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"Countercyclical Tax Bases"

Andrew Hayashi
University of Virginia Law School

January 30, 2018
Vanderbilt Hall – 208
Time: 4:00 – 5:50 p.m.
Week 3

SCHEDULE FOR 2018 NYU TAX POLICY COLLOQUIUM

(All sessions meet from 4:00-5:50 pm in Vanderbilt 208, NYU Law School)

1. Tuesday, January 16 – Greg Leiserson.Washington Center for Equitable Growth. "Removing the Free Lunch from Dynamic Scores: Reconciling the Scoring Perspective with the Optimal Tax Perspective."

2. Tuesday, January 23 – Peter Dietsch, University of Montreal Philosophy Department. "Tax Competition and Global Background Justice."

3. Tuesday, January 30 – Andrew Hayashi, University of Virginia Law School. "Countercyclical Tax Bases."

4. Tuesday, February 6 – Gerald Auten, U.S. Treasury Department. "Income Inequality in the United States: Using Tax Data to Measure Long-Term Trends."

5. Tuesday, February 13 – Vanessa Williamson, Brookings Institution.

6. Tuesday, February 27 – Jacob Goldin, Stanford Law School.

7. Tuesday, March 6 – Lisa Philipps, Osgoode Hall Law School. "Gendering the Analysis of Tax Expenditures."

8. Tuesday, March 20 – Lisa De Simone, Stanford Graduate School of Business.

9. Tuesday, March 27 – Damon Jones, University of Chicago Harris School of Public Policy.

10. Tuesday, April 3 – Ajay Mehrotra, American Bar Foundation and Northwestern University School of Law. "T.S. Adams and the Beginning of the Value-Added Tax."

11. Tuesday, April 10 – Jason Furman, Harvard Kennedy School.

12. Tuesday, April 17 – Emily Satterthwaite, University of Toronto Law School. "Electing into a Value-Added Tax: Survey Evidence from Ontario Micro-Entrepreneurs."

13. Tuesday, April 24 – Wolfgang Schon, Max Planck Institute. "Taxation and Democracy."

14. Tuesday, May 1 – Mitchell Kane, NYU Law School.

*** PRELIMINARY DRAFT – DO NOT CITE ***

COUNTERCYCLICAL TAX BASES

Andrew T. Hayashi[*]

Tax scholarship has tended to focus on the efficiency properties of different tax bases under assumptions about the macroeconomy that only sometimes hold, and has paid relatively little attention to how those bases operate in recessions. I show how different tax bases interact with household credit constraints and adjustment costs to either stabilize or aggravate economic shocks. I argue that the choice of the local tax base should consider the effect that the base has on the resilience of the economy by stabilizing government spending and household consumption expenditures. I report evidence of the relationship between local tax bases and the resilience of local economies to the 2001 and 2008 recessions.

[*] Associate Professor of Law, University of Virginia School of Law. Thanks to Leslie Ashbrook and Kristin Glover, Dan Murphy, and Max Hare for excellent research assistance.

INTRODUCTION

The Great Recession of exacted a heavy toll on households, imposing significant hardship during the recession itself: unemployment peaked at almost 10% in 2009;[1] the poverty rate hit a high of 15.1% in 2010;[2] and home foreclosures reached 2.23%.[3] The recession also left lasting scars that are still to be reckoned with, as individuals who experienced long spells of unemployment may never return to the lifetime income trajectories that they expected. Some parts of the country have yet to recover. Although the Great Recession was unusual in its magnitude, recessions are rather common. The National Bureau of Economic Research, which is responsible for dating the beginnings and ends of recessions,[4] has identified five recessions between 1980 and 2010, an average of one every six years; over this period the economy was in contraction for 16% of the time.[5] Recessions are not rare.

But the effects of recessions and pace of recovery are not uniform across the country. Notwithstanding low barriers to the movement labor and capital across the country, factors of production are not perfectly mobile and differences in the composition of local economies create differences in their vulnerability to economic shocks of particular kinds. For example, the housing market collapse was most acutely felt in places like Arizona and Florida, where home construction composed a significant part of the local economy and where home prices had boomed in the pre-recession period.

This variation in the vulnerability and resilience of local economies to recessions calls out for an explanation. The inevitability of the next recession and the importance of mitigating its worst effects gives urgency to the question of what this explanation is. If resilience could be, at least in

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[1] CONG. BUDGET OFFICE, PUB. NO. 4837, THE SLOW RECOVERY OF THE LABOR MARKET 2 (2014).

[2] U.S. Census Bureau, *Historical Poverty Tables: People and Families – 1959 to 2016, tbl. 2* (Sept. 8, 2017), https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-people.html.

[3] *2011 Year-End Foreclosure Report: Foreclosures on the Retreat*, RealtyTrac.com (Jan. 9, 2012), http://www.realtytrac.com/content/foreclosure-market-report/2011-year-end-foreclosure-market-report-6984.

[4] Bureau of Economic Analysis, *Frequently Asked Questions: Recession: How Is That Defined*, bea.gov (Mar. 31, 2008), https://www.bea.gov/faq/index.cfm?faq_id=485. In dating the recessions, *see* Nat'l Bureau Econ. Research, *The NBER's Recession Dating Procedure* (Jan. 7, 2008), http:// www.nber.org/cycles/jan08bcdc_memo.html. The NBER defines a recession as "a recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales." http://www.nber.org/cycles.html.

[5] Nat'l Bureau Econ. Research, *US Business Cycle Expansions and Contractions* *http*://www.nber.org/cycles.html (last visited Jan. 9, 2018).

part, a result of policies that can be adopted more widely then we should try and determine what those policies are.

Of course, one of the main objectives of fiscal and monetary policy has historically been exactly this: managing the business cycle. As a result, there is an enormous literature on the effects of countercyclical monetary and fiscal policy.[6] For several reasons detailed in Part II, however, traditional policy instruments were ineffective during the Great Recession.[7] The inefficacy of governments and central banks during this period has provoked reflection by scholars about alternatives to government spending, tax cuts, and expansionary monetary policy for tempering economic downturns.[8]

In this Article I investigate whether the tax base affects the resilience of a local economy to a negative economic shock. This investigation contributes to two scholarly literatures. First, the literature on the optimal tax base has tended to emphasize the efficiency properties of different tax bases under neoclassical assumptions about macroeconomic conditions that do not hold in deep recessions where demand affects output.[9] I argue that the performance of a tax base in recessions should be considered when trying to identify the optimal tax base. Second, the fiscal policy literature, which generally looks favorably on tax and spending policy instruments that act as automatic stabilizers to economic expansions and contractions, has taken only partial views of how the tax base serves this function.

One view has endorsed programs and features of the fiscal system that stabilize households' after-tax incomes in the face of economic shocks. Adopting this view, economists and legal scholars have written favorably about unemployment insurance,[10] the progressive rate structure of the

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[6] *See e.g.* Martine Guerguil et al., *Flexible Fiscal Rules and Countercyclical Fiscal Policy*, 52 J. MACROECONOMICS 189 (2017) (providing a literature review on cyclical fiscal and monetary policy).

[7] *See infra* Part II.

[8] *See, e.g.*, Yair Listokin, *Equity, Efficiency, and Stability: The Importance of Macroeconomics for Evaluating Income Tax Policy*, 29 YALE J. REG. 120-128 (2012) (describing how certain tax expenditures destabilize because they fluctuate with the economy).

[9] Paul Krugman, *How Did Economists Get It So Wrong*, N.Y. Times Mag., Sept. 2, 2009, at 36; Joseph E. Stiglitz, *Rethinking Macroeconomics: What Failed, and How to Repair It*, 9 J. EUR. ECON. ASS'N 591 (2011). Much of the debate about the tax base has been about the choice between an income tax and a consumption tax. *See e.g.*, Joseph Bankman & David A. Weisbach, *The Superiority of an Ideal Consumption Tax Over an Ideal Income Tax*, 58 STAN. L. REV. 1413 (2006); Shaviro, Daniel, *Beyond the pro-consumption tax consensus*, 60 STAN. L. REV. 745 (2007).

[10] *See, e.g.*, David Kamin, *Legislating for Good Times and Bad*, 54 HARV. J. LEGIS. 149, 171-73 (2017); Alisdair McKay & Richardo Reis, *The Role of Automatic Stabilizers in the U.S. Business Cycle*, 84 ECONOMETRICA 141, 182-83 (2016).

federal income tax,[11] refundable tax credits,[12] and the alternative minimum tax.[13] Of course, on the other side of these expenditures and taxes is the government. Income instability does not disappear because of these institutional features; it is merely transmitted to the government. Government expenditures and foregone revenues that stabilize household incomes are amounts that might otherwise be used to fund public goods, employ agents to administer and enforce the law, and to enable redistributive transfers. One might think that a government, which has ready access to capital markets, would be in a better position to run deficits that stabilize household incomes than the households themselves. But the Great Recession brought into high relief the fact that sometimes the political will to have governments play this role is lacking and, even when it is not, that state and local governments face borrowing constraints and balanced budget restrictions that inhibit their ability to finance short term budget deficits. For these reasons and for these governments, shortfalls in tax revenues or increases in mandatory outlays can compel spending cuts in discretionary expenditures.

Thus, the second view of fiscal stabilization policies focuses on the volatility of tax revenues associated with different tax bases from the perspective of the government. This view has tended to be the province of state and local tax policy experts, who are well aware of the close connection between revenues and expenditures for many local governments.[14] Because income tax revenues and sales tax revenues tend to fluctuate contemporaneously with changes in incomes and consumption expenditures, these experts have tended to emphasize the desirability of real property taxes, which have a variety of features that smooth revenue fluctuations even as property values vary.[15] But this temporal decoupling of

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[11] *See, e.g.*, Alan J. Auerbach & Daniel Feenberg, *The Significance of Federal Taxes as Automatic Stabilizers*, 14 J. ECON. PERSP. 37, 55 (2000); Yair Listokin, *Stabilizing the Economy Through the Income Tax Code*, 132 TAX NOTES 1575, 1577 (2009).

[12] Lily L. Batchelder, Fred T. Goldberg Jr, & Peter R. Orszag, *Efficiency and tax incentives: The case for refundable tax credits.* 59 STAN. L. REV. 23 (2006).

[13] Brian Galle & Jonathan Klick, *Recessions and the Social Safety Net: The Alternative Minimum Tax as a Countercyclical Fiscal Stabilizer*, 63 STAN.. L. REV. 187 (2010).

[14] *See, e.g.*, Andrea Louise Campbell & Michael W. Sances, *State Fiscal Policy During the Great Recession: Budgetary Impacts and Policy Responses*, ANNALS AM. ACAD. POL. & SOC. SCI. 252, 254 (2013) (describing volatility in state tax revenue, particularly from personal income tax); Yolanda K. Kodrzycki, *Smoothing Tax Revenues over the Business Cycle: Gauging Fiscal Needs and Opportunities* 13 (Fed. Res. Bank of Boston, Working Paper No. 14-11, 2014), https://www.bostonfed.org/publications/research-department-working-paper/2014/smoothing-state-tax-revenues-over-the-business-cycle-gauging-fiscal-needs-and-opportunities.aspx (describing greater volatility of sales tax revenues than income tax revenues during the 2000s).

[15] *See, e.g.*, Jesse Edgerton, Andrew F. Haughwout, & Rae Rosen, Institutions, *Tax*

property tax liabilities from the property tax base means that households' property taxes can remain high even as their property wealth is falling in value and, conversely, that they may pay little in property taxes as property values rise. From a property owner's perspective, real property taxes can be procyclical, rather than countercyclical. Scholars who have emphasized the pernicious effect of revenue volatility on local governments have tended to neglect the cost of revenue stability on households.

What all of this means is that the stabilizing effects of fiscal policies must include both their effect on household demand, but also their effect on government employment and demand for goods and services. At all levels, governments employ many workers, and deep cuts in public employment necessitated by tax shortfalls can exacerbate the effects of an economic downturn. Evaluating the stabilizing effects of the tax base, particularly at the local level, require balancing the need to keep revenues adequate to finance local government spending but without placing too great a strain on households. Whether propping up aggregate demand in a recession is better accomplished by ensuring a steady flow of tax revenue to the local government or cutting taxes depends, on the one hand, (i) on how close is the relationship between tax revenues and government spending and how effective is government spending at increasing demand for goods and services in the economy and, on the other hand, (ii) on how close is the relationship between taxes and household consumption expenditures and how effectively household spending multiplies throughout the economy. Thus, it is an empirical question whether local economies are more resilient if government revenues, or household after-tax income, are more stable in a recession.

In this Article, I attempt to answer this empirical question by investigating how differences in the tax base are correlated with the depth of recessions and the quickness of the rebound. I use simple examples in Part II to generate intuitions about how the choice of the tax base can affect economic resilience, and then use those examples to frame my empirical analysis and suggest potential hypotheses about the effect of the tax base on local economics resiliency. In Part III, I look at the 2001 and the 2008 recessions for evidence about the relationship between tax bases and local economic resilience.

Structure and State-local Fiscal Stress, 57 NAT'L TAX J. 147, 152-53 (2004) (describing greater volatility of New York City's income tax base than its property tax base); David Gamage, *Managing California's Fiscal Roller Coaster*, 49 ST. TAX NOTES 659, 661 (2008) (describing advantageous stability of property taxes). On the desirability of relying on the property tax, see Alm, James, *A convenient truth: Property taxes and revenue stability*, Cityscape (2013): 243-245.

I. STABILIZING TAX BASES

A. Law and Macroeconomics Generally

Economic analysis of the law has tended to focus on the long run efficiency properties of legal rules.[16] In the long run, economic output is determined by the potential output of the economy which, in turn, is determined by the efficiency of legal rules. When legal rules are more efficient, potential output grows. But what happens when the economy is operating below potential ouput? What happens when, as in the Great Recession from 2008 to 2010, or in the recession of the early 2000s, unemployment is above the natural rate and resources are idle? In these circumstances, consumption and investment have spillover effects, positive externalities, on the economy that increase output.[17]

Traditionally, there have been two channels through which governments have attempted to stimulate the economy: through fiscal policy and monetary policy. Traditional fiscal responses include deficit-financed government spending and tax cuts.[18] But the Great Recession exposed significant political disagreement about these responses,[19] and many

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[16] Lewis Kornhauser, *The Economic Analysis of Law* 1.2, THE STANFORD ENCYCLOPEDIA OF PHILOSOPHY (July 17, 2017), https://plato.stanford.edu/archives /fall2017/entries/legal-econanalysis/.

[17] There is evidence that government spending increases output while tax hikes decrease output. Blanchard, Olivier, and Roberto Perotti, *An empirical characterization of the dynamic effects of changes in government spending and taxes on output*, 117 QTR. J. ECON. 1329 (2002). Evidence from OECD countries from 1970 to 2007 suggests that tax cuts have a greater effect on growth then increases in government spending. Alesina, Alberto, and Silvia Ardagna, *Large changes in fiscal policy: taxes versus spending*, 24 TAX POL. & ECON. 35(2010). On the other hand, other scholars find that government spending crowds of private investment, resulting in a multiplier of less than one. Barro, Robert J., and Charles J. Redlick, *Macroeconomic effects from government purchases and taxes*, 126 Qtr. J. Econ. 51(2011). Government spending multipliers are significantly greater during recessions than during expansions. Auerbach, Alan J., and Yuriy Gorodnichenko, *Measuring the output responses to fiscal policy*,4 Am. Econ. J. Econ. Pol. 1 (2012) (reporting estimates on the spending multiplier of between zero and 0.5 during expansions, and between one and 1.5 during recessions). For a literature review on government spending multiplier, *see* Valerie A. Ramey, *Can government purchases stimulate the economy?*, 49 J. ECON. LIT. 673(2011).

[18] N. GREGORY MANKIW, PRINCIPLES OF ECONOMICS 814-15 (6th ed 2012),

[19] *See e.g.*, Alberto Alesina, *Fiscal Policy After the Great Recession*, 40 ATL. ECON. J. 429, 430 (2012); Robert Pollin, *US Government Deficits and Debt Amid the Great Recession: What the Evidence Shows*, 36 CAMBRIDGE J. ECON. 161, 162 (2012). Enduring controversy over the effects of the American Recovery and Reinvestment Act is evidence of this. PUB. L. NO. 111-5, 123 STAT. 115 (2009). For evidence of the effect of this stimulus bill on employment, *see* Daniel J. Wilson, Fiscal spending jobs multipliers:

countries were reluctant to incur large deficits to prop up demand for goods and services that would keep resources (particularly human resources) from falling idle.[20] Moreover, new government spending generally requires legislation, which can take a long time to pass even in the presence of political agreement.

The other traditional policy instrument for stimulating the economy is monetary policy. However, monetary policy appears to have been largely ineffective during the Great Recession. Nominal interest rates approached zero throughout the developed economies, leaving central banks without any room to use the traditional lever for stimulating investment.[21] The limited effectiveness of traditional monetary policy necessitated the adoption of unprecedented interventions into the economy, which were politically fraught and controversial themselves. Although historically it has been rare for interest rates to approach zero, interest rates have not rebounded along with the recovery from the Great Recession, and economic observers have anticipated that we will bump up against the zero lower bound more frequently in the future.

In the face of the political infeasibility and economic inefficacy of traditional fiscal and monetary instruments for managing business cycles, scholars have brought renewed attention to fiscal mechanisms that serve as "automatic stabilizers," which increase government spending and reduce taxes just as macroeconomic indicators become adverse, without requiring government action.[22] More recently, several scholars have explored opening up the anti-recession toolkit to change other legal rules, including environmental regulations and zoning requirements, to stimulate demand.[23]

Evidence from the 2009 American Recovery and Reinvestment Act, 4 AM. ECON. J.: ECON. POL.251 (2012); Zachary Liscow, et al., *Does State Fiscal Relief During Recessions Increase Employment? Evidence from the American Recovery and Reinvestment Act*, 4 AM. ECON. J.: ECON. POL. 118 (2012).

[20] *See* Pollin, *supra* note 4

[21] *See e.g.* Michael T. Kiley & John M. Roberts, *Monetary Policy in a Low Interest Rate World*, BROOKINGS PAPERS ON ECON. ACTIVITY 317 (Spring 2017); *see also* Jing Cynthia Wu & Fan Dora Xia, *Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound*, 48 J. MONEY, CREDIT & BANKING 253, 253 (2016) ("[S]ince December 2008, the federal funds rate has been near zero, so that lowering it further to produce more stimulus has not been an option."

[22] *See e.g.* Alisdair McKay & Ricardo Reis, *The Role of Automatic Stabilizers in the U.S. Business Cycle*, 84 ECONOMETRICA 141, 144-45 (2016) (providing a literature review of work on stabilizers). *See also* Zachary D. Liscow & William A. Woolston, *How Income Taxes Should Change during Recessions*, (2016); Yair Listokin, *Equity, Efficiency, and Stability: The Importance of Macroeconomics for Evaluating Income Tax Policy*, 29 YALE J. ON REG. 45, 86-88 (2012) (describing ways to reform tax expenditures to fluctuate less with the business cycle).

[23] *See, e.g.,* Andrew Hayashi & Daniel P. Murphy, *Savings Policy and the Paradox of Thrift*, 34 Yale J. on Reg. 3 (2017); Yair Listokin, *Law and Macroeconomics: The Law and*

They have drawn attention to the fact that even traditional fiscal and monetary interventions depend for their effectiveness on the ability of businesses and households to spend and invest stimulus dollars. Regulation of various kinds can short-circuit economic stimulus of any form. Perhaps, then, the law should change with economic conditions, or at least when economic conditions become dire enough.

This introduces a tradeoff. The legal rules that stimulate demand and lead to increased employment and incomes in the short run may also reduce potential output if they were adopted on a permanent basis. How should we navigate the trade-off between short run policies that increase economic performance now, but reduce potential output? One might be inclined to think that we should design legal rules solely for their effects on potential output. Of course, the more time that the economy spends below potential output, the less compelling this intuition is. Thus, there are two reasons why we should take business cycle management into account if we are concerned about the efficiency of legal rules.

The first reason is the simple trade-off between the short and the long run. If the short term is painful enough, and lasts long enough, then the social welfare advantages of mitigating the downturn may outweigh the social welfare disadvantages of adopting rules that reduce potential output. After all, social welfare over the long run is simply the sum of social welfare over a number of short run periods. The second reason to choose rules with the business cycle in mind is that adverse economic shocks may have lasting effects on potential output itself. This is the phenomenon known as hysteresis.[24] For a variety of reasons, a negative shock may flatten the growth path of the economy going forward.[25] Thus, even maximizing potential output over a long period of time may require adopting rules that mitigate the lasting effects of deeper recessions.

There are two ways that we might try to resolve the tension between mitigating business cycle fluctuations and maximizing potential output. The first way is to change legal rules when the circumstances warrant, and change them back when those circumstances no longer obtain. For example, suppose that a progressive consumption tax maximizes potential output subject to the distributive preferences of society, but that an income tax reduces output volatility and curbs economic downturns much more

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Economics of Recessions, 34 Yale J. on Reg. 3 (2017); Jonathan S. Masur & Eric A. Posner, *Should Regulation Be Countercyclical?*, 34 Yale J. on Reg. 3 (2017); Zachary Liscow, *Counter-Cyclical Bankruptcy Law: An Efficiency Argument for Employment-Preserving Bankruptcy Rules*, 116 Colum. L. Rev. 1461 (2016).

[24] *Hysteresis*, OXFORD DICTIONARY OF ECONOMICS (John Black ed., 2d ed. 2002).

[25] *See* Olivier J. Blanchard & Lawrence H. Summers, *Hysteresis and the European Unemployment Problem*, NBER MACROECONOMICS ANN. 1986, at 15 (describing impact of shocks on European unemployment in the 1970s and 1980s).

effectively than a consumption tax. One way to proceed would be to adopt a consumption tax in the ordinary course but incorporate more income tax-like elements during recessions, undoing those elements after the economy has rebounded. This could happen through new legislation or through the built-in automatic response of legal rules changing economic indicators, such as unemployment or the inflation rate.[26] The second approach is to choose neither the legal rule that maximizes potential output nor the legal rule that best mitigates recessions, but instead choose the legal rule that strikes the appropriate balance. Whether an either/or approach, or an "interior solution" approach, is preferable depends on the feasibility and costs and benefits of changing legal rules with the times. David Kamin has done a thorough analysis of the different mechanisms by which policy can adjust with economic circumstances.[27]

Many fiscal policy instruments have stabilizing properties, including unemployment insurance and the progressive rate structure of the federal income tax. Scholars have identified a number of other stabilizing features of our fiscal system, all of which serve to stabilize households' after-tax incomes when their pretax incomes fall. Nevertheless, the effect of the tax base on economic resilience is understudied. Generally, the focus has been on the efficiency and equity properties of different tax bases (most often consumption and income) against the background assumption of full employment and under which there is no role for a stimulus tax policy. As discussed above, the literature on "optimal tax" policy is enormous, and indeed occupies a significant part of the field of public finance within economics.[28] Nevertheless, little of this work considers the potential benefits, in certain circumstances, of stimulating household demands during deep recessions.

B. Taxes During Recessions

Although the question of how the tax base affects the resilience and stability of the economy has been neglected, the stabilization properties of progressive tax rates are well understood. It is generally argued that

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[26] See, e.g., John B. Taylor, *The Lack of an Empirical Rationale for a Revival of Discretionary Fiscal Policy*, 99 AM. ECON. REV.: PAPERS AND PROCEEDINGS OF THE ONE HUNDRED TWENTY-FIRST MEETING OF THE AM. ECON. ASS'N 550 (2009); John B. Taylor, *Reassessing Discretionary Fiscal Policy*, J. ECON. PERSP., Summer 2000, at 21 (both advocating for monetary policy that adjusts automatically with macro variables).

[27] David Kamin, *Legislating for Good Times and Bad*, 54 HARV. J. ON LEGIS. 149 (2017).

[28] For an overview of optimal taxation theory, see N. Gregory Mankiw, Matthew Weinzierl, & Danny Yagan, *Optimal Taxation in Theory and Practice*, J. ECON. PERSP., Fall 2009, at 147.

progressive income tax rates operate as "automatic stabilizers," because the share of one's income that one pays in tax falls when one's income falls. As a result, after-tax income, and presumably therefore consumption, is less variable than pre-tax income. Note, then, that when a fiscal instrument or design feature is referred to as "stabilizing," this typically means stabilizing with respect to households' and businesses' after-tax income.

But this is only part of the story. Imagine a world where the government faces borrowing constraints, or which is subject to balanced budget restrictions, so that government operations must be financed by contemporaneous tax revenues each year. In that case, just as the progressive tax rate structure reduces the variance in the after-tax income of households, symmetrically, it increases the variance of tax revenues. When incomes fall, tax revenues fall more than proportionally and, to the extent that government expenditures are sensitive to current revenues, so does government spending.[29]

This observation raises several questions about the consequences of government budgets that change more than proportionally with households' incomes. First, one category of government expenditures is on public goods. Is it at all clear that demand for public goods should fall more than proportionally during a recession? A second purpose of revenue collection is redistribution. Is this less important during a recession? To the contrary, if household incomes fall across-the-board, the welfare gains from redistribution should tend to increase. The focus of this paper is the third question arising from the tradeoff in a recession between higher tax revenues and higher after-tax household incomes: the question of whether the government or households are more likely to spend the income in a way that increases economic output and the utilization of resources.[30] Put slightly differently: is the tax multiplier likely to be different than the government spending multiplier in a recession? This depends on how

[29] To be sure, this is an extreme situation, and in general we expect governments to have lower borrowing costs and a greater ability to smooth their spending in the face of revenue shocks. However, as discussed in Part I, both political and legal constraints may cause this not to be true.

[30] There is a growing literature on the effect of different forms of stimulus, including tax rebates. *See e.g.*, Shapiro, M.D., and Slemrod, J.B., 2003, "Consumer Response to Tax Rebates," American Economic Review, 93, pp. 381-96; Parker, Jonathan A., Nicholas S. Souleles, David Johnson, and Robert McClelland. "Consumer Spending and the Economic Stimulus Payments of 2008." American Economic Review, 103(6): 2530-2553; Agrawal, Sumit, Chunlin Liu, and Nicholas S. Souleles. 2015. "The Reaction of Consumer Spending and Debt to Tax Rebates." forthcoming, Journal of Political Economy; Agarwal, Sumit, and Wenlan Qian. 2014. Consumption and Debt Response to Unanticipated Income Shocks: Evidence from a Natural Experiment in Singapore. American Economic Review 104:12, 4205-4230.

households and governments spend their money.[31]

The existence of a Keynesian multiplier greater than one on household consumption or government spending depends on the existence of slack in the economy – on there being idle resources. But there is also ample evidence that the magnitude of the multiplier depends on the existence of household credit constraints.[32] The more binding are these constraints, the higher are households' marginal propensity to consume out of each dollar of income that they receive, and hence the larger the multiplier.[33] In any recession, there is heterogeneity in the amount of economic slack across geography and across industries, but there is also heterogeneity in credit constraints faced by different households and businesses.

The existence of credit constraints is closely related to the problem of illiquidity. Many households, including those with relatively high incomes, often have wealth tied up in illiquid investments and durable consumption goods, most typically housing, that can only be adjusted at some cost.[34]

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[31] Scholars have noted that the multiplier effects of government spending on output depend both on the state of the economy — whether it is in contraction or expansion — and on the components of government spending. Alan J. Auerbach, and Yuriy Gorodnichenko, *Measuring the output responses to fiscal policy*, 4 AM. ECON. J.: ECON. POL. 1, 11 (2012). Some economists have argued that, at the aero lower bound, the "multiplier" on government spending is particularly large. Eggertsson, G., 2011. What fiscal policy is effective at zero interest rates? In: NBER Macroeconomic Annual 2010; Christiano, L.J., Eichenbaum, M., Rebelo, S., 2011. When is the government spending multiplier large? Journal of Political Economy 119, 78–121; others argue that financial frictions also amplify the government spending multiplier. See Eggertsson, G., Krugman, P., 2012. Debt, deleveraging, and the liquidity trap: A Fisher–Minsky–Koo approach. Quarterly Journal of Economics 127, 1469–1513; Fernández-Villaverde, J., 2010. Fiscal policy in a model with financial frictions. American Economic Review, Papers and Proceedings 100, 35–40. The effects of financial frictions on the multiplier may be even greater in a liquidity trap. See Carrillo, Julio A., and Céline Poilly. "How do financial frictions affect the spending multiplier during a liquidity trap?." Review of Economic Dynamics 16.2 (2013): 296-311. Intuitions about many policy interventions are turned upside down when interest rate is zero. See, e.g., Denes, Matthew, Gauti B. Eggertsson, and Sophia Gilbukh. "Deficits, public debt dynamics and tax and spending multipliers." The Economic Journal 123.566 (2013) ("[c]utting government spending can increase the budget deficit at zero interest rates…Similarly, increasing sales taxes can increase the budget deficit rather than reducing it.")

[32] *See* J. Andres et al., *Household Debt and Fiscal Multipliers*, 82 ECONOMICA 1048 (2015).

[33] Demyanyk, Yuliya S., Elena Loutskina, and Daniel Patrick Murphy. "Fiscal Stimulus and Consumer Debt." (2016); See Galí, Jordi, J., David López-Salido, and Javier Vallés. 2007. "Understanding the Effects of Government Spending on Consumption." Journal of the European Economic Association, 5: 227-270; Eggertsson, Gauti B. and Paul Krugman. 2012. "Debt, Deleveraging, and the Liquidity Trap: A Fisher-Minsky-Koo Approach." Quarterly Journal of Economics 127(3): 1469-11513.

[34] Raj Chetty & Adam Szeidl, *Consumption Commitments and Risk Preferences*, 122 Q. J. ECON. 831, 838 (2007).

When this is the case, the effects of income shocks are concentrated along the consumption margins that *can* be adjusted, leading to outsized welfare effects for households for which a large share of their consumption is "committed" in this way.[35]

For these reasons, the multiplier on a dollar of income depends on who receives it and where they spend it. Thus, we are left with the question of whether the government, through planning, or households, through price signals, are more likely to target spending on "shovel ready" projects in industries operating well below capacity. Were we to observe spending patterns of government and compare them with the pattern of expenditures by households, we would expect that whichever spent more in regions and industries operating below capacity, and where employees were more credit constrained and illiquid, would generate larger positive effects on economic output. For example, one consequence of lower tax revenues for local governments in the Great Recession was public sector layoffs. The more credit constrained and illiquid these employees are, the higher their marginal propensity to consume out of their income and the larger a negative effect on the economy will be their unemployment. Implied by this observation is the symmetry that lower taxes for illiquid and credit constrained individuals will have a large multiplier effect on output. In the next Section, I use several examples to illustrate how the choice of the tax base affects household and government spending following an economic shock, and discuss how those results depend on the multipliers.

II. COUNTERCYCLICAL TAX BASES: EXAMPLES

In this Part I present several stylized examples of how households might respond to a shock to their cash incomes or housing wealth, depending on the tax base. Although a complete economic model of how different bases function during a recession is a worthy direction for future work, a few examples are sufficient to illustrate some of the possibilities and structure intuitions for the empirical study that follows in Part III. Suppose that

[35] For analysis of the welfare consequences of taxing committed consumption and evidence that changes in mortgage payments have effects on contemporaneous consumption of other goods and services, including the amount that people eat out, *see* Andrew T. Hayashi, *The Quiet Costs of Taxation: Cash Taxes and Noncash Bases* 23-24 (Univ. Va. Sch. Law Law & Econ. Research Paper Series, No. 2017-15, 2017). Di Maggio et al. also find that a 50% decline in the magnitude of mortgage payments, due to expansionary monetary policy, induced a 35% increase in car purchases. They also find that these effects are heterogeneous, with larger effects for lower income and more highly leveraged households. Di Maggio, Marco, et al. "Interest rate pass-through: Mortgage rates, household consumption, and voluntary deleveraging." American Economic Review 107.11 (2017): 3550-88.

Andrew expects to earn $100 of wage income in each of periods 1 and 2. He can spend his income on only two goods: food and housing. His objective is to maximize his utility from the consumption of food and housing which I assume, for the sake of simplicity, he values in the same way and from which he derives diminishing marginal utility.[36] At the beginning of period 1, Andrew comes up with a plan about how to spend his income in each period. Each unit of food and housing costs one dollar. Under these assumptions, his ideal consumption plan is to consume 50 units each of housing and food in both periods.

Now consider how Andrew's optimal consumption plan changes under three different tax regimes. In the first regime, income is taxed at a flat rate of 10%. In the second and third regimes either housing or food is subject to an ad valorem tax of 25%. Under the income tax, Andrew will consume 45 units each of housing and food, in both periods. If housing consumption is taxed then Andrew will consume 40 units of housing and 50 units of food in both periods. The case of the food tax is symmetric with the case of the housing tax. Under all three regimes Andrew will pay $10 of tax in each period. This pattern of income and consumption is summarized in tabular form in the Appendix and labeled the "Baseline."

The question I explore in the following examples is how Andrew will respond if his plan his disrupted because of an adverse economic shock. The answer to this question depends on the nature of the shock and the nature of the tax regime, and how they interact. Specifically, Andrew will respond differently to an economic downturn that reduces his wage income than a downturn in the housing market that changes the consumption benefit he gets from his housing. Distinguishing between the two kinds of adverse economic shocks is not just a matter of theoretical importance that affects how different tax bases mitigate or aggravate the effects of the shock, but it is also of practical significance because of the increasing importance of sector-specific shocks in the U.S. economy over time.[37] Of course, many recessions, including the Great Recession, are characterized by both falling home values and falling incomes. Thus, my decision to use examples where only one of the two forces are at work is analytically clarifying but also limiting, because I do not consider interactions between the two.

The table below shows how Andrew's expenditures on food and

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[36] Specifically, I assume that Andrew's utility is given by u=ln(h)+ln(f)

[37] There is evidence that broad aggregate shocks have become less volatile in recent years, while sector or region-specific shocks have remained constant. *See, e.g.*, Garín, Julio, Michael Pries, and Eric Sims, *The Relative Importance of Aggregate and Sectoral Shocks and the Changing Nature of Economic Fluctuations*, Am. Econ Journal: Macroeconomics; Foerster, Andrew T., Pierre-Daniel G. Sarte, and Mark W. Watson. *Sectoral versus aggregate shocks: A structural factor analysis of industrial production*, 119 J. Pol. Econ. 1, 1-38 (2011).

housing and the local government's tax revenues change, relative to the Baseline, under six different scenarios. Panels 1-3 describe changes following an unexpected $20 decline in Andrew's period 1 wages, and panels 4-6 follow a $20 decline in the period 1 consumption value of Andrew's housing. The tax on housing consumption is meant to correspond to a real property tax. This is only an approximation. For one thing, not all changes in property values will be tracked in the short term by changes in the flow of consumption benefits from homeownership.[38] Moreover, in the real world, property taxes typically have a variety of features that separate in time changes in property values from changes in property tax liabilities. The examples I discuss here assume that the property tax liabilities are calculated contemporaneously with changes in value; however, the intuitions generated by these examples can help us understand what the consequences of real-world property taxes might be. I assume in each case that the tax is imposed and collected in the same period in which the income is earned or the consumption expenditures made.

In the discussion of these examples, I focus exclusively on the changes in period 1 consumption and tax revenues generated by the economic shock, because period 1 represents the recessionary period in which incomes and/or property values are falling and, by assumption, economic output is driven by demand. In period 1, one can think of government spending and household expenditures as generating positive income externalities, the magnitude of which depends on the Keynesian multiplier on that spending. I assess each example solely in terms of the anticipated effect on aggregate demand in period 1. The effects of housing expenditures, food expenditures, and tax revenues on aggregate demand will vary. For one thing, the relationship between tax revenues and government spending may be attenuated. Jurisdictions that require a close matching of government expenditures and revenues, because of balanced budget requirements and limitations on borrowing, are likely to be most affected by reductions in revenues during a recession. The more attenuated the connection between contemporaneous revenues and government spending, the less important is it for the tax base to stabilize government revenues. Second, the Keynesian multiplier on household spending is likely to be different than the multiplier on government spending because of where the income is spent. Any such difference will affect whether it is preferable in the choice of the tax base for governments to experience revenue shortfalls or households to cut

[38] One conventionally thinks of a housing market collapse as affecting the prices of homes. The relationship between the price of a home and its rental value, and in particular the rental value to the owner, is not perfect. The assumption that the value of the home is equal to the stream of consumption value to the owner herself is a strong one, but helpfully simplifies the analysis and I do not think the important results would change.

expenditures.

By focusing solely on the effect of the tax base on aggregate demand in a recession I certainly do not come to an all-things-considered assessment of the optimality of different tax bases. I do not answer the question of which tax base maximizes social welfare in the long run, in the presence of periodic demand-driven output. Nevertheless, shedding light on which tax base is more effective at propping up demand during recessions is an input into this ultimate determination, an input that has not, to my knowledge, been studied.

Effects of Recessions on Household Expenditures

Income Recession

Panel 1: Costless Adjustment

	Period 1			Period 2		
	Housing	Food	Tax	Housing	Food	Tax
Property Tax	-4	-5	-1	-4	-5	-1
Income Tax	-4.5	-4.5	-2	-4.5	-4.5	0
Sales Tax	-5	-4	-1	-5	-4	-1

Panel 2: Committed Housing Consumption

	Period 1			Period 2		
	Housing	Food	Tax	Housing	Food	Tax
Property Tax	0	-10	0	0	-10	0
Income Tax	0	-9	-2	0	-9	0
Sales Tax	0	-8	-2	0	-8	-2

Panel 3: Committed Housing, Credit Constraints

	Period 1			Period 2		
	Housing	Food	Tax	Housing	Food	Tax
Property Tax	0	-20	0	0	0	0
Income Tax	0	-18	-2	0	0	0
Sales Tax	0	-16	-4	0	0	0

Housing Recession

Panel 4: Costless Adjustment

	Period 1			Period 2		
	Housing	Food	Tax	Housing	Food	Tax
Property Tax	-4	-5	-1	-4	-5	-1
Income Tax	-5	-5	0	-5	-5	0
Sales Tax	-5	-4	-1	-5	-4	-1

Panel 5: Committed Housing Consumption

	Period 1			Period 2		
	Housing	Food	Tax	Housing	Food	Tax
Property Tax	0	2.5	-5	0	2.5	0
Income Tax	0	0	0	0	0	0
Sales Tax	0	0	0	0	0	0

Panel 6: Committed Housing, Credit Constraints

	Period 1			Period 2		
	Housing	Food	Tax	Housing	Food	Tax
Property Tax	0	5	-5	0	0	0
Income Tax	0	0	0	0	0	0
Sales Tax	0	0	0	0	0	0

Panels 1 and 4 show how expenditures and tax revenues change under each of the three tax regimes, if Andrew is able to freely adjust his consumption plan after the income/housing shock. Panels 2 and 5 illustrate how these results change if Andrew's planned housing expenditures can only be changed at a (prohibitive) cost. The literature refers housing expenditures subject to these adjustment costs as "committed consumption."[39] For a variety of reasons it may be costly for individuals to adjust their consumption of certain commodities, with housing perhaps being the best example. In the case of a homeowner, the costs of adjusting the flow of housing services used each period can be quite significant if this adjustment requires moving. The inability to adjust one's housing, except at a significant cost, has a number of important consequences including that negative income shocks are borne along fewer consumption margins,

[39] Raj Chetty & Adam Szeidl, *Consumption Commitments and Risk Preferences*, 122 Q. J. ECON. 831, 838 (2007).

thereby resulting in much more painful cuts to "discretionary" categories of spending (food, in this example) than would be optimal in the absence of adjustment costs.[40] In another recent paper I explored some of the welfare consequences of taxing committed consumption.[41] In this paper I continue to develop this analysis to the macroeconomic context. Finally, panels 3 and 6 illustrate the effects of recessions when households have credit constraints as well as committed housing consumption, and for that reason are unable to borrow in period 2 to finance increased food consumption in period 1.

For example, compare the property tax regime in panel two with the property tax regime in panel three. Panel two shows how Andrew's expenditures will change following a $20 income shock in period one, if his housing expenditures cannot be adjusted. In that case, the entire $20 reduction in his lifetime wealth must come out of his food budget. In order to smooth this shock, he will borrow $10 and repay that amount in period two, so that he must only reduce his food expenditures by $10 in period one and $10 in period two. Panel three considers how Andrew will respond if he is credit constrained. In this case, the entire $20 reduction in period one income must be borne by him in that period, so that his food expenditures fall by $20 in period one. This is an especially undesirable outcome both from a social welfare and from a macroeconomic perspective. Ideally, Andrew would be able to spread the $20 income shock, reducing food and housing expenditures in both periods. Concentrating the entire shock along one margin imposes the greatest possible disutility on him, and the fact that it reduces his discretionary expenditures in period one, where consumer spending is needed to stimulate the economy, makes things even worse.

In the Appendix I show Andrew's consumption pattern in each of these six scenarios. The table above was derived from these patterns to show how expenditures *change* following an economic shock, because it is the nature of these changes that either aggravate or mitigate the negative income or wealth shock.

A. The Effect of an Income Shock

Consider first panel 1, which illustrates the case of a negative shock to households' wage income, under the assumption that those households can costlessly adjust their consumption in response. That is, they neither face credit constraints nor is their housing consumption fixed. In this case, a negative income shock reduces the household's lifetime budget constraint and reduces housing and food expenditures proportionately, and equally, across periods one and two. Under income tax, Andrew consumes the same

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[40] Id.

[41] Andrew T. Hayashi, *The Quiet Costs of Taxation: Cash Taxes and Noncash Bases* 23-24 (Univ. Va. Sch. Law Law & Econ. Research Paper Series, No. 2017-15, 2017).

amount of housing and food in each period and so he reduces his housing and food expenditures by the same amount in each period following the income shock. But what is important to note here is that, under a consumption tax on food or housing, the decline in expenditures is smaller for goods that are more heavily taxed. Food expenditures fall by less under a sales tax, and housing expenditures fall by less under a property tax.

What this means is that the choice of the tax base not only has long run consequences for the allocation of resources in the economy, but it also influences which sectors are more resilient in recessions. Perhaps surprisingly, spending declines *less* for goods that are more heavily taxed. If recessions have effects that persist over time, this relatively greater resilience of more heavily taxed sectors could, in theory, offset some of the structural disadvantage of the sector due to the tax law. Unsurprisingly, tax revenues fall by more under income tax than either a property tax or a sales tax. This is because the negative income shock pushes down expenditure on both goods, yet only one of the two goods is taxed under the property tax or the sales tax. This highlights how the ability of households to adjust their expenditures following in income shock will affect not only the magnitude of those expenditures, but also the revenue consequences.

Which tax base is more effective at stabilizing aggregate demand? The answer must be an empirical one. Note that under both a property tax and a sales tax that aggregate expenditures on housing, food taxes fall by $10, with food expenditures falling more under a property tax and housing expenditures falling more under a sales tax. As between the property tax and sales tax then, the property tax is more effective at stabilizing demand if the multiplier on food expenditures is higher than the multiplier on housing expenditures. Under an income tax, housing and food expenditures fall in between the declines under the two consumption taxes. Tax revenues, however, fall by more under an income tax. Thus, the income tax is likely to be preferable when government spending has a lower multiplier than household expenditures and when taxes are not a binding constraint on government spending.

What happens if Andrew can only adjust his housing expenditures at a significant cost (the cost of moving and, if he is a renter, the costs of breaking his lease)? Now, Andrew cannot smooth the negative income shock between food and housing and must bear the entire burden in the form of reduced food consumption. Under the income tax, his tax bill falls by two dollars which means he must reduce his food consumption by $18, which he can divide between periods one and two. In the case of a sales tax, Andrew can accommodate this $20 decline of income by cutting back on his food expenditures by eight dollars in each period. This reduction in his food expenditures also reduces the sales tax he must pay by two dollars in

each period. Under a property tax, aggregate food expenditures fall by the full amount of the negative income shock: $20. Thus, the presence of housing adjustment costs concentrates negative income shocks along the food and tax revenue margins, with the government bearing the largest share of the burden under a sales tax and the smallest share of the burden under a property tax.

Panel three introduces credit constraints on households to show how they affect expenditure responses to the negative income shock. If households are unable to borrow income from period two to smooth the effect of the shock, then the entire shock must be borne by lower period 1 food expenditures and reduce tax revenues. The effect is stark in this example. Whereas a household with access to credit and which can costlessly adjust its housing consumption will cut back on food expenditures by only five dollars during the recessionary period, a household with committed housing consumption and credit constraints will cut back on food expenditures by $20.

What these examples suggest is that a recession characterized by lower incomes will result in lower tax revenues across the board, but that in regions with high rates of homeownership or where housing adjustment costs are otherwise high, that tax revenues will fall the most if the jurisdiction relies on the sales tax and will fall the least if the jurisdiction relies on the property tax. Higher housing adjustment costs will also tend to aggravate the effect of the recession on the non-housing sector, with the greatest effects being in counties where households are credit constrained and under a property tax. The total effect of the tax base on the local economy again depends on the extent to which reduce tax revenues are binding on the local government and the relative effects of government spending vis-à-vis household consumption on aggregate demand.

B. Housing Market Shocks

Consider now the case of a negative shock to the value of Andrew's home, causing a $20 reduction in the flow of housing consumption to him in period 1. If Andrew can costlessly adjust his housing expenditures, he will respond in just the same way as if he experienced a negative wage income shock of $20. Panel four is nearly identical to panel one. This is because both the shock to Andrew's cash income and the shock to his housing have the same effect on his budget constraint. In the absence of adjustment costs and credit constraints, the solution to his intertemporal maximization problem is virtually identical. The only difference is that, under income tax, a negative shock to home values (does not (by itself) reduce households' tax liabilities. As a result, under the income tax,

revenues fall by more and household expenditures fall by less than in the case of a housing shock. Since aggregate expenditures are the same under all three tax regimes, the net effect of the tax base on the local economy depends on the relative efficacy of household expenditures and government spending in propping up aggregate demand.

In the case of a negative shock to housing consumption, housing adjustment costs can actually have salutary effects, at least from the perspective of separating discretionary spending. Panel five illustrates this. Following a negative housing shock, Andrew would prefer to cut back on his food spending and use some of the savings to improve his housing. If this is too costly, then he is stuck overpaying for substandard housing. This is a dramatic and concentrated shock that will push Andrew far away from his most preferred bundle of housing and food consumption. But note, this reduction in the value of housing consumption does not affect his expenditures on housing. By assumption, those expenditures are fixed. He simply is paying more to live in a much less desirable home. He bears, silently, the costs of reduced consumption from a durable good. From an expenditure perspective, the committed nature of his housing consumption silos the economic shock and prevents it from spilling over to other areas of the economy.

Moreover, there is no effect of this negative wealth shock on food expenditures under and income tax or a sales tax. Under a property tax, however, the reduced value of Andrew's home result in a lower property tax liability, which he will use to fund increased food expenditures. If Andrew smooths his increased food consumption over time then he will spend an additional $2.50 in each period. If he were to spend the entire tax savings in period 1, the five dollar reduction in local tax revenue would be offset by a five dollar increase in food expenditures. Whether the property tax fares better than an income or sales tax at stabilizing aggregate demand in the wake of a housing recession depends on a comparison of (i) the efficacy of local government spending and whether the tax revenue constraint is binding in the current period, and (ii) how effectively expenditures on nonhousing goods and services stimulate the economy. Because theoretical predictions go in both directions, it is an empirical question that I attempt to shed some light on in Part III.

What this suggests is that, to the extent that a recession is driven by declines in housing values, tax revenues would be expected to fall the most in jurisdictions with a property tax and to fall least in jurisdictions with an income tax. In contrast to recessions caused by negative income shocks, housing adjustment costs, such as are common in areas with high homeownership rates, will be associated with *more* stable household spending. In this environment, whether the property tax is more or less

effective at stabilizing demand than the income tax with a sales tax depends on the relative efficacy of household spending versus government spending on aggregate demand.

To be clear, contemporary property, income, and sales taxes differ in important ways from the examples used here. It is not certain that the outcomes in these examples will match the data even if their logic is correct. The examples given above are highly stylized, and make simplifying assumptions that are at odds with the considerable complexity of actual tax bases.[42] Nevertheless, they reveal that the choice of the base can affect the resilience of the local economy and show qualitatively how those bases interact with the cause of the economic downturn.

III. A STUDY OF COUNTY TAX BASES AND RESILIENCY

A. Context

To study the effect of the tax base on the resilience of the local economy to income and housing shocks, I use data on U.S. counties over the period 1997-2014. Across the country, there is a lot of variation in state and local tax bases, and the time period I examine included both the relatively mild recession of 2001, and the Great Recession of 2008-2009. Although recessions are associated with adverse turns in a number of macroeconomic indicator, the Great Recession was particularly affected by a collapse in the housing market and the collateral effects on the financial sector.

Although there is typically wide geographical variation in both the depth of recessions and the pace of recovery, the composition of local economies makes it difficult to isolate the effect of the tax base on recovery and resilience. For example, rural, nonmetropolitan, counties have recovered from the Great Recession at a slower pace than urban areas,[43] some of which is due to a much higher rate of job creation in more densely populated counties. From 2010 to 2014, 41% of job growth occurred in counties with more than 1 million people.[44] By contrast, from 2002 to 2006

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[42] Perhaps most importantly for the purpose of grounding intuitions about the property tax, because of the delay the assessment process, property tax revenues mechanically lag property tax values by at least a year. In the case of committed housing consumption, the assessment delay means a delay in both the lower tax liability and the increase in food expenditures that it permits, so it does not change the conclusions derived above, although it may change the timing of when tax revenues and household expenditures check.

[43] Thomas B. Edsall, *Reaching Out to the Voters the Left Left Behind*, THE NEW YORK TIMES, April 13, 2017, https://www.nytimes.com/2017/04/13/opinion/reaching-out-to-the-voters-the-left-left-behind.html (last visited May 19, 2017).

[44] *Id.*

they accounted for only 23% of job creation.[45] Agricultural and extractive industries have performed particularly well in the last eight years.[46]

Compounding this challenge is the fact that deep recessions, such as the Great Recession, tend to provoke extraordinary monetary and fiscal interventions by federal authorities that have disparate impacts across the country. For example, funds provided by the American Recovery and Reinvestment Act filled one third of state budget gaps in 2009 and 2010.[47] Moreover, state and localities themselves responded to the downturn,[48] with states increasing sales taxes and adopting new excise taxes to supplement revenues that fell 11% in the first year of the recession.[49] This revenue-raising response is consistent with the approach historically taken by states,[50] and which is generally endorsed by academic commentators.

Joe Stiglitz and Peter Orszag have argued that tax increases are preferable to budget cuts for states because part of the tax payments are made in part from savings, which tend to be held by higher-income households.[51] Stiglitz and Orszag find only modest effects of the effect of increasing taxes on wages, employment, and the median wage. Although some states did cut taxes during the Great Recession, most cuts were relatively small and occurred early on. On net, tax changes occurring in 2008 and 2009 resulted in a net increase in $29.7 billion, or 3.8% of revenue.[52] At the same time, local governments also responded by making spending cuts in all major areas,[53] cuts that have persisted and in some cases even grown as the country has emerged from the Great Recession. Bucking prior history, state and local government spending *declined* by 4% from the

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[45] *Id.*

[46] *Rural Employment and Unemployment*, U.S. DEPT. AGRICULTURE. https://www.ers.usda.gov/topics/rural-economy-population/employment-education/rural-employment-and-unemployment/

[47] Nicholas Johnson, Catherine Collins, and Ashali Singham, State Tax Changes in Response to the Recession (Ctr. on Budget and Policy Priorities, Mar. 8, 2010) at 4.

[48] One study conducted by the Center on budget and policy priorities, found that states responded aggressively to the economic recession by increasing their tax bases. Nicholas Johnson, Catherine Collins, and Ashali Singham, State Tax Changes in Response to the Recession (Ctr. on Budget and Policy Priorities, Mar. 8, 2010).

[49] Id.

[50] Id. ("states historically have turned to revenue increases as part of the response to recessions. They have found that raising new revenue provides more short-term economic benefit than relying only on spending cuts and does not have an adverse impact on longer-term economic performance.")

[51] Id. at 4.

[52] Id.

[53] Id. at 4. During the latest recession state and local government payrolls shrunk considerably, which some researchers attribute to declines in property tax revenues. Benjamin H. Harris & Yuri Shadunsky, Urban-Brookings Tax Policy Ctr., State and Local Governments in Economic Recoveries: This Recovery Is Different (Apr. 22, 2013).

trough of the Great Recession until 2012,[54] which has caused some observers to suggest that state and local governments, which had played a role in facilitating recovery from prior recessions, had been a drag in this most recent recovery.

The Great Recession was accompanied by precipitous decline in state tax revenue that was both much larger than prior recessions and dramatically larger than the decline in economic output.[55] Local government revenues, on the other hand, were less variable than state tax revenues, largely because of the reliance on the property tax at the local level, which because of various features tends to result in more stable revenues over time.[56] Property taxes tend to stay high even as property values fall, because of delays in assessment and other features designed to prevent large swings in tax liabilities, for the sake of both households and government budgeting.

Moreover, in some jurisdictions, not all properties are reassessed every year. In Maryland, for example, only 1/4 of the homes in each county are reassessed every year, meaning that the tax liabilities are based on market values from five years earlier. These lags can result in a large separation between contemporaneous property values and taxes, and therefore large swings in *effective* tax rates. For example, a Boston Globe article from 2013 describes the case of a taxpayer whose property tax bill increased 9.6% from 2007 to 2013 during a period in which his home *fell in value* by 39%.[57] For taxpayers like the one in the Globe article, a decline in his home wealth was compounded by an increase in his tax liability, and an increase in his home wealth is only subsequently followed by an increase in his property taxes. For taxpayers who are not credit constrained, this delay in how changes in taxes track changes in the base does not matter much, but for taxpayers who are illiquid or credit-constrained, current tax liabilities need to come out of current cash expenditures. In this way, property taxes can reduce discretionary expenditures at exactly the time that the economy can least afford to lose the demand.

B. Data

For data on local government revenues and expenditures to use the

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[54] See also Dadayan, Lucy and Donald Boyd. 2012. "The Depth and Length of Cuts in State-Local Government Employment Is Unprecedented." The Nelson A. Rockefeller Institute of Government, Albany, NY. http://www.rockinst.org/pdf/government_finance/2013-01-09-State-Local_ Government_Employment.pdf.

[55] https://www.lincolninst.edu/sites/default/files/pubfiles/1959_1280_boyd_final.pdf

[56] Id. at 11.

[57] https://www.bostonglobe.com/metro/regionals/north/2013/01/27/values-fall-recession-but-homeowners-stuck-with-higher-tax-bills/EM4kjnktq1fCtMOAkTgHWN/story.html

Government Finance Database,[58] prepared by researchers at Willamette University, from the government finance data collected by the U.S. Census annually. The Census collects data from all counties every five years, in years that end in a 7 or 2. During the other years, the Census collects data from only a sample of counties. The sample is nonrandom, and tends to include much larger counties. For this reason, it is not possible to create a representative annual panel data set of government finances for the universe of counties. As a measure of household consumption, I follow the recent literature by using data on new car purchases from Mian, Rao, and Sufi (2012).[59]

I supplemented this database with information from a variety of other sources. Data on median home prices was collected from Zillow; data on violent crimes and property crimes was collected from the FBI's Uniform Crime Reports; I used the Bureau of Labor Statistics' Local Area Unemployment Statistics for data on county unemployment rates and labor force participation; and I used data from the IRS's Statistics of Income division on aggregate income and filing at the county level. Data on the composition of the local economy, including employment in the retail and construction sectors, was collected from the Census' County Business Patterns data series, and population and poverty data were taken from the Census' Small Area Income and Poverty Estimates program. Employment in the retail sector is important, because retail is generally understood to be a nontradable sector, so that spending in local shops and restaurants has a greater multiplier effect than expenditures on traded goods. Employment in the construction sector is important because it is associated with housing market conditions.

As the examples in Part II suggest, the relationship between the tax base and the local economy's resilience depend on the share of households' consumption that is "committed", and the households' credit constraints. I use homeownership rates reported in the American Community Survey for 2010 as a measure of households' committed consumption at the county level. For measures of credit constraints, I use data on 2001 and 2006 debt/income ratios also published by Mian, Rao, and Sufi (2012).[60]

Using these data, I report summary statistics and suggestive correlations about the relationship between county tax bases and the resilience to negative economic shocks. There are significant challenges to identifying a

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[58] Pierson K., Hand M., and Thompson F. (2015). The Government Finance Database: A Common Resource for Quantitative Research in Public Financial Analysis. PLoS ONE doi: 10.1371/journal.pone.0130119

[59] Mian, A., K. Rao, and A. Sufi, *Household Balance Sheets, Consumption, and the Economic Slump*, 128 QTR. J. ECON. 1687 (2013).

[60] Id.

causal effect of the tax base on the magnitude of a recession and the pace of the recovery First, the choice of the tax base may be endogenous to the composition of the local economy which, in turn, may affect its resiliency. Second, the local tax base that I measure may be correlated with policy changes which I do not observe made by the local government during the recession, or with being the beneficiary of policies adopted at the federal level. I do not claim that the regression estimates reported in Tables 3-4 and 7-8 represent the exact causal effect of the tax base on economic outcomes. Nevertheless, I believe the evidence reported here sheds the first light on the relationship between tax bases and both household consumption and government spending during recessions, and is suggestive of avenues for further research.

In each of Subparts C and D, I report summary statistics for the counties experiencing the smallest and largest increases in unemployment during either the Great Recession, or 2001 recession, respectively. I also report summary statistics for the counties that experienced the smallest and largest recoveries to pre-recession levels of unemployment. In a series of OLS regressions I explore the relationship between the local tax base and a variety of local economic outcomes, and government revenue and expenditure outcomes.

C. Great Recession

Figures 1 and 2 show the areas of the country that were hit hardest by the Great Recession, and the areas of the country that rebounded most strongly by 2012. The two maps are nearly complements to each other, illustrating that the counties that suffered the largest increases in unemployment from 2007 to the trough were also those that had the slowest recoveries. Although Nevada has appeared prominently in news stories documenting the housing market collapse, Arizona, Utah, Idaho, and Colorado in the region also experienced very large increases in unemployment, along with Florida and the Southeast. By contrast, the Dakotas, Minnesota, parts of Michigan, and a scattering of counties in the middle of the country down through Texas had almost completely recovered to pre-recession rates of unemployment by 2012. I note, however, that due to missing data the two maps are not strictly comparable.

Figures 3 and 4 are scatterplots showing how the depth of the recession (measured by the percent increase in the unemployment rate) and the recession recovery, respectively, vary with counties' reliance on the income tax, property tax, and sales tax. Looking at Figure 3, it appears that counties that were more reliant on the income tax tended to suffer more, and counties that were more reliant of the property tax suffered smaller increases in

unemployment. In the case of the sales tax, there is a nonmonotonic relationship. Counties in which the sales tax was either the dominant source of tax revenue or only a trivial source of revenue tended to suffer less than counties where the sales tax was a meaningful but not dominant source of tax revenue. The scatterplots in Figure 4 are more difficult to interpret, but seem to suggest that counties that were more reliant on the property tax tended to recover more quickly.

Counties with the Biggest Spike in Unemployment

For Table 1, I divided up all U.S. counties into five quintiles according to the percent increase in unemployment they experience from 2007 until the recession's trough. The mean increase in unemployment rate is 2.42 percentage points for the bottom quintile, and 6.78 percentage points for the top quintile. The counties that did worse tended to have higher debt/income ratios, reflecting more severe credit constraints. They tended to have larger populations and be more urban, have higher incomes and lower poverty rates, and have more valuable homes. Unsurprisingly, given the nature of the recession, they tended to have worse-performing housing markets and a higher share of the workforce employed in construction: 8%, compared to 4% for the counties that have the smallest increases in unemployment.

Local government tax and expenditure policy is also correlated with the depth of the recession. Counties that suffered the most tended to have higher expenditures per capita in 2007 than counties that suffered less. The counties with the highest increase in unemployment also tended to be less reliant on the property tax and more reliant on the income tax.

Counties with the Largest Employment Rebound by 2012

Table 2 reports summary statistics for five groups of counties, depending on how much of the spike in unemployment had disappeared by 2012. For example, in quintile five, the average county had recovered 91% of the increase in unemployment sustained from 2007 until the trough. By contrast, in quintile one, the average county had recovered only 13% of the increase in unemployment from 2007 until the trough.

The counties that covered most by 2012 with those with lower debt/income ratios in 2007 (the most recent year for which I have data), which is consistent with what Figures 1 and 2 suggest: that the counties that suffered most were also the ones with the slowest recoveries by 2012. The fastest recoveries were in more rural counties with smaller populations, an interesting fact that is in tension with popular reporting about the geographic dispersion of recovery from the recession.

Otherwise, the 2012 summary statistics cannot easily be compared with those from 2007, since the recession itself would affect some of the variables reported here, including the poverty rate and median income. It is interesting to note that the counties with the most successful recoveries in fact have lower home values on average, as well as lower rates of violent crime and property crime. The most resilient counties were also, perhaps surprisingly, those that experienced the largest decrease in retail employment 2007 until the trough of the great recession.

Although the relationship is nonmonotonic across all five quintiles, counties that recovered the most had the highest local government expenditure per capita, and were most reliant on the property tax of all counties. Thus, in the Great Recession, greater reliance on the property tax is associated with both a less severe increase in unemployment, and a quicker recovery to prerecession rates of unemployment. The income tax, on the other hand, is associated with larger spikes in unemployment and generally slower recoveries. The higher rates of local government expenditure for the most resilient counties suggests that local government expenditures may have been important channel through which local taxes influenced the recession and the recovery.

Relationship Between the Tax Base and Fiscal Outcomes

To explore this relationship more comprehensively, I ran a series of OLS regressions attempting to explain the percent change in a variety of local government revenue and expenditure variables from 2007 to 2012. I chose this time window because, as noted above, the complete census of all county governments is conducted only every five years. Table 3 reports the results. All regressions include state fixed effects and robust standard errors. The primary explanatory variables of interest are property tax/taxes, income tax/taxes, and sales tax/taxes. These variables are all calculated as of 2007, and captures the relative importance of each kind of tax as a source of tax revenue.

Column 1 reports the coefficient estimates for a regression of the percentage change in taxes on these three measures of the tax base. County tax revenues increased more, or decreased least, the more reliant the county is on property taxes and sales taxes. This first result is consistent with findings that the property taxes a more stable source of revenue and other taxes. It is perhaps a little surprising that counties with a significant source of sales tax revenue also tended to have more stable tax revenue from 2007 to 2012. Column 2 interacts the three different taxes with the county's homeownership rate in 2010, which I use as a proxy for the importance of committed consumption in the county. I also include the county's

debt/income ratio as a proxy for credit constraints, and the coefficient on this variable is negative and statistically significant at the 5% level. The examples in Part II suggest that counties with more severe credit constraints might be expected to have bigger declines in tax revenues, particularly in counties that are reliant on sales tax. The interaction terms between the tax base and homeownership rates are not statistically significant, and the main effect of the homeownership rate is not statistically significant at conventional levels either. I note that debt/income data are not available for all counties, and so hypotheses tests have less power in this regression model.

Columns 3 through 7 regress the percent change in local government revenues and expenditures on property taxes, income taxes, and sales taxes as shares of revenue in 2007. I use revenue in the denominator to better capture the significance of the tax on the county's budget as a whole. Property taxes and sales taxes are associated with more stable revenues and total government expenditures from 2007 to 2012. Income taxes, on the other hand, are associated with declines in revenues and total government expenditures (although the coefficient estimates are not statistically significant), and associated in particular with the reduction in local government expenditures on salaries and wages. Taken together, these regressions are consistent with evidence about the stabilizing effect of property taxes on local government revenues and expenditures. Surprisingly, they also suggest that the sales tax also help stabilize local government revenues and spending during the downturn. Counties that relied on the income tax, by contrast, cut back on public-sector compensation.

Relationship Between the Tax Base and Economic Outcomes

Table 4 focuses on the relationship between the local tax base and economic outcomes. The coefficient estimates in column 1 show that the counties experiencing larger increases in unemployment tended to be those that were more reliant on income tax, that had higher rates of homeownership and a higher share of the labor force in construction, and where households were more highly leveraged. This is consistent with the example in Part II illustrating the decline in household expenditures and tax revenues in the case of a shock to household income. That example predicts a more severe recession in the presence of committed consumption and credit constraints.

Column 2 depicts the interaction of the tax base with homeownership rates, but the interaction terms are not statistically significant at conventional levels. Columns 3 and 4 explore the effect of the tax base on

the percent decline in retail employment, but there is not much evidence of a relationship between the tax base and retail employment.[61]

Columns 5-10 estimate the effect of the tax base on percent changes in unemployment, retail employment and automotive sales for 2007 to 2010.[62] Consistent with the estimates in column 1, column 5 suggests that higher unemployment is associated with reliance on the income tax, higher homeownership rates, higher rates of household leverage, and a high share of the economy involved in construction. To explore the predictions from the examples in Part II, column 6 interacts the different components of the tax base with homeownership rates in 2010, and fully interacts the property tax with both homeownership and household leverage. Interestingly, although the main effect of the property taxes is to reduce the effect of the recession on unemployment, property taxes are associated with deeper recessions both in counties with higher rates of homeownership, and greater household leverage, but that in counties with both high homeowner rates and high debt/income ratios the property tax again serves to dampen the recession.

My two measures of changes in household expenditures are the change in retail employment and car sales. The first measure is, admittedly, an indirect measure and car sales are a better measure of discretionary consumption. The tax base does not have a very strong relationship with declines in retail employment from 2007 to 2010, but there is an interesting relationship between the presence of a local income tax and change household consumption. Although the income tax is associated with reduced car purchases, that effect diminishes as the homeownership rate increases. This is consistent with the example of a housing recession described in Part II. Households with low adjustment costs facing negative housing shock will cut back on discretionary expenditures in order to finance a move into better housing. Homeowners, on the other hand, who can only adjust their housing consumption at a significant cost, will maintain the same level of discretionary consumption as before the housing shock because they cannot smooth between housing and other consumption. Thus, we would expect to see in jurisdictions with an income tax and a negative housing shock that higher rates of homeownership are associated with smaller declines in discretionary consumption.

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[61] Although the coefficient of the sales tax variable is significant at the 5% level, sales tax collections or endogenous with retail employment, so the result is difficult to interpret.

[62] The fact that the number of observations for these regressions is similar to the number of observations for the first four regressions reflects the fact that the debt/income variable is generally available for the larger counties that appear in the sample used by the census in years other than those ending in 2 or 7.

D. 2001 Recession

The maps in Figures 5 and 6 illustrate how different the 2001 recession was from the Great Recession. The largest increases in unemployment during the 2001 recession occurred in the Virginia and West Virginia, the Carolinas, Michigan to Colorado, and also in the Northeast, including Massachusetts, Connecticut, and Rhode Island. By 2005, the employment recovery was widespread with regions in the West, Texas, in the deep South enjoying lower unemployment rates than even the pre-recession period.

Local tax base is also less predictive of the depth of the 2001 recession and the pace of recovery. Figures 7 and 8 show how the tax base, measured in 1997 (the last year of a full local government census before the 2001 recession) is associated with the percent increase in unemployment, and the unemployment recovery by 2005. There is perhaps a positive relationship between a county's reliance on the income tax and the severity of the 2001 recession, but the relationship is noisy.

Counties with the Biggest Spike in Unemployment

The 2001 recession was, of course, much less severe than the Great Recession, but it also differed along a variety of dimensions. Table 5 shows the characteristics of counties broken out by the magnitude of the unemployment increase from 2000 to the trough of the recession. Across the board, the increase in unemployment was smaller than in the Great Recession. Many of the variables that predict unemployment spikes in the Great Recession did not exhibit the same correlation for the 2001 recession.

It is true that the counties that suffer most tended to have higher median incomes, but neither debt/income ratios, county population, nor home values appear to be very predictive of the severity of the 2001 recession. Interestingly, median home values rose faster in counties that experienced the largest surge in unemployment, and the retail sector also performed better in these counties.

Counties with the Largest Employment Rebound by 2005

Also in sharp contrast to the Great Recession, five years after the onset of the 2001 recession, many counties had flourishing labor markets, with unemployment rates lower than the prerecession period. In the top quintile, the average county had recovered roughly 200% of the spike in unemployment it experienced during the recession. A close look at these counties suggests that they may be the places where the seeds of the Great

Recession were planted. These counties are characterized by high amounts of household leverage, booming residential housing markets in which the median home increase in value by 18% from 2000 to 2005, and a high share of local unemployment involved in construction. At the same time, these were neither the largest counties nor the counties with the highest incomes. The recovery/boom tended to be more of a suburban phenomenon than it was in the Great Recession.

Relationship Between the Tax Base and Fiscal Outcomes

Table 7 reports the regression estimates from a series of regressions exploring the relationship between the county tax base and the percent change in a variety of budget variables from 2000 to 2003. Also unlike the Great Recession, the local tax base does not have a statistically significant correlation with the change in tax revenue. There is some evidence, in columns 3 to 6 that counties more reliant on the property tax as a source of revenue increased overall expenditures, relative to other counties, particularly on police protection, and that counties that were more reliant on the sales tax as a source of revenue had relative increases in revenues, and total expenditures, particularly on salaries and wages. However these relationships are only borderline statistically significant.

Relationship Between the Tax Base and Economic Outcomes

Table 8 explores the relationship between local tax base and changes in the unemployment rate overall and employment in the retail sector both from 2000 to the trough of the recession, and from 2000 to 2003. Column 1 shows that counties that were more reliant on the income tax experienced larger surges in unemployment during the recession. Credit constraints had a particularly significant adverse effect on unemployment during the 2001 recession. As the examples in Part II illustrate, a household that experiences a negative income shock that is unable to borrow against future income must bear the full shock in the form of reduced current consumption, thus potentially aggravating the recession in those counties with more binding credit constraints. Looking at column 2, the main effect of the sales tax is to mitigate unemployment shocks, but the interaction with the homeownership rates is positive, suggesting that the sales tax aggravates unemployment in counties with higher rates of committed consumption.

Retail employment is one outcome that is affected by household consumption decisions. Column 3 suggests that counties that were more reliant on the property tax and had higher household leverage were better able to support retail spending, but that retail employment tended to fall in

counties with higher homeownership rates. This is consistent with the example in Part II, again, which suggests that high rates of homeownership require households to reduce their discretionary expenditures on retail goods following a negative income shock. The results in columns 5-8 are generally consistent with the regression estimates from the first four regressions.

CONCLUSION

Scholarship on the efficiency properties of tax bases has largely neglected how those bases function during recessions, when household and government spending have positive income externalities and effects on output. In fact, the choice between an income tax, sales tax, and real property tax does have consequences for the resilience of the local economy and which sectors suffer the most. More specific conclusions depend importantly on households' access to credit, their costs of adjusting in the wake of a recessionary shock, and the cause of the recession.

APPENDIX

Expenditures and Income by Period, Tax Regime, and Shock

BASELINE

	Period 1				*Period 2*			
	Housing	Food	Tax	Income	Housing	Food	Tax	Income
Property Tax	40	50	10	100	40	50	10	100
Income Tax	45	45	10	100	45	45	10	100
Sales Tax	50	40	10	100	50	40	10	100

Income shock in period 1 - Property Tax

	Period 1				*Period 2*			
	Housing	Food	Tax	Income	Housing	Food	Tax	Income
Full adjustment	36	45	9	80	36	45	9	100
No adjustment	40	30	10	80	40	50	10	100
Borrowing only	40	40	10	80	40	40	10	100

Income shock in period 1 - Income Tax

	Period 1				*Period 2*			
	Housing	Food	Tax	Income	Housing	Food	Tax	Income
Full adjustment	40.5	40.5	8	80	40.5	40.5	10	100
No adjustment	45	27	8	80	45	45	10	100
Borrowing only	45	36	8	80	45	36	10	100

Income shock in period 1 - Sales Tax

	Period 1				*Period 2*			
	Housing	Food	Tax	Income	Housing	Food	Tax	Income
Full adjustment	45	36	9	80	45	36	9	100
No adjustment	50	24	6	80	50	40	10	100
Borrowing only	50	32	8	80	50	32	8	100

Housing shock in period 1 - Property Tax

	Period 1				*Period 2*			
	Housing	Food	Tax	Income	Housing	Food	Tax	Income
Full adjustment	36	45	9	100	36	45	9	100
No adjustment	20	55	5	100	40	50	10	100
Borrowing only	20	52.5	5	100	40	52.5	10	100

Housing shock in period 1 - Income Tax

	Period 1				*Period 2*			
	Housing	Food	Tax	Income	Housing	Food	Tax	Income
Full adjustment	40	40	10	100	40	40	10	100
No adjustment	45	45	10	100	45	45	10	100
Borrowing only	45	45	10	100	45	45	10	100

Housing shock in period 1 - Sales Tax

	Period 1				*Period 2*			
	Housing	Food	Tax	Income	Housing	Food	Tax	Income
Full adjustment	45	36	9	100	45	36	9	100
No adjustment	50	40	10	100	50	40	10	100
Borrowing only	50	40	10	100	50	40	10	100

Figure 1: Percent Increase in Unemployment from 2007 to Trough

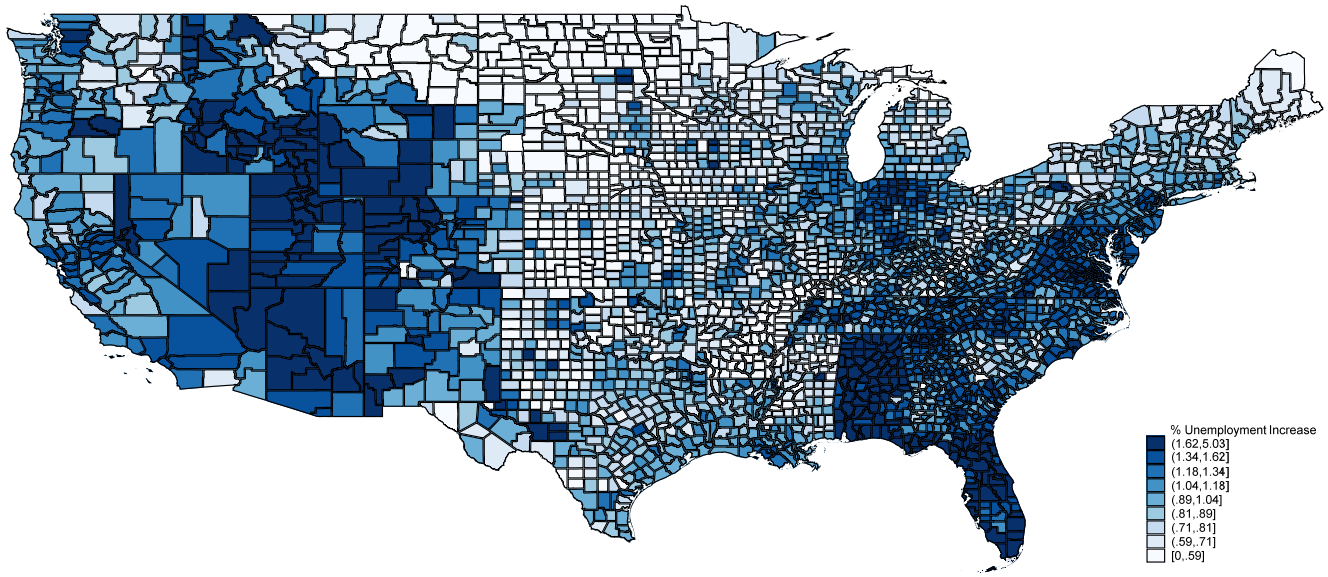


Figure 2: Percent Recovery of Increase in Unemployment by 2012

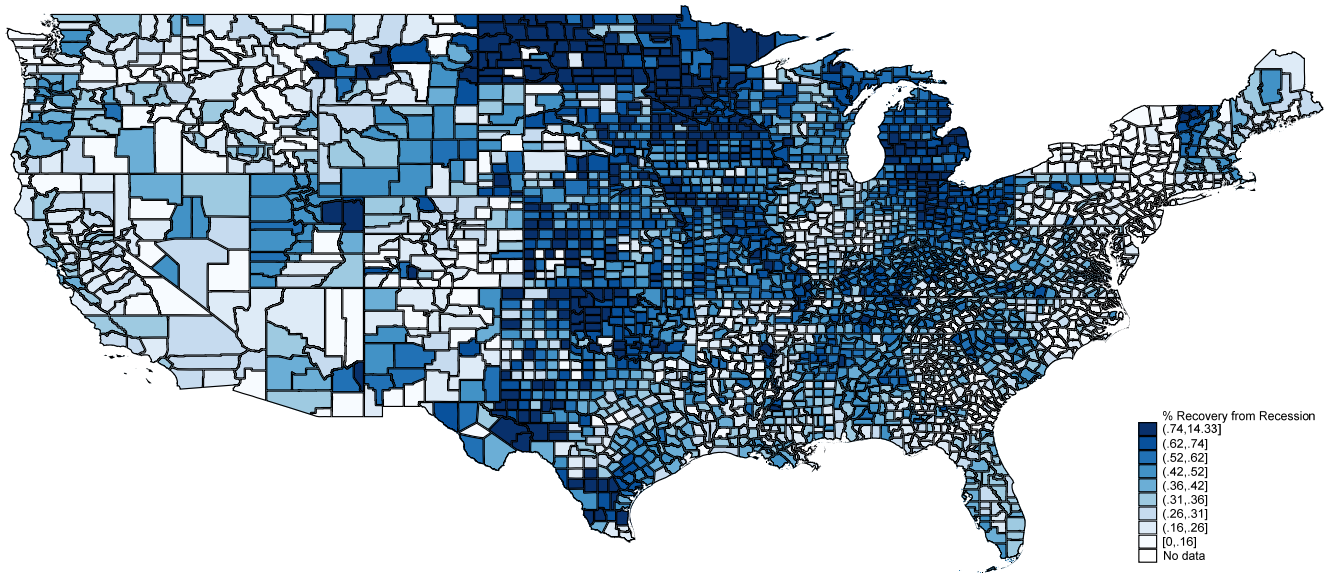
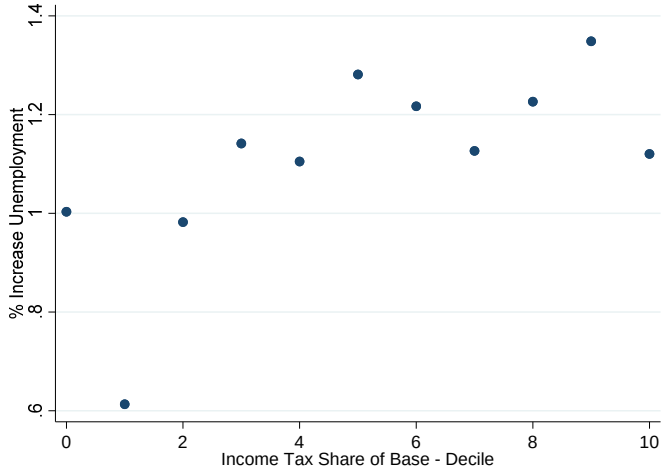
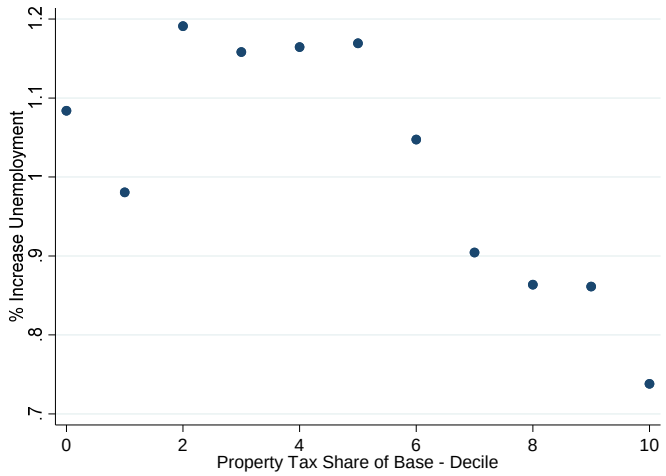


Figure 3: Relationships Between 2007 Income, Property and Sales Tax Share of Base and Depth of Unemployment Trough





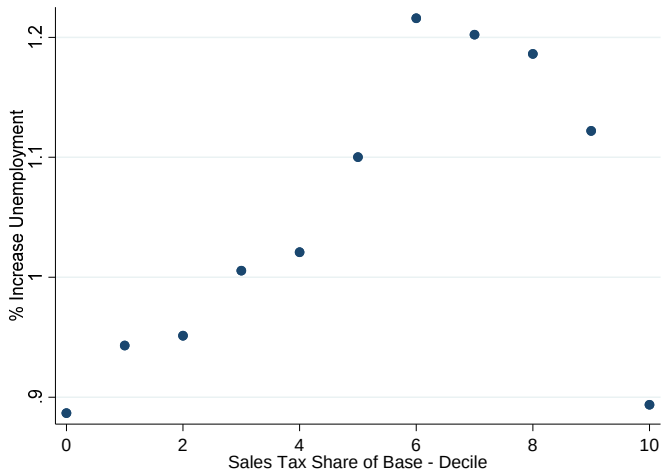
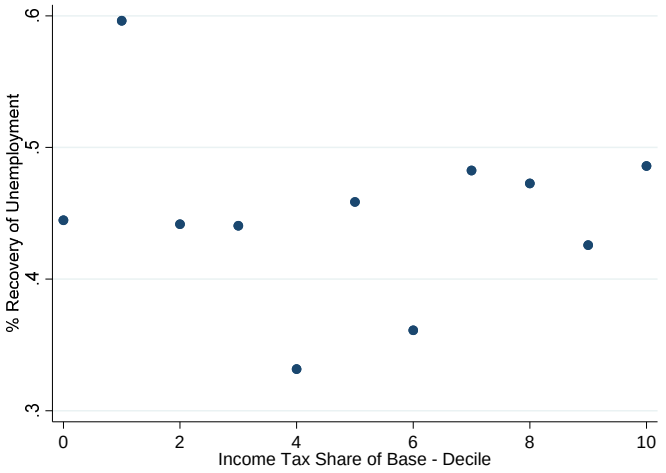
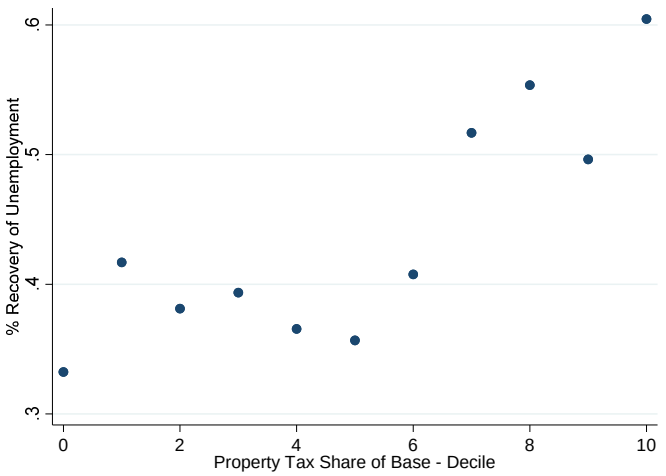


Figure 4: Relationships Between 2007 Income, Property and Sales Tax Share of Base and Depth of Recovery to Pre-Recession Unemployment





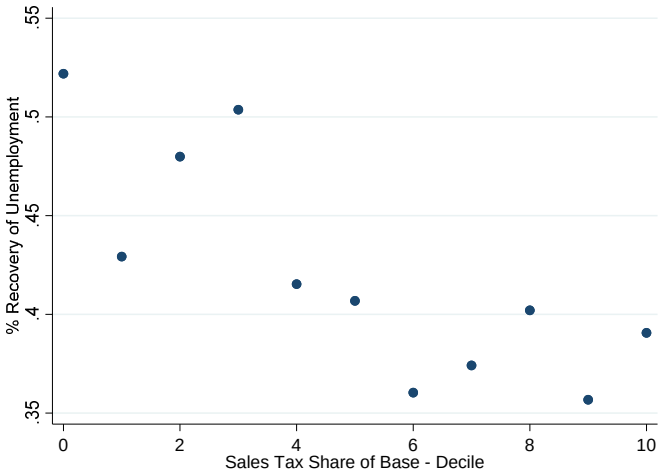


Figure 5: Percent Increase in Unemployment from 2000 to Trough

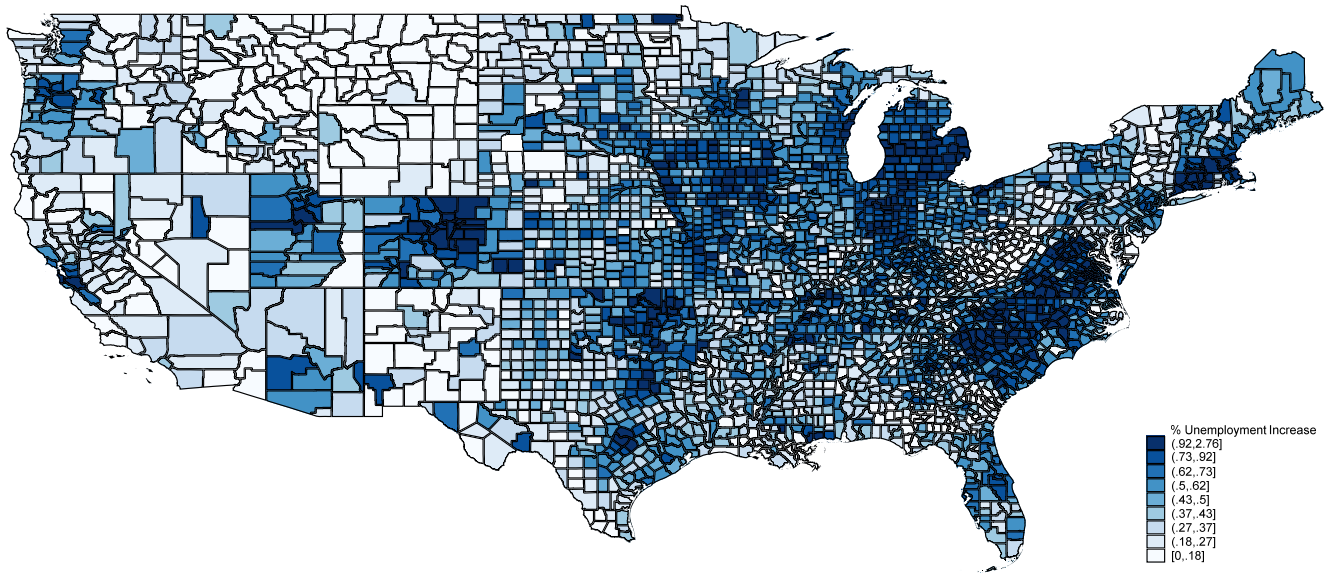


Figure 5: Percent Recovery of Increase in Unemployment by 2005

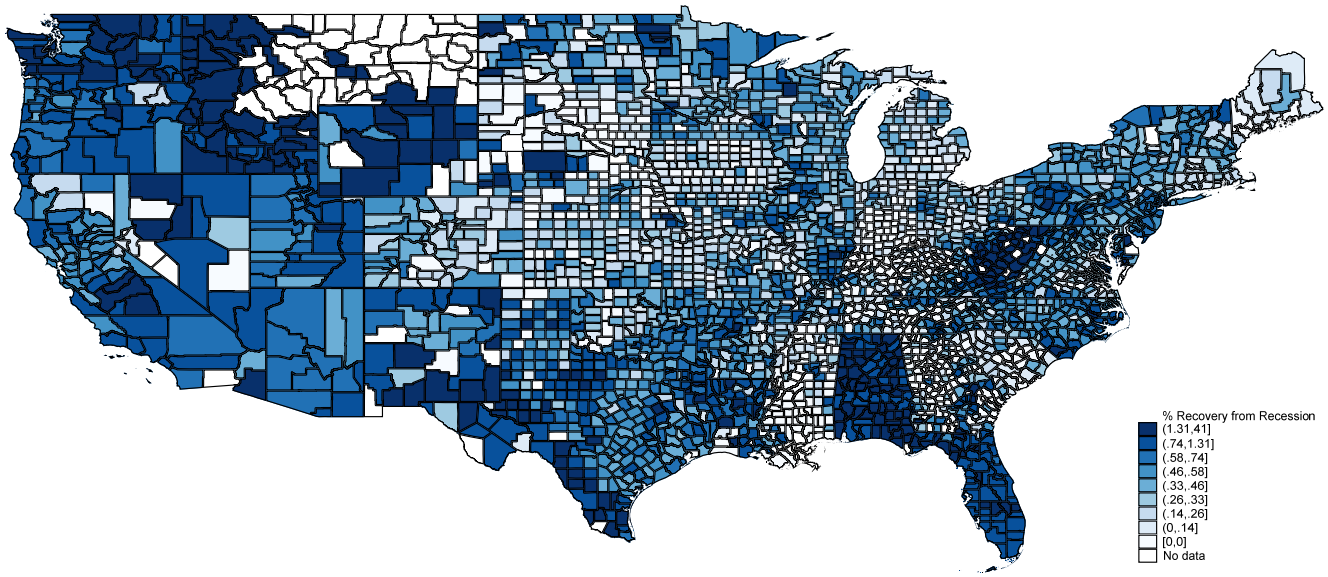
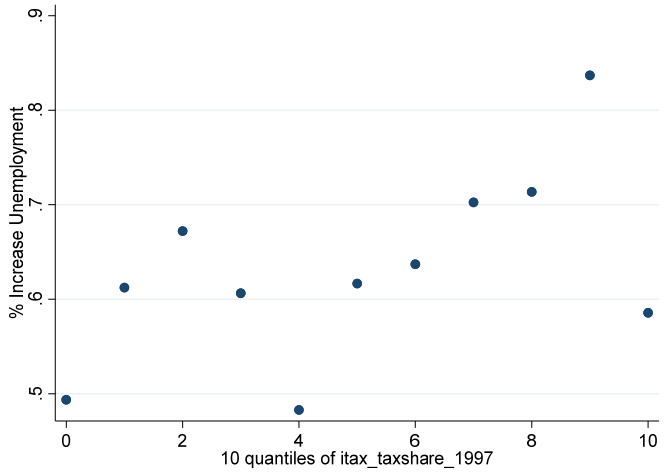
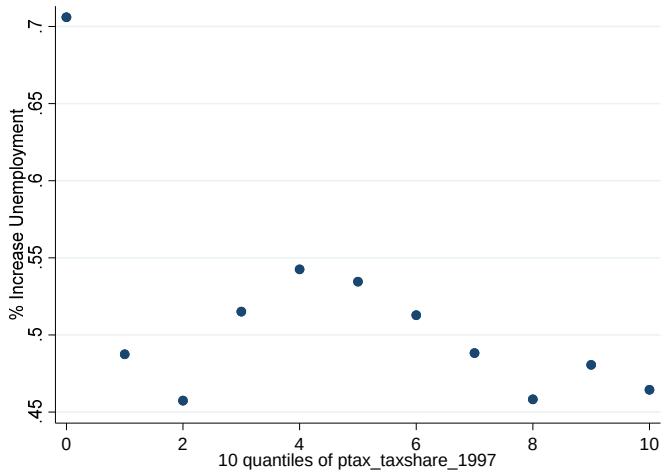


Figure 7: Relationships Between 1997 Income, Property and Sales Tax Share of Base and Depth of Unemployment Trough





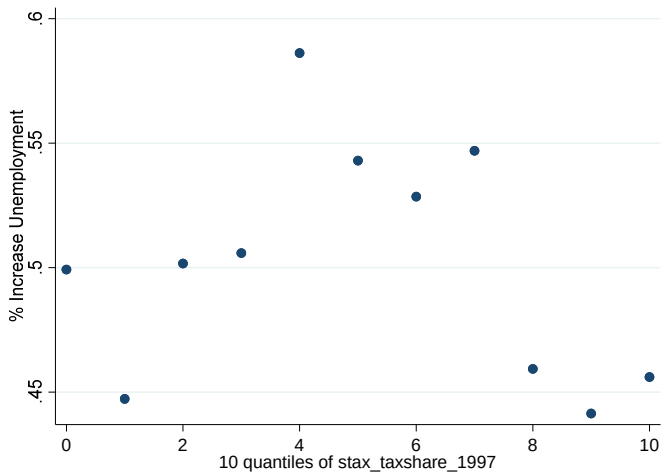
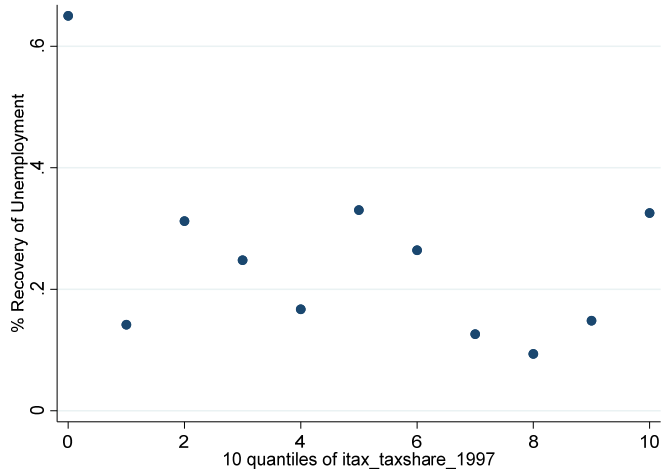
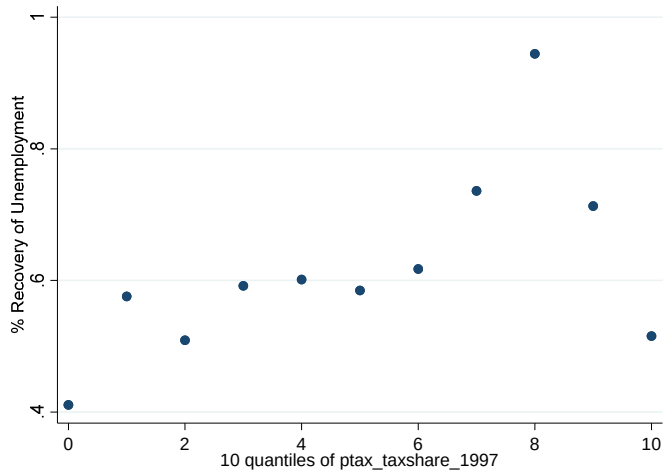


Figure 8: Relationships Between 1997 Income, Property and Sales Tax Share of Base and Depth of Recovery to Pre-Recession Unemployment





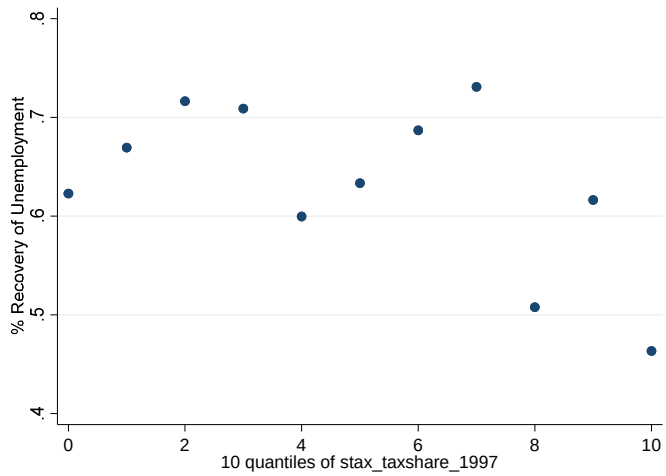


Table 1: Characteristics of Counties in 2007 by Increase in Unemployment

	Quintile of % Increase Unemployment					
	1	2	3	4	5	Total
Increase Unemp. Rate	2.42	3.88	4.81	5.68	6.78	4.71
	(1.36)	(1.23)	(1.51)	(1.44)	(2.02)	(2.15)
Debt/Income	1.36	1.43	1.53	1.70	1.96	1.62
	(0.41)	(0.45)	(0.53)	(0.62)	(0.74)	(0.62)
Unemployment Rate	0.05	0.05	0.05	0.05	0.04	0.05
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)
Population	25,724.79	70,816.43	94,545.42	118,496.52	136,385.13	88,732.69
	(71,063.66)	(145305.55)	(256150.17)	(307654.91)	(511529.54)	(300674.23)
Total Expenditure/Pop	1.39	1.15	1.26	1.40	1.67	1.37
	(1.57)	(2.11)	(1.27)	(1.13)	(1.31)	(1.53)
Poverty Rate	0.16	0.15	0.16	0.15	0.14	0.15
	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Median Income	38,533.17	41,589.51	42,401.78	45,061.88	45,940.69	42,702.03
	(7,649.54)	(9,307.11)	(10,375.75)	(12,954.07)	(12,098.86)	(10,962.74)
Median Home ($10k)	11.90	14.03	16.77	20.52	21.55	18.35
	(5.58)	(7.39)	(10.51)	(13.60)	(14.07)	(12.27)
Violent Crime/1000	0.86	1.15	1.38	1.55	1.33	1.25
	(0.93)	(0.98)	(1.21)	(1.19)	(1.05)	(1.10)
Property Crime/1000	2.71	3.75	3.99	4.28	3.93	3.73
	(2.66)	(2.61)	(2.65)	(2.85)	(2.78)	(2.76)
Rural/Urban Code	6.79	5.00	4.75	4.18	4.28	5.00
	(2.30)	(2.56)	(2.60)	(2.60)	(2.62)	(2.71)
% Const. Employ.	0.04	0.05	0.05	0.06	0.08	0.06
	(0.05)	(0.03)	(0.04)	(0.04)	(0.06)	(0.05)
Property Tax Share	0.81	0.76	0.72	0.68	0.67	0.73
	(0.23)	(0.24)	(0.23)	(0.22)	(0.19)	(0.23)
Income Tax Share	0.13	0.40	0.38	0.42	0.46	0.38
	(0.23)	(0.19)	(0.18)	(0.19)	(0.16)	(0.21)
Sales Tax Share	0.25	0.28	0.26	0.26	0.27	0.26
	(0.25)	(0.24)	(0.22)	(0.20)	(0.18)	(0.22)
% Chg Median Home	0.03	0.02	0.01	0.01	0.00	0.01
	(0.05)	(0.06)	(0.06)	(0.06)	(0.08)	(0.07)
% Decline Retail Emp.	0.39	0.26	0.28	0.27	0.29	0.30
	(0.30)	(0.21)	(0.23)	(0.21)	(0.21)	(0.24)

Table 2: Characteristics of Counties in 2012 by Recovery to Pre-Recession Unemployment

	Quintile of Recovery					
	1	2	3	4	5	Total
Recovered Share of Unemp. Increase	0.13 (0.07)	0.28 (0.03)	0.39 (0.04)	0.53 (0.05)	0.91 (0.93)	0.45 (0.49)
2007 Debt/Income	1.70 (0.62)	1.82 (0.74)	1.59 (0.65)	1.46 (0.46)	1.49 (0.42)	1.70 (0.62)
Unemployment Rate	0.09 (0.03)	0.08 (0.02)	0.08 (0.02)	0.07 (0.02)	0.06 (0.03)	0.08 (0.03)
Population	103,410.68 (188485.02)	136,360.97 (516257.38)	111,669.02 (348163.13)	66,072.33 (161719.33)	42,943.39 (114946.97)	91,661.04 (304432.91)
Total Expenditure/Pop	1.70 (1.35)	1.54 (2.06)	1.43 (1.34)	1.39 (1.44)	1.81 (2.71)	1.57 (1.87)
Poverty Rate	0.19 (0.07)	0.18 (0.07)	0.17 (0.06)	0.17 (0.06)	0.15 (0.05)	0.17 (0.07)
Median Income	44,566.61 (13,156.34)	45,728.08 (13,118.22)	44,316.65 (10,196.37)	43,880.30 (10,321.21)	45,628.34 (9,602.66)	44,823.91 (11,400.03)
Median Home ($10k)	15.98 (8.95)	15.62 (8.85)	14.15 (9.23)	12.17 (5.35)	11.67 (6.00)	14.32 (8.31)
Violent Crime/1000	1.32 (1.10)	1.13 (1.00)	1.04 (1.13)	0.95 (0.81)	0.86 (0.89)	1.06 (1.00)
Property Crime/1000	4.58 (3.11)	3.94 (3.05)	3.97 (3.19)	3.73 (2.54)	2.87 (2.37)	3.81 (2.92)
Rural/Urban Code	4.64 (2.64)	4.44 (2.64)	4.60 (2.68)	5.18 (2.68)	6.13 (2.53)	5.00 (2.71)
% Const. Employ.	0.04 (0.05)	0.04 (0.04)	0.04 (0.04)	0.04 (0.03)	0.04 (0.03)	0.04 (0.04)
Property Tax Share	0.68 (0.26)	0.73 (0.25)	0.73 (0.25)	0.68 (0.26)	0.76 (0.27)	0.72 (0.26)
Income Tax Share	0.01 (0.06)	0.02 (0.09)	0.03 (0.12)	0.04 (0.14)	0.02 (0.09)	0.02 (0.11)
Sales Tax Share	0.23 (0.23)	0.15 (0.18)	0.15 (0.17)	0.21 (0.23)	0.17 (0.23)	0.18 (0.21)
% Chg Median Home	-0.02 (0.05)	-0.01 (0.05)	-0.00 (0.05)	-0.00 (0.05)	0.00 (0.05)	-0.01 (0.05)
% Decline Retail Emp.	0.19 (0.26)	0.17 (0.22)	0.19 (0.23)	0.19 (0.23)	0.24 (0.28)	0.19 (0.24)

Table 3: County Tax Bases and Fiscal Changes 2007-2012

	2007-2012 Percent Change						
				Expenditures			
	(1) Taxes	(2) Taxes	(3) Revenues	(4) Total	(5) Wages	(6) Police	(7) Public Welfare
Property Tax/Taxes	0.362***	0.324					
	(3.86)	(0.35)					
Income Tax/Taxes	0.0937	-1.178					
	(0.75)	(-1.08)					
Sales Tax/Taxes	0.242**	-0.201					
	(2.33)	(-0.21)					
2010 Homeowner %		-0.105					
		(-0.09)					
Property Tax/Taxes # 2010 Homeowner %		0.102					
		(0.08)					
Income Tax/Taxes # 2010 Homeowner %		1.890					
		(1.30)					
Sales Tax/Taxes # 2010 Homeowner %		0.611					
		(0.49)					
Debt/Income		-0.0255**					
		(-1.99)					
Property Tax/Revenues			0.315***	0.269***	-0.0538	0.0317	0.511
			(4.34)	(4.37)	(-0.76)	(0.31)	(0.87)
Income Tax/Revenues			-0.142	-0.231	-1.508***	-0.378	-0.480
			(-0.68)	(-0.94)	(-3.05)	(-0.71)	(-0.21)
Sales Tax/Revenues			0.454***	0.381***	0.186	-0.298	2.413*
			(3.60)	(2.69)	(1.58)	(-1.37)	(1.96)
Population	-4.49e-08**	-3.21e-08*	-4.69e-08***	-1.37e-08	2.32e-09	-7.54e-08**	-6.29e-08
	(-2.22)	(-1.95)	(-3.42)	(-1.19)	(0.19)	(-2.43)	(-0.44)
r2	0.185	0.225	0.206	0.201	0.127	0.127	0.0657
N	2969	2111	2969	2969	2938	2919	2108
t statistics in parentheses	* p<0.10	** p<0.05	*** p<0.01				

Table 4: County Tax Bases and Recession Outcomes from 2007-Trough and 2007-2010

	2007-Trough Percent Change					2007-2010 Percent Change				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Unemp. Inc.	Unemp. Inc.	Retail Decr.	Retail Decr.	Unemp.	Unemp.	Retail Emp.	Retail Emp.	Car Sales	Car Sales
Property Tax/Revenues	-0.0415	-1.832	0.0146	0.930	0.00498	-2.630**	-0.0473	0.875	0.0242	0.0303
	(-0.77)	(-1.55)	(0.51)	(1.39)	(0.10)	(-2.57)	(-1.64)	(1.38)	(1.55)	(0.11)
Income Tax/Revenues	0.389**	-0.630	-0.0821	-0.475	0.592***	0.949	-0.101	0.932	-0.0581	-1.160**
	(2.20)	(-0.45)	(-0.87)	(-0.69)	(4.06)	(0.85)	(-0.89)	(1.21)	(-1.25)	(-2.56)
Sales Tax/Revenues	0.157*	-0.0245	-0.0857**	0.201	0.160*	0.0484	0.0436	0.0638	0.00898	-0.0223
	(1.70)	(-0.05)	(-2.00)	(0.72)	(1.80)	(0.11)	(0.93)	(0.19)	(0.34)	(-0.15)
2010 Homeowner %	0.427***	0.759	0.590***	1.185***	0.258***	0.197	0.0176	0.177	-0.139***	-0.244*
	(4.85)	(1.41)	(11.54)	(4.15)	(3.16)	(0.42)	(0.33)	(0.60)	(-5.23)	(-1.83)
Debt/Income	0.0564***	0.202	-0.0226***	0.224*	0.0801***	0.0365	-0.0229**	-0.0116	-0.00951**	-0.0510
	(4.04)	(0.85)	(-2.60)	(1.96)	(5.65)	(0.17)	(-2.38)	(-0.10)	(-2.37)	(-0.97)
% Const. Employ.	0.528***	0.630***	-0.0555	-0.0428	0.824***	0.921***	0.221	0.195	-0.0271	-0.0356
	(2.87)	(3.64)	(-0.44)	(-0.34)	(4.59)	(5.45)	(1.19)	(1.05)	(-0.50)	(-0.66)
Property Tax /Revenue # 2010 Homeowner %		2.254		-1.287		3.398**		-1.290		-0.0626
		(1.44)		(-1.41)		(2.51)		(-1.47)		(-0.17)
Property Tax/Revenue # Debt/Income		1.168		-0.571		1.686**		-0.425		-0.0198
		(1.55)		(-1.45)		(2.51)		(-1.14)		(-0.12)
2010 Homeowner % # Debt/Income		-0.220		-0.343**		0.0354		-0.0253		0.0443
		(-0.70)		(-2.19)		(0.13)		(-0.16)		(0.63)
Property Tax/Revenue # 2010 Homeowner % # Debt/Income		-1.460		0.802		-2.161**		0.598		0.0642
		(-1.50)		(1.50)		(-2.49)		(1.16)		(0.29)
Income Tax/Revenue # 2010 Homeowner %		1.421		0.551		-0.482		-1.415		1.527**
		(0.71)		(0.57)		(-0.31)		(-1.33)		(2.44)
Sales Tax/Revenue # 2010 Homeowner %		0.230		-0.398		0.134		-0.0164		0.0477
		(0.35)		(-1.03)		(0.21)		(-0.03)		(0.23)
Population	8.02e-08***	6.73e-08***	-4.08e-08**	-4.40e-08**	8.96e-08***	7.98e-08***	6.14e-09	9.31e-09**	8.54e-09*	9.36e-09*
	(4.55)	(3.95)	(-2.20)	(-2.40)	(4.21)	(3.88)	(1.34)	(1.97)	(1.79)	(1.83)
r2	0.643	0.648	0.159	0.161	0.676	0.680	0.0526	0.0562	0.595	0.598
N	2117	2117	2079	2079	2118	2118	2138	2138	2025	2025
t statistics in parentheses	* p<0.10	** p<0.05	*** p<0.01							

Table 5: Characteristics of Counties in 2000 by Increase in Unemployment

	Quintile of % Increase Unemployment					
	1	2	3	4	5	Total
Increase Unemp. Rate	0.72	1.50	1.95	2.35	3.27	1.96
	(0.51)	(0.51)	(0.61)	(0.76)	(1.21)	(1.14)
Debt/Income	1.10	1.08	1.01	1.08	1.14	1.08
	(0.35)	(0.37)	(0.31)	(0.33)	(0.34)	(0.34)
Unemployment Rate	0.06	0.05	0.04	0.04	0.03	0.04
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
Population	56,425.52	144,400.00	95,463.52	145,482.80	162,590.16	121,607.58
	(115319.93)	(562809.84)	(200131.86)	(382041.54)	(310307.23)	(350583.95)
Total Expenditure/Pop	1.08	0.86	0.81	0.83	1.00	0.92
	(2.77)	(0.69)	(0.77)	(0.83)	(0.92)	(1.43)
Poverty Rate	0.16	0.15	0.13	0.12	0.11	0.13
	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.06)
Median Income	32,705.07	34,450.27	35,498.79	38,088.70	41,175.43	36,377.44
	(7,111.12)	(7,575.54)	(7,259.04)	(8,913.64)	(11,057.39)	(9,006.00)
Median Home ($10k)	10.23	11.07	10.46	11.89	12.52	11.44
	(4.73)	(4.94)	(6.23)	(6.87)	(6.09)	(5.99)
Violent Crime/1000	1.58	1.47	1.20	1.28	1.40	1.39
	(1.34)	(1.26)	(1.05)	(1.18)	(1.15)	(1.20)
Property Crime/1000	4.65	4.81	4.45	4.03	4.30	4.44
	(3.00)	(3.10)	(3.03)	(2.88)	(2.86)	(2.98)
Rural/Urban Code	6.00	5.34	5.08	4.60	3.98	5.00
	(2.36)	(2.56)	(2.58)	(2.83)	(2.74)	(2.71)
% Const. Employ.	0.05	0.05	0.05	0.06	0.06	0.05
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Property Tax Share	0.76	0.74	0.74	0.74	0.75	0.75
	(0.22)	(0.23)	(0.22)	(0.24)	(0.20)	(0.22)
Income Tax Share	0.01	0.01	0.01	0.02	0.04	0.02
	(0.06)	(0.07)	(0.06)	(0.10)	(0.13)	(0.09)
Sales Tax Share	0.19	0.24	0.25	0.24	0.19	0.22
	(0.22)	(0.24)	(0.23)	(0.24)	(0.19)	(0.23)
% Chg Median Home	0.04	0.06	0.05	0.06	0.07	0.06
	(0.07)	(0.07)	(0.07)	(0.07)	(0.08)	(0.08)
% Decline Retail Emp.	0.23	0.20	0.20	0.19	0.18	0.20
	(0.25)	(0.22)	(0.20)	(0.21)	(0.19)	(0.22)

Table 6: Characteristics of Counties in 2005 by Recovery to Pre-Recession Unemployment

	Quintile of Recovery					
	1	2	3	4	5	Total
Recovered Share of Unemp. Increase	0.01 (0.03)	0.20 (0.06)	0.39 (0.05)	0.60 (0.08)	1.95 (2.81)	0.01 (0.03)
Debt/Income	1.07 (0.31)	1.06 (0.30)	1.07 (0.36)	1.07 (0.35)	1.15 (0.39)	1.07 (0.31)
Unemployment Rate	0.06 (0.02)	0.06 (0.02)	0.05 (0.02)	0.05 (0.01)	0.05 (0.02)	0.05 (0.02)
Population	82,075.89 (177486.40)	105,945.44 (156951.74)	176,604.73 (422592.90)	190,320.57 (404704.07)	165,123.38 (627682.19)	142,134.33 (392280.93)
Total Expenditure/Pop	1.09 (1.28)	1.09 (0.96)	1.17 (0.95)	1.35 (2.28)	1.09 (0.96)	1.16 (1.39)
Poverty Rate	0.16 (0.07)	0.14 (0.06)	0.14 (0.06)	0.15 (0.06)	0.17 (0.06)	0.15 (0.06)
Median Income	38,882.11 (9,466.53)	41,148.85 (9,874.43)	41,088.46 (11,566.22)	39,366.40 (10,600.61)	36,016.79 (7,677.19)	39,302.31 (10,092.56)
Median Home ($10k)	12.69 (5.98)	16.66 (10.67)	18.00 (11.10)	20.73 (15.07)	19.49 (12.75)	17.33 (11.68)
Violent Crime/1000	1.39 (1.23)	1.27 (1.06)	1.39 (1.08)	1.54 (1.28)	1.42 (1.21)	1.40 (1.18)
Property Crime/1000	4.48 (2.99)	4.24 (2.66)	4.33 (2.58)	4.65 (2.92)	4.23 (3.06)	4.39 (2.85)
Rural/Urban Code	5.03 (2.83)	4.66 (2.75)	4.81 (2.69)	4.90 (2.68)	5.36 (2.48)	4.95 (2.70)
% Const. Employ.	0.05 (0.04)	0.05 (0.05)	0.05 (0.04)	0.05 (0.04)	0.06 (0.04)	0.05 (0.04)
Property Tax Share	0.45 (0.40)	0.40 (0.40)	0.39 (0.40)	0.40 (0.40)	0.38 (0.39)	0.41 (0.40)
Income Tax Share	0.04 (0.13)	0.02 (0.09)	0.01 (0.08)	0.01 (0.06)	0.00 (0.02)	0.02 (0.08)
Sales Tax Share	0.08 (0.15)	0.10 (0.19)	0.11 (0.19)	0.10 (0.18)	0.09 (0.15)	0.10 (0.17)
% Chg Median Home	0.07 (0.06)	0.08 (0.08)	0.10 (0.08)	0.13 (0.09)	0.18 (0.13)	0.11 (0.10)
% Decline Retail Emp.	0.16 (0.20)	0.12 (0.15)	0.13 (0.16)	0.14 (0.19)	0.17 (0.23)	0.14 (0.19)

Table 7: County Tax Bases and Fiscal Changes 2000-2003

	2000-2003 Percent Change						
				Expenditure			
	(1) Taxes	(2) Taxes	(3) Revenues	(4) Total	(5) Wages	(6) Police	(7) Public Welfare
Property Tax/Taxes	0.0477	0.481					
	(0.34)	(0.39)					
Income Tax/Taxes	0.135	-0.292					
	(0.54)	(-0.13)					
Sales Tax/Taxes	-0.00207	-0.375					
	(-0.02)	(-0.30)					
2010 Homeowner %		0.460					
		(0.28)					
Property Tax/Taxes # 2010 Homeowner %		-0.574					
		(-0.33)					
Income Tax/Taxes # 2010 Homeowner %		0.701					
		(0.23)					
Sales Tax/Taxes # 2010 Homeowner %		0.516					
		(0.30)					
2001 Debt/Income		0.0656**					
		(2.45)					
Property Tax/Revenues			0.0858	0.191***	-0.0621	0.218**	0.00545
			(1.61)	(3.13)	(-0.75)	(2.29)	(0.01)
Income Tax/Revenues			0.216	-0.148	-0.0361	-0.121	-2.899
			(0.61)	(-0.41)	(-0.08)	(-0.35)	(-0.78)
Sales Tax/Revenues			0.167*	0.187*	0.265*	0.259	0.871
			(1.81)	(1.84)	(1.79)	(1.43)	(1.07)
Population	-2.08e-08***	-2.79e-08***	-2.51e-08***	-6.52e-09	-2.66e-08*	-1.05e-08	-6.16e-08
	(-2.61)	(-3.16)	(-2.69)	(-0.68)	(-1.73)	(-0.79)	(-1.32)
r2	0.175	0.204	0.119	0.104	0.0942	0.0876	0.0565
N	1319	1103	1319	1320	1319	1288	1061
t statistics in parentheses	* p<0.10	** p<0.05	*** p<0.01				

Table 8: County Tax Bases and Recession Outcomes from 2000-Trough and 2000-2003

	2000-Trough Percent Change				2000-2003 Percent Change			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unemp. Inc.	Unemp. Inc.	Retail Decr.	Retail Decr.	Retail Emp.	Retail Emp.	Unemp.	Unemp.
1997 Property Tax/Revenues	0.0775*	-1.389	-0.0910***	0.569	-0.00189	-1.099	0.0672	-1.331
	(1.79)	(-1.52)	(-3.49)	(0.98)	(-0.06)	(-1.27)	(1.59)	(-1.50)
1997 Income Tax/Revenues	0.702***	-0.548	-0.111	0.606	-0.0944	0.152	0.697***	0.356
	(3.56)	(-0.32)	(-1.08)	(0.93)	(-0.61)	(0.12)	(3.79)	(0.20)
1997 Sales Tax/Revenues	-0.0669	-1.055***	-0.0310	0.122	-0.0828*	-0.0679	-0.0545	-1.061***
	(-1.10)	(-2.86)	(-0.80)	(0.47)	(-1.84)	(-0.23)	(-0.94)	(-3.14)
2010 Homeowner %	-0.0403	-0.343	0.463***	0.306	0.188***	-0.327	-0.133*	-0.309
	(-0.56)	(-1.05)	(10.90)	(1.52)	(3.62)	(-1.26)	(-1.91)	(-0.96)
2001 Debt/Income	0.103***	0.0254	-0.0716***	-0.124	0.0849***	-0.311*	0.0887***	0.111
	(4.46)	(0.10)	(-5.46)	(-0.89)	(4.76)	(-1.83)	(4.38)	(0.46)
% Const. Employ.	0.261	0.242	-0.292**	-0.328**	0.381**	0.373**	0.500***	0.481***
	(1.41)	(1.29)	(-2.15)	(-2.51)	(2.05)	(2.05)	(3.04)	(2.91)
1997 Property Tax/Revenues #		1.697		-0.778		1.436		1.578
2010 Homeowner %		(1.38)		(-0.97)		(1.19)		(1.34)
1997 Property Tax/Revenues #		0.914		-0.865		1.152		0.763
2001 Debt/Income		(0.99)		(-1.57)		(1.41)		(0.86)
2010 Homeowner % # 2001		0.0166		0.0928		0.527**		-0.126
Debt/Income		(0.05)		(0.48)		(2.08)		(-0.39)
1997 Property Tax/Revenues #		-0.921		1.062		-1.514		-0.690
2010 Homeowner % # 2001		(-0.74)		(1.39)		(-1.31)		(-0.59)
1997 Income Tax/Revenues #		1.700		-0.950		-0.333		0.493
2010 Homeowner %		(0.74)		(-1.10)		(-0.19)		(0.21)
1997 Sales Tax/Revenues # 2010		1.438***		-0.201		-0.0228		1.470***
Homeowner %		(2.74)		(-0.53)		(-0.05)		(3.07)
Constant	0.239***	0.517**	-0.0522	0.0476	-0.302***	0.0861	0.264***	0.453*
	(3.98)	(2.17)	(-1.44)	(0.33)	(-6.83)	(0.48)	(4.63)	(1.90)
r2	0.459	0.463	0.162	0.168	0.0926	0.0948	0.475	0.480
N	2165	2165	1873	1873	2213	2213	2186	2186
t statistics in parentheses	* p<0.10	** p<0.05	*** p<0.01					