data appendix for

**How Much Does Household Collateral Constrain Regional Risk Sharing?**

# C Data Appendix

This appendix describes the metropolitan data set in detail. First we define aggregate collateral measures (section C.1). Then, we define the US metropolitan areas and describe the sample (section C.2). In section C.3, we describe metropolitan consumption and income data and compare them to US aggregates. In section C.4, we describe regional collateral measures. Finally, in section C.5, we describe the Canadian data.

## C.1 Aggregate Collateral Measures

**Residential Wealth** 1890-1970: Historical Statistics of the United States, Colonial Times to 1970, series N197, "Non-farm Residential Wealth". Original source: Grebler, Blanck and Winnick, The Capital Formation in Residential Real Estate: Trends and Prospects, Princeton University press, 1956 (Tables 15 and A1). Excluded are clubs, motels, dormitories, hotels and the like. The series measures the current value of structures and land. Structures are reported in current dollars by transforming the value in constant dollars by the construction cost index (series N121 and 139). Structures in constant dollars are obtained from an initial value of residential wealth in 1890 (based on 1890 Census report 'Real Estate Mortgages') and estimates of net capital formation in constant dollars. Land values are based on an estimation of the share of land value to total value using federal Housing Administration data. These estimates are in Winnick, Wealth Estimates for Residential Real Estate, 1890-1950, doctoral dissertation, Columbia University, 1953.

1945-2001: Flow of Funds, Federal Reserve Board, Balance sheet of households and non-profit organizations (B.100, row 4). Line 4: Market value of (owner-occupied) household real estate (code FL155035015). The market value of real estate wealth includes land and structures, inclusive vacant land, vacant homes for sale, second homes and mobile homes.

**Fixed Assets** 1925-2001: Bureau of Economic Analysis, Fixed Asset Tables, Current cost of net stock of owner-occupied and tenant-occupied residential fixed assets for non-farm persons. This includes 1-4 units and 5+ units and is the sum of new units, additions and alterations, major replacements and mobile homes.

## C.2 Metropolitan Areas

**Definition** The concept of a metropolitan areas is that of a core area containing a large population nucleus, together with adjacent communities having a high degree of economic and social integration with that core. They include metropolitan statistical areas (MSA's), consolidated metropolitan statistical areas (CMSA's), and primary metropolitan statistical areas (PMSA's). An area that qualifies as an MSA and has a population of one million or more may be recognized as a CMSA if separate component areas that demonstrate strong internal, social, and economic ties can be identified within the entire area and local opinion supports the component areas. Component areas, if recognized, are designated PMSA's. If no PMSA's are designated within the area, then the area remains an MSA.

The S&MM survey uses the definitions of MSA throughout the survey and of CMSA when CMSA's are created. We use the 30 metropolitan areas described in table 6. Before the creation of the CMSA's, we keep track of all separate MSA's that later form the CMSA in order to obtain a consistent time series. For example, the Dallas-Forth Worth

CMSA consists of the population-weighted sum of the separate Dallas MSA and Forth Worth MSA until 1973 and of the combined area thereafter.

**Households** The total number of households in the 30 metropolitan areas is 47 percent of the US total in 2000 compared to 40 percent in 1951. The total number of households are from the Bureau of the Census. Most of the increase occurs before 1965. Likewise, the 30 metropolitan areas we consider contain exactly 47 percent of the population in 1999 (see tables 6 and 7, first column).

## C.3 Metropolitan Consumption and Income Data

**Price Indices** Data are for urban consumers from the Bureau of Labor Statistics. The Consumer Price all items Index $p_t^{i,a}$, its rent component $p_t^{i,h}$ and the food component $p_t^{i,c}$ are available at the metropolitan level (Bureau of Labor Statistics). The price of rent is a proxy for the price of shelter and the price of food is a proxy for the price of non-durables. We use the rent and food components because the shelter and non-durables components are only available from 1967 onwards. Two-thirds of consumer expenditures on shelter consists of owner-occupied housing. The Bureau of Labor Statistics uses a rental equivalence approach to impute the price of owner-occupied housing. Because $\rho_t^i$ is a relative *rental* price, our theory is conceptually consistent with the Bureau of Labor Statistics approach. All indices are normalized to 100 for the period 1982-84.

**Consumption and Income** Inter-regional risk-sharing studies use retail sales data as a proxy for non-durable consumption (DelNegro (1998) and references therein). Such data for metropolitan areas have not been used before. We collect retail sales data from the annual Survey of Buying Power published by Sales & Marketing Management (S&MM). Nominal non-durable consumption for region $i$, $C_t^i$, is total retail sales minus hardware and furniture sales and vehicle sales. From the same source we obtain the number of households in each region, $N_t^i$. Real per household consumption $c^i$ is nominal non-durable consumption deflated by $p_t^{i,c}$ and divided by the number of households $N_t^i$.

Disposable personal income $Y_t^i$ is also from S&MM. Disposable personal income consists of labor income, financial market income and net transfers. We also use a more narrow labor income measure: labor income plus net transfers from the Regional Economic Information System (REIS). The latter is only available for 1970-2000. Real per household disposable income $\eta^i$ is nominal disposable income deflated by $p_t^{i,a}$ and divided by the number of households $N_t^i$.

There are no complete consumer price index data for Baltimore, Buffalo, Phoenix, Tampa and Washington. There are no complete consumption and income data for Anchorage. Elimination of these regions leaves us with annual data for 23 metropolitan regions from 1951 until 2002. This is the regional data set we use in the empirical work.

**Comparison** We compare non-durable retail sales and disposable income with aggregate consumption and income data (Table 7), with metropolitan non-durable consumption data from the Consumption Expenditure Survey (Bureau of Labor Statistics, 1986-2000, Table 8) and with metropolitan labor income data plus transfers from the REIS for 1969-2000 (Table 9). The correlation between the growth rates of aggregate real non-durable consumption per household and the metropolitan average of real non-durable retail sales per household is 0.77. Also, our metropolitan data are highly correlated with the metropolitan data from the Bureau of Labor Statistics and the REIS.

**Source and Definitions** We collect data from the Survey of Buying Power (and Media Markets), a special September issue of the magazine Sales and Marketing Management. The data are proprietary and we thank S&MM for permission to use them. We use five series and reproduce the S&MM definitions below.

Table 6: Population and Composition of Metropolitan Areas.

| | | | |
|---|---|---|---|
| Anchorage (AK), MSA | 261 | Miami CMSA | 3,897 |
| Atlanta (GA), MSA | 4,145 | Miami, FL | 58.1% |
| Baltimore (MD), MSA | 2,557 | Fort Lauderdale, FL | 41.9% |
| Boston CMSA | 6,068 | Milwaukee CMSA | 1,691 |
| Boston, MA-NH | 58.6% | Milwaukee-Waukesha, WI | 88.8% |
| Worcester, MA-CT | 8.7% | Racine, WI | 11.2% |
| Lawrence, MA-NH | 6.7% | Minneapolis (MN-WI) MSA | 2,797 |
| Lowell, MA-NH | 5.1% | New York CMSA | 21,134 |
| Brockton, MA | 4.3% | New York, NY | 45.5% |
| Portsmouth-Rochester, NH-ME | 4.2% | Bergen-Passaic, NJ | 6.6% |
| Manchester, NH | 3.4% | Bridgeport, CT | 0.5% |
| Nashua, NH | 3.3% | Dutchess County, NY | 1.2% |
| New Bedford, MA | 3.2% | Danbury, CT | 0.4% |
| Fitchburg-Leominster, MA | 2.5% | Jersey City, NJ | 3.0% |
| Buffalo (NY), MSA | 1,169 | Middlesex-Somerset-Hunterdon, NJ | 5.6% |
| Chicago CMSA | 9,176 | Monmouth-Ocean, NJ | 5.4% |
| Chicago, IL | 90.3% | Nassau-Suffolk, NY | 13.5% |
| Gary, IN | 6.9% | Newburgh, NY-PA | 1.8% |
| Kenosha, WI | 1.6% | Newark, NJ | 9.9% |
| Kankakee, IL | 1.1% | New Haven-Meriden, CT | 6.2% |
| Cincinnati CMSA | 1,983 | Stamford-Norwalk, CT | 0.6% |
| Cincinnati, OH-KY-IN | 92.6% | Trenton, NJ | 1.7% |
| Hamilton-Middletown, OH | 7.4% | Waterbury, CT | 0.5% |
| Cleveland CMSA | 2,946 | Philadelphia CMSA | 6,194 |
| Cleveland-Lorain-Elyria, OH | 76.4% | Philadelphia, PA-NJ | 82.4% |
| Akron, OH | 23.6% | Wilmington, NC | 9.5% |
| Dallas CMSA | 5,254 | Atlantic-Cape May, NJ | 5.7% |
| Dallas, TX | 67.4% | Vineland-Millville-Bridgeton, NJ | 2.3% |
| Fort Worth-Arlington, TX | 32.6% | Phoenix - Mesa MSA | 3,276 |
| Denver CMSA | 2,597 | Pittsburgh (PA), MSA | 2,356 |
| Denver, CO | 81.7% | Portland CMSA | 2,273 |
| Boulder-Longmont, CO | 11.3% | Portland-Vancouver, OR-WA | 84.7% |
| Greeley, CO | 7.0% | Salem, OR | 15.3% |
| Detroit CMSA | 5,463 | Saint Louis (MO-IL), MSA | 2,606 |
| Detroit, MI | 81.4% | San Diego (CA), MSA | 2,825 |
| Ann Arbor, MI | 10.6% | San Francisco CMSA | 7,056 |
| Flint, MI | 8.0% | San Francisco, CA | 24.6% |
| Honolulu (HI), MSA | 876 | San Jose, CA | 23.9% |
| Houston CMSA | 4,694 | Oakland, CA | 34.1% |
| Houston, TX | 89.5% | Vallejo-Fairfield-Napa, CA | 7.4% |
| Galveston-Texas City, TX | 5.3% | Santa Cruz-Watsonville, CA | 3.6% |
| Brazoria, TX | 5.2% | Santa Rosa, CA | 6.5% |
| Kansas City (MO-KS), MSA | 1,782 | Seattle CMSA | 3,562 |
| Los Angeles CMSA | 16,440 | Seattle-Bellevue-Everett, WA | 67.9% |
| Los Angeles-Long Beach, CA | 58.1% | Tacoma, WA | 19.8% |
| Orange County, CA | 17.4% | Bremerton, WA | 6.5% |
| Riverside-San Bernardino, CA | 20.0% | Olympia, WA | 5.8% |
| Ventura, CA | 4.6% | Tampa (FL), MSA | 2,404 |
| | | Washington,DC-MD-VA-WV, PMSA | 4,948 |

Total population numbers (in thousands) are displayed next to the metropolitan areas. For the Consolidated Metropolitan areas (CMSA), the constituent MSA's are listed and the fraction of their population in the total of the CMSA is shown next to their name. All numbers are from the Regional Economic Information System of the Bureau of Economic Analysis for the year 2000.

*Total retail sales* measures sales from five major store groups considered to be the primary channels of distribution for consumer goods in local markets. Store group sales represent the cumulative sales of all products and or services handled by a particular store type, not just the product lines associated with the name of the store group. The five store groups are: food stores, automotive dealers, eating and drinking places, furniture, home furnishings and appliance stores, and general merchandize stores. Total retail sales reflect net sales. Receipts from repairs and other services by retailers are also included, but retail sales by wholesalers and service establishments are not.

*Automotive dealer sales* are sales by retail establishments primarily engaged in selling new and used vehicles for personal use and in parts and accessories for these vehicles. This includes boat and aircraft dealers and excludes gasoline service stations.

*Furniture, home furnishings and appliance store sales* measures sales by retail stores selling goods used for the home, other than antiques. It includes dealers in electronics (radios, TV's, computers and software), musical instruments and sheet music, and recordings.

*Households* measures the number of households, defined by the Census which includes all persons occupying a housing unit. A single person living alone in a housing unit is also considered to be a household. The members of a household need not be related.

*Effective Buying Income* is an income measure of income developed by S&MM. It is equivalent to disposable personal income, as produced by the Bureau of Economic Analysis in the NIPA tables. It is defined as the sum of labor market income, financial income and net transfers minus taxes. *Labor income* is wages and salaries, other labor income (such as employer contributions to private pension funds), and proprietor's income (net farm and non-farm self-employment income). *Financial income* is interests (from all sources), dividends (paid by corporations), rental income (including imputed rental income of owner-occupants of non-farm dwellings) and royalty income. *Net transfers* is Social Security and railroad retirement, other retirement and disability income, public assistance income, unemployment compensation, Veterans Administration payments, alimony payments, alimony and child support, military family allotments, net winnings from gambling, and other periodic income minus social security contributions. *Taxes* is personal tax (federal, state and local), non-tax payments (fines, fees, penalties, ...) and taxes on owner-occupied nonbusiness real estate. Not included is money received from the sale of property, the value of income in kind (food stamps, public housing subsidy, medical care, employer contributions for persons), withdrawal of bank deposits, money borrowed, tax refunds, exchange of money between family members living in the same household, gifts and inheritances, insurance payments and other types of lump-sum receipts. Income is benchmarked to the decennial Census data.

We create a *durable retail sales* series by adding automotive dealer sales and furniture, home furnishings and appliance store sales. *Non-durable retail* sales is total retail sales minus durable retail sales.

**Comparison with Aggregate Data** We construct aggregate non-durable retail sales per households and compare it to aggregate non-durable consumption per household. The aggregate consumption data are from the National Income and Product Accounts (NIPA). The two nominal time series are very similar. Non-durable metropolitan retail sales per household are on average 17 percent higher than national non-durable consumption per household. Their correlation between their growth rates is 0.75. The one exception is 1999 when retail sales grow at a rate of 19.6 percent compared to 5.6 percent for non-durable consumption. We believe this is an anomaly in the data and deflate the 1999 retail sales so that the metropolitan average growth rate equals the national one. This correction is identical across areas. The volatility of NIPA consumption growth is 2.57 percent whereas the volatility of aggregated S&MM non-durable retail sales is 2.89 percent. For comparison, the volatility of non-durable retail sales growth at the regional level varies between 3.8 percent (Washington-Baltimore CMSA) and 8.3 percent (Dallas-Forth Worth CMSA).

We compare the sum of motor vehicles and parts and furniture and household equipment for the US. to the metropolitan data on automotive dealer sales and furniture, home furnishings and appliance store sales. Nationwide, these two categories of consumption make up 84 percent of all durable purchases. Sales are higher by an average of 30 percent. The pattern of the two series mimic each other closely. The correlation between national durable consumption growth and the average metropolitan durable retail sale growth is 0.80. For 1999 the sales data show a much bigger increase than the durable consumption data (27 percent versus 8.6 percent). As for non-durables, we correct the 1999 metropolitan retail sales for this discrepancy. We refer to the two series as *metropolitan* non-durable and durable *consumption* per household.

Effective buying income (EBI) per household corresponds to the Bureau of Economic Analysis's disposable income (personal income minus personal tax and non-tax payments). The S&MM income data are tracking disposable income closely. There are a two discrete jumps in the EBI time-series (1988 and 1995), but the concept remains disposable, personal income. The S&MM is not precise as to which income categories were excluded between 1987 and 1988 and between 1994 and 1995. From comparing the definition of EBI before and after the changes, it seems to us that the most important changes are the exclusion of other labor income (such as employer contributions to pension plans, ...) and income in kind (such as food stamps, housing subsidies, medial care,...). To obtain a consistent time-series, we correct the S&MM income data by the ratio of average EBI to disposable income from the NIPA. This correction is identical across areas. We refer to this series as *metropolitan disposable income* per household. Table 7 summarizes.

Table 7: Comparison With Aggregate US data.

| Year | HH (000) | metr. HH (%) | NDS ($) | NDS to NDC | DS ($) | DS to DC | EBI ($) | EBI to DI |
|---|---|---|---|---|---|---|---|---|
| 1951 | 17,623 | 39.4 | 3,008 | 1.23 | 799 | 1.36 | 5,959 | 1.15 |
| 1960 | 23,080 | 43.7 | 3,519 | 1.22 | 899 | 1.26 | 7,711 | 1.11 |
| 1970 | 28,332 | 44.7 | 4,688 | 1.09 | 1,180 | 1.05 | 11,936 | 1.03 |
| 1980 | 36,144 | 44.7 | 9,683 | 1.12 | 2,660 | 1.24 | 24,975 | 1.00 |
| 1990 | 41,784 | 44.8 | 15,418 | 1.15 | 5,531 | 1.37 | 43,698 | 0.95 |
| 2000 | 49,379 | 47.2 | 24,741 | 1.30 | 11,888 | 1.90 | 56,566 | 0.83 |

The first column gives the number of households in the metropolitan data set. The second column gives the fraction of US households that are in the metropolitan data set. The third column gives the nondurable retail sales per household (in $) in the metropolitan data set (NDS). The fourth column gives the ratio of non-durable retail sales per household to non-durable consumption per household in the NIPA data (NDC). The fifth and sixth column do the same for durable sales and consumption (DS and DC). The seventh and eight column give the effective buying income per household in the metropolitan data set (EBI) and the ratio of the latter to disposable income per household from NIPA (DI).

**Comparison with CEX Data** We compare the SM&M data to the non-durable and durable consumption data from the Consumer Expenditure Survey (CEX). Based on household data, the Bureau of Labor Statistics (Bureau of Labor Statistics) provides metropolitan averages for 13 overlapping two-year periods (1986-87 until 1994-95 and 1996-97 until 1999-2000). The two data sources have 25 regions with full data in common. Buffalo is in the CEX sample until 1994-95 and is replaced by Tampa, Denver and Phoenix from 1996-97 onwards.

Consumption expenditures on non-durables are defined as in Attanasio and Weber (1995): It includes food at home, food away from home, alcohol, tobacco, utilities, fuels and public services (natural gas, heating fuel electricity, water, telephone and other personal services), transportation (gasoline and motor oil, public transportation), apparel and services (clothes, shoes, other apparel products and services), entertainment, personal care products and services, reading, and miscellaneous items. Durable consumption includes vehicle purchases and household furnishings and equipment. Consumption expenditures on housing services measure the cost of shelter. $p_t^{ih} h_t^i$ is comprised of owned dwellings, rented dwellings and other lodging. The CEX imputes the cost for owner-occupied dwellings by adding up mortgage interest rates, property taxes and maintenance, improvements, repairs, property insurance and other expenditures. The average expenditure share on housing was 31.5 percent in 2000.

Non-durable and housing services consumption add up to 55-60 percent of total annual consumption expenditures. Excluded consumption items are consumer durables (furniture, household supplies), vehicle purchases, insurance (vehicle, life, social security), health care and education.

For each area, we construct bi-annual averages from the S&MM consumption data. The correlation between all data cells is 0.77 for non-durables and 0.66 for durables. The average correlation across regions is 0.88 for non-durables and 0.73 for durables. We conclude that the metropolitan sales data give an accurate measure of consumption on non-durables and durables at the metropolitan level.

We also compare the bi-annual averages of before-tax income from the CEX with the metropolitan disposable income. The correlation is high for each region. The average correlation across regions is 0.94 and is 0.91 for all data cells jointly. Table 8 summarizes the correlations by region for the 25 areas with all 13 periods.

Table 8: Comparison With Household Data.

| MSA | Nond.Cons | Dur.Cons | Income |
|---|---|---|---|
| Washington, DC (PMSA) | 0.926 | 0.660 | 0.973 |
| Baltimore, MD (PMSA) | 0.973 | 0.791 | 0.956 |
| Atlanta, GA (MSA) | 0.740 | 0.522 | 0.944 |
| Miami, FL (CMSA) | 0.533 | 0.399 | 0.922 |
| Dallas, TX (CMSA) | 0.939 | 0.839 | 0.917 |
| Houston, TX (CMSA) | 0.936 | 0.955 | 0.932 |
| Los Angeles, CA (CMSA) | 0.836 | 0.845 | 0.944 |
| San Francisco, CA (CMSA) | 0.921 | 0.797 | 0.981 |
| San Diego, CA (MSA) | 0.838 | 0.511 | 0.961 |
| Portland, OR (CMSA) | 0.989 | 0.932 | 0.973 |
| Seattle, WA (CMSA) | 0.928 | 0.841 | 0.935 |
| Honolulu, HI (MSA) | 0.858 | 0.409 | 0.956 |
| Anchorage, AK (MSA) | 0.931 | 0.601 | 0.847 |
| New York, NY (CMSA) | 0.952 | 0.727 | 0.957 |
| Philadelphia, PA (CMSA) | 0.812 | 0.698 | 0.932 |
| Boston, MA (CMSA) | 0.876 | 0.515 | 0.799 |
| Pittsburgh, PA (MSA) | 0.921 | 0.759 | 0.846 |
| Chicago, IL (CMSA) | 0.803 | 0.601 | 0.953 |
| Detroit, MI (CMSA) | 0.960 | 0.534 | 0.956 |
| Milwaukee, WI (CMSA) | 0.792 | 0.636 | 0.949 |
| Minneapolis-St, Paul, MN (MSA) | 0.940 | 0.863 | 0.972 |
| Cleveland, OH (CMSA) | 0.881 | 0.878 | 0.956 |
| Cincinnati, OH (CMSA) | 0.898 | 0.864 | 0.974 |
| St. Louis, MO (MSA) | 0.881 | 0.815 | 0.945 |
| Kansas City, MO-KS (MSA) | 0.958 | 0.708 | 0.961 |
| Average | 0.881 | 0.708 | 0.938 |

Correlation of household non-durable consumption, durable consumption and income data, aggregated by the CEX for metropolitan areas and the metropolitan area non-durable and durable retail sales and disposable income data from S&MM.

**Comparison with REIS Data** Disposable income contains two important channels of insurance. It includes income from financial markets and the net income from government transfers and taxes. For consumption to fully capture income smoothing, the income concept should exclude smoothing that takes place through financial markets, credit markets and through the federal tax and transfer system. The Regional Economic Information System (REIS) of the Bureau of Economic Analysis allows us to construct separate series for labor market income, financial market income and net transfers for each metropolitan area.

For the overlapping period 1969-2000, we compute the correlation between the idiosyncratic component of log disposable income, $\log\left(\hat{y}_t^{i,d}\right)$, from the S&MM and labor income plus transfers $\log\left(\hat{y}_t^{i,lt}\right)$ from the REIS. Table 9 shows that the correlation is generally high, but with a few exceptions (Miami, Cincinnati, Milwaukee). The average correlation is 0.64. This imperfect correlation is due to a combination of measurement error in income and insurance through financial markets. The discrepancy warrants use of both income measures in the empirical analysis.

Table 9: Comparison With Regional Income Data

| South and West | Coeff. | Northeast and Midwest | Corr. |
|---|---|---|---|
| Washington, DC (PMSA) | 0.79 | New York, NY (CMSA) | 0.84 |
| Baltimore, MD (PMSA) | 0.42 | Philadelphia, PA (CMSA) | 0.82 |
| Atlanta, GA (MSA) | 0.73 | Boston, MA (CMSA) | 0.73 |
| Miami, FL (CMSA) | -0.18 | Pittsburgh, PA (MSA) | 0.57 |
| Dallas, TX (CMSA) | 0.63 | Buffalo, NY (MSA) | 0.77 |
| Houston, TX (CMSA) | 0.86 | Chicago, IL (CMSA) | 0.76 |
| Los Angeles, CA (CMSA) | 0.85 | Detroit, MI (CMSA) | 0.74 |
| San Francisco, CA (CMSA) | 0.65 | Milwaukee, WI (CMSA) | 0.12 |
| San Diego, CA (MSA) | 0.75 | Minneapolis-St, Paul, MN (MSA) | 0.70 |
| Portland, OR (CMSA) | 0.57 | Cleveland, OH (CMSA) | 0.90 |
| Seattle, WA (CMSA) | 0.60 | Cincinnati, OH (CMSA) | -0.23 |
| Honolulu, HI (MSA) | 0.84 | St. Louis, MO (MSA) | 0.54 |
| Anchorage, AK (MSA) | 0.80 | Kansas City, MO-KS (MSA) | 0.57 |
| Phoenix, AZ (MSA) | 0.83 | | |
| Denver, CO (CMSA) | 0.67 | Average | 0.64 |

Correlation of regional disposable income from S&MM and labor income plus Transfers from REIS.

## C.4 Regional Housing Collateral

Following Case et al. (2001), we construct the market value of the housing stock in region $i$ as the product of four components:

$$HV_t^i = N_t^i \ HO_t^i \ HP_t^i \ V_0^i$$

$V_0^i$ is the median house price for detached single family housing from the US Bureau of the Census for 2000. For the CMSA's, it is constructed as a population weighted average of the median home value for the constituent MSA's. Population data are from the REIS.

**Home Ownership** Home ownership rates $HO_t^i$ are from the US Bureau of the Census. We combine home ownership rates for 1980, 1990 and 2000 from the Decennial Census with annual home ownership data for the largest 75 cities for 1986-2001, also from the Bureau of the Census. We project a home ownership rate for 1986 using the 1980 and 1990 number and the annual changes in the national home ownership rate. We use the changes in the major cities to infer MSA-level changes between 1986 and 1990. Between 1981 and 1986 and 1975 and 1979 we apply national changes to the MSA's. This procedure captures most of the regional and time series behavior of home-ownership rates. Table 10 illustrates the large regional differences in the median home value and home ownership rate in 1980 and 2000.

**House Price Index** $HP_t^i$ is the housing price index from the Office of Federal Housing Enterprize Oversight, based on the weighted repeat sales method of Case and Shiller (1987). It measures house price increases in detached single family homes between successive sales or mortgage refinancing of the identical housing unit. The index is available for 1975-2000 for all MSA's in our sample. We construct an index for the CMSA's as a population weighted average of the MSA's. The OFHEO database contains 17 million transactions over the last 27 years. There is a literature on quality-controlled house price indices. They broadly fall into two categories. Hedonic methods capture the contribution of narrowly defined dwelling unit and location characteristics to the price of a house in a certain region (number of bedrooms, garage, neighborhood safety, school district, etc.). Out of sample, houses are priced as a bundle of such characteristics. Repeat sales indices are based on houses that have been sold or appraised twice. Because they pertain to the same property, they control for a number of hedonic characteristics (bedrooms, neighborhood safety, etc.). See Pollakowski (1995) for a literature review and a description of data availability.

**Regional Housing Collateral Ratio** The regional collateral ratio $my^i$ is measured in the same way as the aggregate collateral ratio $my$. We regress the difference between the log real per capita housing value $\log hv^i = \log\left(\frac{HV^i}{p^{a,i}}\right)$ and the log real per capita labor income on a constant and a time trend. The housing collateral ratio is the residual from that regression. The resulting measure is available for 1975-2000.

Table 10: Median Home Value and Home-Ownership Rate.

| MSA | $V_{80}$ | $V_{00}$ | $HO_{80}$ | $HO_{00}$ |
|---|---|---|---|---|
| Washington, DC (PMSA) | 79.9 | 178.9 | 54.3 | 64.0 |
| Baltimore, MD (PMSA) | 51.4 | 134.9 | 60.0 | 66.9 |
| Atlanta, GA (MSA) | 47.7 | 135.3 | 61.4 | 66.4 |
| Miami, FL (CMSA) | 57.0 | 126.1 | 61.5 | 63.2 |
| Dallas-Fort Worth, TX (CMSA) | 45.6 | 100.0 | 64.7 | 60.4 |
| Houston, TX (CMSA) | 52.8 | 89.7 | 59.1 | 60.7 |
| Tampa, FL (MSA) | 39.9 | 93.8 | 71.7 | 70.8 |
| San Francisco, CA (CMSA) | 98.4 | 353.5 | 55.8 | 57.8 |
| Los Angeles, CA (CMSA) | 87.6 | 203.3 | 53.8 | 54.8 |
| San Diego, CA (MSA) | 90.0 | 227.2 | 55.1 | 55.4 |
| Portland, OR (CMSA) | 60.8 | 165.4 | 63.2 | 63.0 |
| Seattle, WA (CMSA) | 66.0 | 195.4 | 63.8 | 62.9 |
| Honolulu, HI (MSA) | 129.5 | 309.0 | 49.9 | 54.6 |
| Anchorage, AK (MSA) | 89.2 | 160.7 | 56.6 | 60.1 |
| Denver, CO (CMSA) | 69.1 | 179.5 | 63.0 | 66.4 |
| Phoenix, AZ (MSA) | 59.2 | 127.9 | 68.7 | 68.0 |
| New York, NY (CMSA) | 62.5 | 203.1 | 44.2 | 53.0 |
| Philadelphia, PA (CMSA) | 42.2 | 122.3 | 67.7 | 69.9 |
| Boston, MA (CMSA) | 52.0 | 203.0 | 54.8 | 60.6 |
| Pittsburgh, PA (MSA) | 42.7 | 68.1 | 69.0 | 71.3 |
| Buffalo, NY (MSA) | 39.7 | 89.1 | 63.7 | 66.2 |
| Chicago, IL (CMSA) | 62.8 | 159.0 | 58.5 | 65.2 |
| Detroit, MI (CMSA) | 43.5 | 132.6 | 70.2 | 72.2 |
| Milwaukee, WI (CMSA) | 59.2 | 131.9 | 61.1 | 62.1 |
| Minneapolis-St, Paul, MN (MSA) | 62.3 | 141.2 | 67.2 | 72.4 |
| Cleveland, OH (CMSA) | 52.1 | 117.9 | 66.6 | 68.8 |
| Cincinnati, OH (CMSA) | 47.9 | 116.5 | 63.8 | 67.1 |
| St. Louis, MO (MSA) | 41.8 | 99.4 | 68.2 | 71.4 |
| Kansas City, MO-KS (MSA) | 43.5 | 104.7 | 66.4 | 67.9 |
| Tampa, FL (MSA) | 59.9 | 85.2 | 73.0 | 71.0 |

The table shows median home values for 1980 and 2000 (in thousands of nominal dollars) and the home ownership rate for 1980 and 2000. All data are from the US Bureau of the Census, Decennial Survey 1980 and 2000

## C.5 Canadian Data

All data for Canada are from Statistics Canada (CANSIM), obtained from the Provincial Economic Accounts. They span the period 1981-2003, and the cross-section contains 10 provinces: Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Quebec, Saskatchewan, and Prince Edward Island.

We also use aggregate data for Canada. Consumption at the aggregate and regional level is measured as personal expenditures on non-durables and services less personal expenditures on durable goods. income is defined as personal disposable income. For each region, there is also a consumer price index and a population series available. The corresponding tables are 384-002 and 384-002.

The housing wealth data measure the stock of fixed residential capital for single and multiple dwellings. The series measures the end-of-year net stock at current prices, and are available from 1941 onwards. This value represents the cost of replacing the depreciated residential stock and is constructed using the perpetual inventory method. These series are available for Canada, as well as the ten provinces. The table is 030-0002.

As for the U.S. data, we calculate regional consumption shares are the ratio of real per capita regional consumption to real per capita aggregate consumption. We do the same for the income measure. We compute growth rates of the shares as log changes. The regional and aggregate housing collateral ratios $my$ are computed as the residual from a regression of the log housing wealth-to-income ratio on a constant and a trend. The collateral scarcity measure is computed as $\widetilde{my} = \frac{my^{max} - my_t}{my^{max} - my^{min}}$, where $my^{max}$ and $my^{min}$ are the sample maximum and minimum. In our sample, the maximum value for $my$ is reached in 2003 (0.0495), and the minimum in 1985 (-.1102).