



Institute of
Business and
Economic Research

Fisher Center for
Real Estate and
Urban Economics

PROGRAM ON HOUSING AND URBAN POLICY

CONFERENCE PAPER SERIES

C06-005

ECONOMIC RESILIENCE, FISCAL RESILIENCE AND FEDERAL RESILIENCE: EVIDENCE FROM 9-11

By

Howard Chernick
Andrew F. Haughwout

prepared for
Berkeley Symposium on Real Estate, Catastrophic Risk, and Public Policy
March 23, 2006

These papers are preliminary
in nature: their purpose is to
stimulate discussion and
comment. Therefore, they are not
to be cited or quoted in any
publication without the express
permission of the author.

UNIVERSITY OF CALIFORNIA, BERKELEY

Economic Resilience, Fiscal Resilience and Federalism: Evidence from 9-11

PRELIMINARY: PLEASE DO NOT CITE OR QUOTE WITHOUT PERMISSION

Howard Chernick
Department of Economics
Hunter College
City University of New York
Howard.Chernick@hunter.cuny.edu

Andrew F. Haughwout
Microeconomic and Regional Studies
Federal Reserve Bank of New York
Andrew.Haughwout@ny.frb.org

First Draft: March 2006

Abstract

The terrorist attacks of September 11, 2001 exacted a terrible human toll on New York City, and early estimates suggested that the city's economy also suffered a severe negative shock. We provide evidence that while the short-run effect of the attack was substantial, the city economy demonstrated substantial resilience over the longer run. This resilience was anticipated by market actors and reflected in strong prices for the city's stock of assets – land and structures. Nonetheless, the short run impact of the attacks on city government revenue, combined with very strict borrowing constraints, led to a serious, albeit transitory, fiscal problem for the city. At the same time, the importance of the city economy to New York state revenue and institutional peculiarities of the state's personal income tax meant that the state also faced a serious revenue shortfall. In the end, the city dealt with its fiscal problems with little cash from the state, relying instead on its own tax base and federal aid. We use these observations to develop a simple fiscal model of an environment with geographically concentrated shocks, and discuss its implications for tax base sharing and, more generally, fiscal policy making in a federation.

*Prepared for the **Berkeley Symposium on Real Estate, Catastrophic Risk, and Public Policy** held in March 2006. The views presented here are those of the authors, and do not necessarily reflect those of the Federal Reserve Bank of New York or the Federal Reserve System. The work reported here is based on work undertaken for "Resilient City: The Economic Impact of 9/11," Russell Sage Foundation, 2005. Chernick would like to thank Robert Inman for suggesting the analytical framework for the fiscal analysis.

I. INTRODUCTION

The destruction of the World Trade Center on the morning of September 11, 2001 took place in a city that was in the midst of both short and long run change. In the short run, the New York economy was experiencing a sharp turnaround in its cyclical fortunes: between 1996 and 2000, the city had registered what was arguably its strongest performance in the postwar period (Haughwout and Rabin 2005). We argue that the attack exacerbated the decline in the city economy in the short run, but that the strength of the city as a location for businesses and households was unaffected. Yet New York City's fiscal institutions make coping with short term stress especially difficult. This tension between short run fiscal stress in an economy with a bright long run outlook is the subject of our paper.

We begin with a review of the effects of the attack on the city economy in both the short and long runs. This effort is complicated by the fact that the attack took place in the midst of a national and local recession. We then turn to analysis of the local fiscal impact of the attack, and conclude with some discussion of the design of fiscal institutions in a world with geographically concentrated shocks.

II. HOW DID 9-11 AFFECT NEW YORK CITY'S ECONOMY?

The destruction of the World Trade Center held the potential to create several kinds of effects on the New York economy. First, and most horrific, the attack cost nearly 2,800 lives. In economic terms, this means that the human capital stock for the entire metropolitan region was reduced in the short run. In spite of the tragic consequences for the individuals and their families, however, the direct impact on the long run supply of human capital in New York City, an open economy with over 3.5 million jobs and 8 million residents, is small.

The 16 acres of the World Trade Center site housed approximately 13.4 million square feet of class A office space, nearly 30% of the downtown total.¹ This complex was destroyed on September 11, and several surrounding buildings were damaged or essentially destroyed when the towers fell. While some residential space was also damaged, it was re-occupied relatively quickly. As of this writing, the WTC site remains essentially vacant, although a temporary public transportation station occupies a small portion of the area. This persistent loss of productive business land and capital was a potentially substantial cost to the city economy over the short and medium terms. In addition, for several months following the attack, movement in Lower Manhattan was severely restricted, raising the cost of doing business in the area.²

The attack also provided information to market players about the potential for future loss of life and property to international terrorism. It was this feature of September 11 that caused many commentators to voice significant concerns about the future of New York, and indeed cities in general (see, for example, Mills 2002).

We will offer evidence on both the long and short run economic impacts of the last two of these shocks. For the short run analysis, we rely on changes in real economic variables, especially employment and overall activity, as well as changes in the rental rates of private capital. Long run effects are examined by looking for changes in the prices paid for the stock of assets. In the case of a city facing an imperfectly elastic supply of land, we believe that land prices offer the best measure of changes in demand for city locations. In all cases, we must take care to control for the effects of the ongoing national recession, which itself had important effects on conditions in New York City.

¹ We are grateful to M. Myers Mermel of Tenantwise.com for providing these data in private communication.

IIA. Short run effects of 9-11

Our short run analysis focuses on pre- and post-attack changes in five measures: employment and income, overall activity levels as measured by the NYC CEI, vacancy rates and monthly rents.

Employment, income and overall activity

Employment in New York peaked in December 2000, and declined by 60,000 jobs by August 2001. About another 100,000 jobs were lost between August and October, 2001 (Figure 1). A preliminary estimate by Bram, Orr and Rapaport (2002) indicated that the losses attributable to the attack itself peaked in February 2002 at between 49,000 and 71,000 jobs, accompanied by wage and salary shortfalls in the range of \$3.6 to \$6.4 billion by June 2002. Later estimates (Bram 2004) refined the estimated attack-related job loss to about 60,000, with income losses presumably toward the center of the Bram, Orr and Rapaport range, or around \$5 billion.

The New York City Index of Coincident Economic Indicators (NYC CEI), a broad-based measure of economic activity in the City, began falling as the local recession commenced in January 2001 and declined nearly 0.95% in September 2001 alone; see Figure 2.³ This was the fourth largest monthly decline in the history of the index, which dates to 1965. While the index continued to decline until August 2003, the total decline for the full 2001-2003 downturn totaled 8.9%, significantly less deep than the declines

² The restrictions included the temporary loss of several public transportation stations and, in the days immediately following the attack, prohibitions on vehicular traffic and restrictions on the movement of people below Chambers Street.

³ NYC CEI is a broad-based, dynamic single-factor measure of economic activity in New York City, constructed following the methodology of Stock and Watson (1989). The index is calculated from the common movements in four indicators tied to the city's labor market: payroll employment, the

registered during the city downturns that began in 1969 and 1989. In addition, the rates of decline before and after September 2001 are approximately the same, suggesting that the ongoing national recession was an important factor in the adverse outcomes in the city economy. Nonetheless, the fact that the national economy began to grow sometime late in 2001 or early in 2002 while the city continued to decline for twenty more months suggests that the attack had significant negative effect on the short run performance of the overall city economy.

Rental housing markets

Additional evidence of short run effects of the attack may be found in the city's real estate markets. The figures in Table 1 are the regression coefficients on year 2002 dummies either on their own, or interacted with dummies for particular definitions of the area most likely to be affected by the attack. The data for these regressions are from the New York City *Housing and Vacancy Survey*, a triennial survey of housing units in the city similar in design to the *American Housing Survey*. The dependent variable for the regression reported in panel A is monthly contract rent for non-owner-occupied housing units, and the regressions include controls for the structural characteristics of the units as well as their status in the City's rent stabilization system. We present results from both the levels and semi-log specifications. If the attack were to have broken the trend of rental growth in the city, we would expect negative coefficients to predominate in the panel A. Bold-face entries indicate that 1999-2002 neighborhood rental growth exceeded the increase in national shelter costs, 11.1%. Instead, the data indicate that apartment

unemployment rate, average weekly hours worked in manufacturing, and real earnings. The NYC CEI is described more fully in Orr, Rich and Rosen (1999).

rentals in most of New York were essentially flat relative to the nation.⁴ Since the HVS measures existing stock of rental agreements, rather than the most recent contracts, it is expected to understate marginal changes in the rent commanded by units newly on the market.

Rental office space

The attack destroyed or rendered temporarily or permanently unusable nearly 28 million square feet of class A office space, 13.4 million of which was in the WTC complex itself. In spite of these losses, the office vacancy rate in Manhattan rose in late 2001 (<http://www.allbusiness.com/periodicals/article/834855-1.html>), led by a sharp increase (from 7.5-10.3%) in the downtown market. The exodus of jobs from Lower Manhattan would thus appear to have exceeded those directly displaced from unusable space. However, we should note that there is some evidence that firms economized on space by reducing their allocations of space per employee,

We examine trends in the *rental price* of office space in New York's two central business districts, Downtown and Midtown, using data from the National Real Estate Index.⁵ These data are collected for class A office space in 60 markets across the nation. We focus on the two New York markets and, to control for prevailing national

⁴ Haughwout (2005) describes the calculations underlying these figures in detail. A remarkable exception to the general softness of apartment rents is the downtown market, which strengthened both in absolute terms and relative to the nation. The apparent divergence between rental markets in Lower Manhattan and the rest of the city may be partially attributable to incentives for residents to locate in this area, part of the package of aid that the city received in the wake of the crisis. Under these programs, residents willing to make a two-year residential commitment to areas of Lower Manhattan close to the site of the attack were eligible to receive up to \$12,000 grants. Our estimated 1999-2002 rental increase in Lower Manhattan (column 5 of Table 3) less that in the city as a whole is about \$325 per month, or about \$7,800 over a two year period. Unfortunately we cannot identify which units receive the subsidy, so a direct comparison of the rent with the value of the subsidy is not possible. However, the majority of the units in Lower Manhattan as we define it were eligible for smaller (or zero) subsidies. Haughwout and Rabin (2005) discuss this feature of the data in some detail.

⁵ Global Real Analytics, which produces the index, collects quarterly information on recently closed office building sales and average rents for class A office space.

conditions, calculate indices measuring appreciation in these markets relative to the nation as a whole. These indices, which are based in the fourth quarter of 1985, are shown in Figures 3 and 5. The rental market, displayed in Figure 3, is our measure of the short-run effects of the attack on business location decisions. If the demand for lower Manhattan location remained stable, we might expect to see a strong increase in office rents for the remaining Downtown office space. There is little evidence of this in Figure 3. Indeed, nominal class A office rents declined nearly 9% between 2001Q3 and 2002Q3, suggesting that demand fell at the same time as supply. A decline in demand is consistent with Glaeser and Shapiro's (2002) view that the attack hastened the decline of Lower Manhattan as a principal site for New York City office locations. Yet this decline was matched by an 8.5% decline in class A rents nationwide, with the result that the both the Downtown and Midtown indexes depicted in Figure 3 remained essentially flat, with perhaps a modest downward trend.

As indicated in the Figure, Manhattan office rents relative to the nation, which had been rising during 2001, stabilized or declined slightly after 9-11. The National Real Estate Index measures average prices of the existing stock of rental agreements, and in a rapidly changing market may underestimate changes in rents at the margin. We thus conclude that both Midtown and Downtown commercial rents softened significantly in the wake of the 9-11 attack.

We thus detect evidence of significant dislocations to the short run trajectory of New York City's overall activity levels -- and particularly in its labor and real estate markets -- that can reasonably be attributed to the 9-11 attacks. We turn next to the evidence of the effects of the "terror tax" on expectations for the city's long run future.

IIB. Long run effects of 9-11

Our analysis of the effects of the attack on the long run value of New York City as a location for businesses and households focuses on land prices. Overall, we detect little evidence of permanent effects of an ongoing “terror tax” on either the city or suburban land markets, whether the land is currently occupied by businesses or households. We do, however, note some weakness in the expected future of the downtown office market.

Housing Markets

The series depicted in Figure 4 is the quarterly OFHEO single-family home price index for the New York metropolitan area, divided by the national index. Both indices, and the relative index we plot here, are set to 100 in the second quarter of 1976, when the New York series began. There is little evidence here that the September 11, 2001 attacks on the World Trade Center reduced the long run demand for residential locations in the New York metropolitan area. Repeat-sale house prices in the metropolitan area were rising faster than in the rest of the nation both before and after the attack, as shown by the steady rise in the index on both sides of the September 11 point. That is to say, the New York area’s residential housing market *gained* ground on the rest of the nation immediately after the attack. Thus the relative demand for residential locations in the New York labor market has remained strong since the attack.

The OFHEO data cover only single-family homes, which are presumably located primarily in the suburbs. Increased demand for single family houses could reflect *reduced* demand for Manhattan locations, and a decentralization of population from New York City proper (Mills 2002).

Yet analysis of owner-occupied units in New York City indicates a similar pattern. Our data source for this analysis, the New York City *Housing and Vacancy Survey* (HVS), allows consideration of a much broader range of housing types, from rental apartments to condominiums to single family homes, with the mix reflecting the actual housing consumption patterns of city households.

We have already discussed the softness in rental markets in the city. Panel b of Table 1 explores sales price of owner-occupied units in the City. Unlike rents, *prices* in all the geographic area definitions presented here grew significantly more rapidly than the national CPIU. Table 2 provides evidence of substantial increases in the supply of residential units downtown, indicating that price increases probably understate the increase in demand.

Taken as a whole, there is no evidence here of any declines in prices for residential property that could be attributed to the September 11 terrorist attack. Indeed, given that the supply of downtown (and city-wide) housing appears to have been little changed by the attack, we interpret these results as strong evidence that the demand for residential locations in Lower Manhattan and elsewhere in New York remained very robust in the immediate wake of the 9-11 attack.

The market for office buildings

The relative sales price of office buildings depicted in Figure 5 reveals an interesting pattern both before and after September 11, 2001. Between 1985Q4 and 2003Q3, downtown office building prices essentially held steady relative to the nation. Note, however, that downtown prices reached a trough in 1998Q1 (at which point downtown had fallen over 10% relative to the nation since the end of 1985). From

1998Q2 to 2001Q2 the downtown market rallied, and the relative price index stood at 111.5 on the eve of September 2001. By the close of 2001, the downtown market had given back all its gains relative to the nation, and the index reached a recent low of 96.8 in 2002Q3. There is modest evidence here of a rally in the downtown market since that point, as the index rose back above the break-even point (at 101.6) by 2003Q3.

The fact that the relative downtown office prices remain below the peak they reached immediately prior to the September 11 attacks might be taken as evidence that the attack itself had a very substantial effect on office prices. There are several points to make here. First, the 2001Q2 peak of the office index (111.5) was anomalous in the sense that it represented a sharply higher level than the previous quarter (103.7). Second, the pre-9-11 rise in the index as we measure it was the result of a modest decline in the national index and a modest uptick in the Downtown index.⁶ That is, the graph shows a sharp increase in part because of the national office market downturn. Third, the fact that the Downtown office market stabilized in the subsequent two years provides some indication that demanders continue to find locations there attractive. By the end of the period, the relative Downtown price index was about three percent higher than it had been three years earlier. On the other hand, there is some evidence, as suggested by Glaeser and Shapiro (2002), of a post-attack shift in demand to Midtown, where prices have rallied strongly relative to both the nation and to Downtown since mid-2001.

Overall, the evidence from the office market suggests a post-attack weakening of demand in Lower Manhattan relative to the rest of the nation, especially in light of the decline in the supply of space that accompanied the destruction of the World Trade

⁶ The price for a square foot of class A office space in lower Manhattan rose from \$307 in 2001Q1 to \$328 in 2001Q3 (an all-time high) while the national average fell from \$215 to \$213. Comparing fourth quarter prices, downtown prices were 4.8% higher in 2001 than in 2002.

Center. The most dramatic effects are seen in the price graph (Figure 4), although an unusual spike just prior to the attack makes the data difficult to interpret. Nonetheless, it is clear that the dramatic increase in prices that occurred in Midtown has not been experienced Downtown. On the other hand, Downtown demand has held up reasonably well relative to the nation as a whole, especially given the temporary dislocations associated with the clean-up and re-design of the WTC and surrounding areas.

For Manhattan as a whole, we can calculate the weighted average price increase, by applying the downtown and midtown shares of class A space as weights to the relevant price increases. That calculation yields a 12.6% *increase* in office building prices across Manhattan between 2001 and 2003.

Summary

- Short run dislocations attributable to the 9-11 attack were substantial. Recent estimates suggest lost income for FY 2001-2002 in the neighborhood of \$5 billion, attributable to lost jobs.
- Rental real estate markets weakened, but somewhat less significantly. The Downtown rental residential market remained strong, perhaps in part because of targeted subsidies. Demand for Downtown rental office space appears to have declined.
- Long run demand for city locations as a place to live or do business appears to have been little affected by the attack.

The challenge facing the city in the wake of 9-11 can therefore be characterized as a need to offset the effects of a large, but temporary, shock to the private economy. How the city managed its own finances is the subject of the next section.

III. The Fiscal Effects of 9/11.

The combination of national recession, the bursting of the high-tech bubble in the stock market, and the 9/11 attack led to a severe deterioration in the fiscal condition of New York City. The city's de facto rainy day fund was quickly exhausted.¹ The budget gap for FY 2002, from July 2001 to June 2002, was largely dealt with by increased borrowing. The balanced budget rules were waived, allowing NYC to issue an additional \$2.1 billion in long-term debt, at an annual cost of between \$150 million and \$180 million. The projected budget deficit grew from \$1.1 billion in FY03 to 6.4 billion in FY04, or about 14% of total expenditures. The city also responded by cutting expenditures, raising taxes, and substituting federal for local spending. In this section, we estimate the public sector costs imposed on NYC by the 9/11 attack, and compare those costs to the level of federal compensation.

IIIA. Analytical Approach.

Though our goal in this section is to assess the fiscal costs of 9/11, our approach is based on changes in the welfare of the residents of NYC. The government's function is to provide the services demanded by its residents, and collect sufficient revenues to pay for those services. Economic well-being depends on after-tax income, and the level of public services. The loss

¹ By using at least partially anticipated surpluses in any given year to pre-pay debt-service and public authority expenditures in the next year, New York City has been able to smooth out variations between its relatively cyclical revenue structure and its expenditure requirements.

suffered by New Yorkers due to the 9/11 attack can be separated into the loss in before-tax income, and the loss through the public sector. The loss through the public sector is equal to the increased tax rate required to offset the loss in tax base from the disaster and pay for any increase in service costs in the wake of the disaster. If public service levels are maintained at or close to their prior level, as we will assume, then to offset the loss in tax base tax rates must rise. This leads to a decrease in after-tax incomes. An increase in transfers offsets the loss in before tax income, but must be financed partly from local sources. The analytical approach for measuring public sector costs is presented in the appendix.

III B. Measurement of Losses.

In this section, we provide estimates of the components of the public sector loss, as described in appendix equation (8), and federal compensation, as described in equation (10). Cost flows of more than one year are discounted at a social discount rate of 3.5 percent. (Moore et al, 2004) Results are summarized in Table 3.

Table 3. The Fiscal Costs of 9/11

Present Value of				Total Cost	Cost Per Resident
Net Cost (Gain) from Increase in Medicaid transfers (2002)	\$520M (Total Increase in Medicaid Spending)	Minus \$130M (City Contribution)	Minus \$58.5M (City share of State Contr.)	= \$331M	\$-41
Increase in Required Expenditures ₀₂₋₀₃				\$898.6M	\$111
Increase in Required Expenditures ₀₂₋₀₆				\$1.09B	\$135
Tax Loss ₀₂₋₀₃				\$2.472B	\$330
Tax Loss ₀₂₋₁₀				\$3.95B	\$488
NYC Loss ₀₂₋₀₃				\$3.04B	\$400
NYC Loss ₀₂₋₁₀				\$4.71B	\$582
Total Loss Per Resident ₀₂₋₀₃	\$400 NYC Loss ₀₂₋₀₃		+ \$59 NYC Share of NYS Tax Loss		\$459
Total Loss Per Resident ₀₂₋₁₀	\$582		+ 59		\$641
Federal Budgetary Compensation	\$762M Unrestricted		+ 550M Interest Savings on Refinancing		\$162
Net Cost Per Resident ₀₂₋₀₃	\$-41 Transfers	+\$111 (Expend)	+ \$389 (Tax Cost _{NYC+NYS})	- \$162 (Fed. Comp.)	\$297 (0.8 %)
					(As % of Personal Income)
Net Cost Per Resident ₀₂₋₁₀					\$479 (1.35%)

III B1. Changes in Transfer Payments and the Disaster Relief Medicaid Program²

As shown in Figure 5, public assistance and Food Stamp caseloads were little changed after 9/11. By contrast, Medicaid caseloads grew dramatically. From September 2001 to May 2002, the number of Medicaid recipients grew by 25 percent, from 1,617,000 to slightly more than 2 million. A major reason for this increase was the temporary relaxation of eligibility requirements, under a program called Disaster Relief Medicaid. While about a third of the increase is likely to have happened anyway, policy changes allowed Medicaid eligibility to increase by about 271,000 additional people.

The increase in Medicaid eligibility imposed a direct fiscal \$130 million in annual city-funded Medicaid expenditures.³ Since counties in New York pay about 25 percent of non-nursing home expenditures under Medicaid, this implies a total increase in spending of four times that amount, or \$520 million. If we value Medicaid transfers at their programmatic cost, then ΔT is equal to \$520mil. City residents in their dual capacity as state taxpayers must also bear a proportionate share of the 25 percent of the Medicaid costs borne by the state. Hence, the net benefits to NYC residents of the increased Medicaid transfers can be approximated by

$$\Delta T/N = [\$520 \text{ mil} - \$189 \text{ mil}]/N = \$390 \text{ mil}/8.1 \text{ mil} = + \$41 \text{ per capita.}^4$$

² Most of the information on Disaster Relief Medicaid was obtained in communications with Rachelle Celebrezze of the New York City Independent Budget Office.

³City of New York Comptroller, *One Year Later: The Fiscal Impact of 9/11 on New York City* (September 4, 2002). Further on as *One-Year Later*.

⁴ The calculation of the net benefits is $\Delta T/N = \Delta \text{expend} - (\text{NYC Share} + \text{Indirect NYC Share of State Share}) = \Delta T - \Delta T [1 - m_f - m_s] + \alpha m_s \Delta T$, where m_f and m_s are the federal and state shares, and α is the share of state revenues paid by NYC residents. A lower bound for α is given by the city's share of state personal income, which was about 45 percent in 2002. Hence, the direct plus indirect cost to NYC city residents from the increased Medicaid spending is $\Delta \text{Fiscal Cost of Transfers} = \{ \$520 \text{ mil} [1 - .5 - .25] + [.45 \cdot .25 \cdot \$520 \text{ mil}] \} = \$189 \text{ mil}$. The net

Of course, not all residents share equally in the benefits of the Medicaid expansion. However, given that about a third of residents are eligible for Medicaid, and the fact that Medicaid dollars are used to purchase services provided primarily by NYC residents, the benefits of increased Medicaid spending are in fact spread over a quite substantial proportion of the population.

III B2. Expenditure Increases

Other than Medicaid, the main sources of increased expenditure for NYC from 9/11 have been for increased overtime and security costs. The city also faces higher pension costs, and exposure to higher claims costs. The City has had to add additional security measures on an ongoing basis, assigning as many as 1,400 officers a day to security patrols. The Comptroller (2002) estimates that the City incurred \$365 million in WTC related overtime costs. Police overtime alone accounted for 70 percent of this total. WTC overtime in FY 2003 was projected to equal about \$14.4 million. The present discounted value of overtime is thus estimated to \$379 million. City liability for claims is likely to be about \$350 million.

Extra pension expenses include \$64.6 million for city employees who died in the attacks. There may also be future pension expenses from increased disability costs. The Comptrollers report estimates additional pension expenses of about \$39 million per year from FY 2003 through FY 2006.⁵ Additional capital costs are to replace equipment or buildings damaged or destroyed by the attack are estimated at \$171 million from FY02-FY06. The present discounted

benefit is $\Delta T/N = [\$520 \text{ mil} - \$189 \text{ mil}]/N = \$390 \text{ mil}/8.1 \text{ mil} = + \41 per capita .

⁵Large amounts of overtime raised the salaries of many police and firefighters by substantial amounts. The inclusion of this extra pay in the pension calculation provided a strong incentive for many police and fire department members to retire after 20 years. In addition, the trauma of the attack itself has led to increased retirements.

value of additional pension payments is \$143.3 million. The present discounted value of the additional capital costs is \$155.4 million. Adding all these costs, the present discounted value of the change in required expenditures for 02 and 03 is \$898.6M, or \$111 per capita. Between 02 and 06, the estimate of increased expenditures is \$1.09B, or \$135 per capita.

III B3. Taxes.

a. Revenue Loss.

Conceptually, the loss in tax revenues due to 9/11 is equal to

$$\Delta \text{Tax}_{9/11} = \tau \Delta \mathbf{B}(\text{attack}) = \Delta \text{Tax}_{\text{actual}} - \Delta \text{Tax}_{\text{recession}} + \Delta \text{Tax}_{\text{policy}}$$

where τ is the average tax rate prior to 9/11, $\Delta \mathbf{B}(\text{attack})$ is the decline in the tax base due to 9/11. $\Delta \text{Tax}_{\text{recession}}$ is the decline in tax collections that would have occurred anyway due to the economic slowdown, and $\Delta \text{Tax}_{\text{policy}}$ is the increase in revenues due to an increase in tax rates on the 9/11 induced lower tax base. As measured by Gross City Product, NYC's economic slowdown began in January of 2001.⁶ The actual change in tax revenues from 2001 to 2002 was a negative \$1.5 billion, or 6.4 percent of revenues.

The budget office estimates that 9/11 related tax losses in 2002 were \$926 million, about 4.3 percent of tax revenues, and 1.6 billion in 2003.⁷ The \$1.6 billion figure equals 7.1 percent

⁶ The NYC Comptroller dates recessions based on quarterly changes in Gross City Product. Changes in GCP are in turn based on the number of jobs located in the City. Between the pre-recession peak of 3.754 million jobs and September, 2001, the City lost 48 thousand jobs.

⁷ Assuming an overall tax rate of seven percent of personal income, or about 5.5 percent of Gross City Product, the estimated tax losses exceed by a considerable amount the losses that would be implied by our earlier estimate of a loss in GCP of \$5 billion. A portion of the difference stems from the fact that the attack also left destroyed or damaged nearly 28 million square feet of office space, with a market value of about \$30 billion dollars, causing significant

of the 2003 revenues, after accounting for policy changes. Over the two year period following the terrorist attack, the estimated loss equals 5.7 percent of revenues. In 2004 and 2005, the loss in business sensitive taxes was about \$420 million, while property tax losses are estimated at about \$125 million at least until 2010. Over the two years following the attack, the tax loss is

$$\text{PDV of TAX LOSS}_{02-03} = \$2.472 \text{ B} = \$330 \text{ per capita.}$$

Per capita tax losses over the eight year period from 2002 to 2010 equal \$488.⁸

b. Tax Policy.

To address the budget deficit induced by 9/11 and the ongoing recession, the property tax rate was increased by 18.5 percent, raising revenues by \$1.8 billion. The top bracket for the personal income tax (PIT) was increased from 3.65 percent to 4.45 percent for taxable incomes greater than \$500,000. The city's sales tax rate was raised by 0.125 percentage points from 2003 to 2005, bringing the combined state-city-transit authority sales tax rate in NYC to 8.625 percent. Overall, personal income taxes were increased by over \$500 million per year between 2003 and 2005, while sales taxes were increased by about \$300 million in 2003 and 2004.

Figure 6 provides a summary picture of NYC's overall tax rate as a percentage of personal income and the tax response after 9/11.⁹ The figure shows a steep decline in city tax effort during the 1990's. By 2000, tax effort had declined to a level not seen since the early

losses in property tax revenue.

⁸ The calculation is: PDV of Tax Losses₀₂₋₁₀ = \$926M (02) + \$1.546B (03) + 495 M (04) + 491M (05) + \$492M (06-10)= \$3.95 B = \$488 per capita.

⁹ Personal income for NYC is estimated as a share of the estimate for the NY metropolitan area (Dept. of Commerce, Bureau of Economic Analysis).

1960's. Since 2002 tax burdens have grown by almost a full percentage point.¹⁰ The magnitude of this increase, which exceeds substantially the increase associated with the previous economic downturn of the early 90's, suggests the crucial role played by tax increases in closing large budget deficits caused by the 9/11 attack and the recession.

Tax revenues resumed their rise in 2003, going up by 7.8 percent in 2003, 21.8% in 2004, 11.2 percent in 2005, and are projected to rise by 5.4 percent in 2006. (NYC Comptroller, 2006) A substantial part of the increase in tax revenues in the years just after 9/11 was due to increases in the various tax rates. However, by 2005 this was no longer the case. Adjusting for changes in tax rates, tax revenues were up 12.1 percent in FY 05, and are expected to increase by 7.9 percent in FY06.

A major and largely unanticipated source of strength in NYC's tax collections has been the sharp increase in revenues from taxes on real estate transactions - the mortgage recording tax and the real property transfer tax. The combined average rate on transactions is about 2.5 percent. While revenues from these taxes were about 500 million per year in the early 90's, revenues were \$1.1 billion in 2003, \$1.8 billion in 2004, \$2.3 billion in 2005, and \$2.4 billion in 2006. The Mayor has taken advantage of the strong overall revenue performance to substantial portion of the 03-04 property tax increase 05 and 06. The growth in real-estate related taxes is a direct result of the strength in housing prices and office building which is described in section II.

There has also been substantial growth in the property tax. Property tax revenues are projected to increase by about 7 percent per year between 2005 and 2009. Based on prior

¹⁰ A rough calculation is that about two thirds of the increase in the tax burden represents policy actions, while the remaining third represents the automatic increase in tax burdens when personal income declines. This calculation is made under the assumption that the property tax, which provided about thirty percent of tax revenues in 2001, is fixed in the short run.

increases in assessed value which are gradually phased in, property tax revenues in FY 2002 grew 6 percent. Reflecting the 18% increase in property tax rates enacted in 2003, revenues grew about 15 percent in both 03 and 04. From 2001 to 2003 revenues from the personal income tax declined precipitously, by some 22.4 percent, but then increased by 20.9 percent in 2004.¹¹ Some 85% of this increase (\$784 million) is due to the progressive rate increase that was imposed retroactively in 2003.

How did the increase in rates affect the tax base? The overall behavior of NYC's tax base is broadly consistent with employment patterns in NYC since 2001 - notably a very sharp decline, followed by a slow and uneven recovery through 2004, then stronger growth through 2006. While Haughwout et al (2004) present evidence that past tax increases in New York City have had a negative base effect, the growth in income and real estate values since 9/11 does not suggest an adverse effect.¹² Negative effects of the tax increase have undoubtedly been muted by the fact that the tax increase was temporary. In addition, NYC's tax burden prior to 9/11 was low in historic terms, and both federal and state tax income tax burdens, particularly for high income taxpayers, have fallen in recent years. This reduction in the cumulative tax burden on high income New Yorkers should increase the ability of NYC to sustain rate increases on its high-income residents. Thirdly, tax rates have also risen in the counties surrounding New York in the post 9/11 period, reducing somewhat the competitive pressure which NYC would face if it were the only jurisdiction raising its taxes.

¹¹ New York City Independent Budget Office. "Analysis of the Mayor's Preliminary Budget for 2005," March, 2004.

¹² The market value of real estate increased by 17 percent between 2004 and 2005, and real-estate related taxes have increased strongly between 2003 and 2006. (IBO, 2004)

III C. The fiscal role of New York State.

In assessing the fiscal impact of disasters in cities, the state is both a casualty and a potential rescuer. The state's own fiscal capacity may be directly affected by the loss of tax base in the affected areas, particularly if it shares the same tax base. Second, the state may shift some of the fiscal risk from city residents to all residents of the state, by reallocating fiscal resources from the rest of the state. In the 9/11 attack, the main effect was the concomitant loss of state fiscal capacity.

The effect of a local disaster on the state's fiscal capacity depends on both the local share of the state tax base, as well as the magnitude of the disaster within the city. Because the New York City economy makes up more than 50 percent of gross state product, the fiscal shock to NYC was also a fiscal shock at the state level. The correlation is magnified by the fact that the city and the state share common tax bases for the sales tax and the personal and corporate income tax. Significantly, the state suffered a larger percentage reduction in revenue than NYC in 2002 and 2003. The reduction was greater for the state because all the major revenue sources for the state are sensitive to economic conditions in the short run, while at least 40 percent of city tax revenues come from the more cyclically stable property tax.

A high estimate of the one year loss in tax revenues to New York State from 9/11 can be given by taking an early estimate of the decline in Gross City Product of \$17.5 billion (NYC Comptroller, 2002) and multiplying that amount by the average NYS tax rate of six percent. This gives an estimate of \$1.05 billion. Multiplying this number by the personal income share in NYC yields a state tax loss to NYC residents of about \$473 million, or \$59 per capita. Adding this amount to the total city costs gives an upper bound estimate of the total loss through the

public sector equal of

$$\text{PDV of Public Sector Loss}_{02-03} = \text{NYC Loss} + \text{NYS Loss} = \$400 + \$59 = \$459 \text{ per resident}$$

The most significant state response was regulatory, rather than fiscal. The city was allowed to temporarily raise income and sales tax rates, and to raise some \$2.1 billion in long-term debt to help cover the current deficit. Over the Governor's veto, the state legislature also agreed to assume some \$500 million of prior debt obligations of New York City. In addition to these measures, the state signed off on the temporary relaxation of Medicaid eligibility rules, and in conjunction with the federal government, relaxed categorical restrictions on a number of federal and state grants, thus permitting increased budget flexibility for the city, allowing helping the City to substitute federal for local funds for social services. The minimal state fiscal response reflects fiscal politics in NYS over the past decade, with net fiscal flows between NYC and the rest of the state moving against the city over the past decade.¹³

III D. Total Losses through the Public Sector.

Assuming that the additional transfers and personnel expenditures are incurred for just

¹³ During this period that state has taken a number of steps with an adverse impact on NYC's fiscal base or its costs. These include the elimination of the commuter tax in 1999, a state funded property tax relief program with a distributional formula favoring the suburbs over the city, and state level intervention in collective bargaining for pension rights. Despite numerous adjustments and special provisions of the state formulae for distributing school aid, the city's share of state aid to education has remained approximately constant over the last ten years. In 1999 NYC received 35.5 percent of state education aid, though it enrolls 38 percent of the state's students. See Campaign for Fiscal Equity, 2000, and *Center for an Urban Future*. "Sympathy but no Support," April, 2002 (available at www.nycfuture.org); The distribution of state aid is discussed in Howard Chernick and Andrew Reschovsky. "Lost in the Balance: How State Policies Affect the Fiscal Health of Cities," Discussion Paper, Center on Urban and Metropolitan Policy, The Brookings Institution, March 2001. The elimination of the commuter tax is considered in Howard Chernick and Olesya Tkacheva, "The Commuter Tax and the Fiscal Cost of Commuters in New York City," *State Tax Notes*, Vol. 25, No. 6, August 5, 2002.

one year after the attack, the total losses to the public sector over the two year period following 9/11 would be approximately equal to

$$\begin{aligned} \text{PDV of Per capita loss}_{02-03} &= \text{Net Transfers} + \text{Required Expenditure Increase} + \text{Tax Loss} \\ &= -(\$41) + \$111 + \$330 = \$400 \text{ per capita.} \end{aligned}$$

Computing estimated losses up through FY 2010 gives a per capita loss of \$582.

IV. Federal Compensation.

IV A. Federal Response to the 9/11 Attack.

In the aftermath of 9/11, President Bush pledged \$20 billion aid to NYC to assist with recovery.¹⁴ The NYC Independent Budget Office divides federal assistance into three categories.¹⁵ About 30 percent of the total funding, some \$6.33 billion, went for emergency response needs. Federal funds were allocated for two specific purposes: rescue, recovery and clean up under the oversight of the Federal Emergency Management Agency (FEMA); and redeveloping the WTC site and revitalizing its vicinity through targeted cash assistance. The second phase focuses on economic recovery, and includes \$4.43 billion. The third phase is for long-term rebuilding, and is worth \$9.71 billion.

Typically the federal government does not provide general fiscal relief to governments

¹⁴ The aid came in three allotments: 1) September 11 Emergency Appropriations that totaled \$11.235 billion and provided cash assistance to individuals, local governments and small businesses; 2) the Liberty Zone Economic Package, enacted in Spring 2002 that granted \$5 billion in tax relief to businesses located in downtown Manhattan; 3) a supplementary emergency appropriation package enacted in July 2002, that appropriated additional \$5.436 billion to NYC. This brought federal appropriations to a total of \$20.4 billion.

¹⁵ See NYC Independent Budget Office, “Three Years After: Where is the \$20 billion in Federal WTC Aid?”, *Inside the Budget* Number 132, August 11, 2004.

that have been hit by natural disasters. However, in the case of the 9/11 attack, \$1.7 billion, or about 8 percent of the total federal reimbursement, was provided to the city of New York. Of that amount, \$762 million was from a transfer of the remainder of the original Congressional appropriation, and went for unrestricted budgetary relief. The other part of general relief was achieved by waiving federal rules on the one-time refinancing of municipal debt, thus allowing NYC to take advantage of lower interest rates for some of its general obligation debt. The cost to the federal government of this provision was \$937 billion. The actual budget savings to NYC in 2003 was estimated at slightly more than \$500 million. The difference is the tax wedge between the tax savings realized by lenders and the savings in interest costs to the borrower.¹⁶ Adding the budgetary saving from the refinancing to the direct budgetary relief, federal compensation for general fiscal costs was

$$\text{General Federal Budget Compensation} = \$762 \text{ million} + 550 \text{ million} = \$162 \text{ per capita.}$$

IV B. Net Public Sector Cost to NYC Residents

Putting all of the estimates together, the cost to the residents of NYC through the public sector for the period 2002 through 2003 is equal to

$$\begin{aligned} \text{PDV of Net Cost}_{02-03} &= \Delta \text{Net Transfers} + \Delta \text{Gov't Exp} + \Delta \text{TAX COSTS}_{\text{NYC+NYS}} - \text{Fed Comp} \\ &= -\$41 + \$111 + \$389 - \$162 = \$297. \end{aligned}$$

Taking the estimates of losses through 2010, gives a figure of \$479. Per capita personal income in NYC in 2002 was equal to \$35,378. Hence, as a share of personal income, the present

¹⁶ The Liberty Zone economic also includes \$1.2 billion in savings from allowing NYC and NYS to issue \$8 billion in tax exempt bonds, to be used for private investment in offices, residential units, and utilities.

discounted value of the net cost to residents of NYC over the two year period following the 9/11 attack was equal to roughly eight tenths of a percent of personal income in 2002. Recurring public sector losses from the destruction of property will raise this estimate somewhat, as will the future costs of servicing the additional debt issued by city to cover costs in FY 2002. The present discounted value of net costs per capita through 2010 equals 1.35 percent of personal income. Thus, depending on the time frame, the present discounted value of costs to NYC residents ranges from about .8 % to 1.35% of personal income in the year of the attack.

Ignoring the Medicaid transfer, federal general compensation to the government of NYC offset about one third of the total public sector cost. Federal tax deductibility will reduce the net burden of the tax increases by about 15 percent. (Schlain, 2004), i.e. from \$389 per capita to \$331 per capita.¹⁷ If we take into account the federal deductibility of state and local income and property taxes, the net cost becomes

PDV_{02-03} (deductibility included) = $-\$41 + \$111 + \$389 - \$162 - \$58 = \$239 = .7$ percent of personal income. With this accounting rule, federal compensation is equal to about 50 percent of the public sector costs from 9/11.

IV C. Total Federal Compensation.

Total direct compensation from the Federal Government was about \$20 billion. Subtracting from this amount the \$1.3 billion for fiscal relief, and the approximately \$5 billion for demolition and cleanup of the World Trade Center site, leaves roughly \$14 billion to compensate for property damage and business interruption. The total cost in property losses is

¹⁷ She estimates that 21 percent of the 2003-2006 PIT surcharge is offset through federal deductibility.

estimated by the Comptroller to be about \$30 billion. Adding to this loss in stock a decline in the Gross City Product that is about \$5 billion, gives a total private sector loss of \$35 billion. Hence, a rough estimate of federal compensation for private sector losses is about 40%. *Combined with the 35 to 50 percent compensation for public sector losses gives a total compensation rate of about 40 percent.*

IV. Federalism and Risk Sharing.

We estimate that the federal government provided about a forty percent compensation rate for the losses incurred by New Yorkers for 9/11. Is this an appropriate rate of compensation, or is it too high or too low? In this section we consider briefly some principles that should underlie disaster compensation to cities from higher level governments.

Risk Sharing and Efficiency. An efficient response to disaster will help a city to recover as fast as possible in the short-run, and to rebuild itself in such a way as to improve on its pre disaster path of economic performance as speedily as possible. To this end, compensation should be structured to induce improvements to the urban system.

To the extent that a city is able to spread the fiscal costs of a disaster among its residents and firms without causing additional reductions in its tax base, or an unraveling of the agglomeration economies which form the economic basis for the city, fiscal costs should be borne locally. To take a historical example, the Chicago Fire of 1871 destroyed about a third of the city's property valuation. Out of 300,000 inhabitants, 90,000 were left homeless. However, Chicago's comparative advantage as a center for manufacturing and commerce was sufficiently strong that, with little assistance from higher level governments, the was able to quickly rebuild.

By 1875 little evidence of the disaster remained. (Chicago Fire, no date)

Of course, at the time of a disaster it is very difficult to discern whether a city will be able to recover on its own. After 9/11 there was considerable concern that the risk from terrorism could lead to a deconcentration of economic activity. Fortunately for New York, this has not turned out to be the case. As we emphasize in the first section of this paper, the price of land and structures, as well as the stock market value of locally based firms, can provide useful clues as to changes in the viability of a city.

If the economic viability of a city carries with it significant spatial externalities, then a disaster-associated reduction in economic health will impose costs on the entire regional economy. If the extent of direct economic interdependence is limited, for example to a city and its surrounding metropolitan area, then the principle of self-insurance would call for a regional or state level response, rather than a national response.

Equity and risk sharing. The equity argument for risk sharing is that the citizens of a federation, by virtue of membership, are entitled to some minimum level of public services, at tax rates that are not unreasonable. If the fiscal shock caused by a disaster weakens a city's fiscal base or increases its expenditure needs, then state and/or federal assistance is called for to maintain fiscal standards. Thus federal compensation for a disaster is an extension of the basic equity principles which underlie the formation of the federation. Equalization schemes are long-term devices for fiscal risk sharing, as are uniform national taxes, which automatically redistribute income from richer to poorer regions of the country. In principle, the extent of compensation for a disaster should conform to the standards of the particular federation. Melitz and Zumer (2002) estimate that in the U.S., regional stabilization in response to shocks ranges between 10 and 20 percent,

depending on the accounting principle. On this principle, the long-term compensation for disaster should be about this rate. A general principle of insurance is that the pool over which risks are shared should be as broad as possible. Under this criteria, the federal government should provide the bulk of compensation.

Ex ante vs. Ex post. As much as possible, the emphasis should be on ex ante rules that are automatically applied, as opposed to case by case relief ex post. The latter is likely to be heavily influenced by the political strength of the affected area's congressional delegation, and by whether the state is a swing state in national political elections. It is unlikely that these political characteristics will be highly correlated with the appropriate economic criteria for risk sharing. Recognizing that there will always be some ex post political bargaining, the goal should be to maximize the proportion of compensation that follows transparent rules.

State versus federal compensation? Ideally, the fiscal burden of compensation for disasters in cities should be shared by all three levels of government; city, state, and federal government. The division between the levels of government should depend on the extent of the disaster, and the external costs. The smaller the shock, relative to the total fiscal capacity of the affected city, the greater should be the city's own ability to respond.

In the case of 9/11, as discussed in the first section of the paper, the economic dislocation to NYC is estimated at roughly 5 billion in foregone economic output. As a fraction of total output, this cost was between one and two percent of total output. Though the absolute magnitude of the economic shock was large, because the NYC economy is itself so large, in relative terms the effect turned out to be smaller than anticipated.

In economic size, as opposed to geography, NYC is equivalent to a medium size state, rather than a city. The (lack of) state response in New York contrasts with the Los Angeles-Northridge earthquake in of 1993. In that case, the state of California levied a surtax on the state sales tax, with the proceeds used to repair damaged infrastructure. The state response in California was possible because the effect of the earthquake on the fiscal capacity of the state of California was considerably smaller than the proportionate effect of 9/11 on the fiscal capacity of NYS.

The form of compensation. To minimize moral hazard and strategic behavior on the part of the city, compensation should be matching, rather than lump-sum. Matching assistance will reduce the fiscal substitution which would be a natural response of cities hit by disasters. Matching assistance could take the form of federal sharing in the cost of transfers, as in Medicaid financing, or through the deductibility of taxes. Both types of matching provide automatic sharing of risk between the city and the nation. Cost sharing through deductibility has been diminishing in the U.S., primarily due to the increase in the number of taxpayers subject to the Alternative Minimum Tax. The change from matching to block grants for welfare has had a similar effect on the transfer side. To the extent that these changes reduce the automatic risk sharing features of the federal system, one possibility might be to create stand-by authority for matching assistance to cities in the case of disasters. Such assistance would be triggered by a disaster of a certain magnitude. However, the principles for determining the matching rate would be pre-determined, to avoid inefficient political bargaining.

Vertical tax competition. The ability of the local public sector to finance the recovery from a

disaster is dependent on the elasticity of the local tax base. The more elastic the tax base, the more the increased fiscal burden should be compensated by higher level governments. While the elasticity of the tax base is influenced by business and resident perceptions of the long-run viability of the city, it also depends on the level of taxes imposed by higher level governments. For most taxes, it seems reasonable to posit that the higher the overlying tax rate, the greater the local base elasticity. This interdependence is magnified when overlapping levels of government tax the same base. (Keen, 1997)

The greater the sharing of tax bases, the more a fiscal shock at the city level is transmitted to the state level. New York City has a tax structure that is closer to that of a state than other U.S. cities. Well over half of its tax revenues come from the corporate and personal income tax, and the sales tax. At the state level, the income tax is the dominant tax. Hence the transmission of the fiscal shock was strong. Because both the New York State and federal income tax rates were low relative to recent years, the city undoubtedly had more leeway to raise its tax rates than in other periods. This reinforces the transmission argument for own-finance.

To be completed. People vs. Governments; Natural Disasters vs. Terrorist Attack

Appendix

A Framework for Measuring the Public Sector Costs of a Disaster

After-tax income for a typical city resident i is equal to

$$y_i = (1-\tau_I)I + \rho V + T - \tau_{prop}V \quad (1)$$

where y is income after taxes, I is income before taxes, τ_I and τ_{prop} are local income and property tax rates, V is the value of property, ρ is the imputed rate of return on property, and T is income from transfers. To simplify the accounting framework, we ignore for the moment NYC's two other major taxes, the sales tax and the corporate income tax. Assuming that the level of public services does not change, then the cost to residents can be expressed completely in terms of the change in after-tax income. That change is equal to the decrease in before tax income, but offset by the required increase in tax rates on the now lower tax base.

$$\Delta y_i = [\Delta I_i (1 - \tau_I) + \rho \Delta V_i (1 - \tau_{prop}) + \Delta T_i] - [\Delta \tau_I I_i + \Delta \tau_{prop} V_i] \quad (2)$$

The loss in pre-tax income comes from a decline in earnings (ΔI) from the disruption to NYC's economy, plus the imputed annual value of destroyed property ($\rho \Delta V$). These losses are partially offset by an increase in transfers (ΔT). The decline in pre tax income leads to a decline in taxes paid, which partially mitigates the decline in after tax income. The second part of the decline in after-tax income comes from the increase in tax rates ($\Delta \tau_{prop} V + \Delta \tau_I I$) needed to maintain public services and pay for increased transfer payments.

To simplify notation, we collapse the city's multiple taxes into a single rate τ and a single base B , the average tax base per resident. Ignoring intergovernmental grants, the city's tax rate is given by expenditures divided by the tax base $B \cdot N$, i.e. the average value times the number of residents N .¹⁸

$$\tau = [\text{Cost of Services} + \text{Transfers}] / (B \cdot N) = [\text{Expenditures}] / (B \cdot N) \quad (3)$$

The required change in the city tax rate is equal to

$$\Delta \tau = [\Delta \text{'s in Expenditures}] / B \cdot N - \tau (\Delta B / B) \quad (4)$$

where the change in expenditures equals the change in the cost of services and the change in transfer payments. For each individual, the total change in after tax income is

¹⁸ For simplicity, I ignore intergovernmental grants in the conceptual framework, though they are taken into account in the next section.

$$\Delta y_i = (\Delta \text{ Private Economy})_i + (\Delta \text{ Public Economy})_i \quad (5)$$

Multiplying (4), the change in the tax rate, by the individual resident's tax base B_i , the change in after tax income from the required increase in the tax rate (the change in the public economy) is

$$(\Delta \text{ Public Economy})_i = \Delta \tau \bullet B_i \quad (6)$$

To determine the total change in the economic well-being of NYC residents, we add up the changes from the private economy and the public economy for all individuals, with a weight ω_i applied to each individual.

$$\Delta W = \sum_i \omega_i \Delta y_i = \sum_i \omega_i [\Delta \text{private economy} + \Delta \text{public economy}] \quad (7)$$

If we assign the same weight to each person ($\omega_i = 1$), and assume that the cost per unit of public services does not change, then the average welfare loss through the public sector from the 9/11 attack is

$$\Delta W_{\text{pub}/N} = \Delta _ - \Delta \text{EXP}/N + \tau \Delta B \quad (8)$$

$$= [\text{change in transfers}] - [\text{exp change}] + [\text{loss in tax revenues}]$$

where N is the resident population of NYC. The first term in (8) is the change in the average transfer payment ($\Delta _$). Using an individual welfare-based calculus, an increase in transfer payments to residents is welfare enhancing, helping to offset the disaster-induced loss in pretax income. This contrasts with the more traditional fiscal perspective, in which the increase in the local share of transfer costs has a negative effect on the city's fiscal condition.

The second term in (8) is the expenditure increase required to keep services at their pre 9/11 level. This extra cost will have a negative effect on the well-being of residents. The third term is the reduction in tax revenue because of losses in the city's tax base. These losses will also have a negative effect on well-being.¹⁹

To get the net per resident cost from the public economy, we subtract direct federal compensation per resident.

$$\text{Net Cost}/N = \Delta W_{\text{pub}/N} - \text{COMPENSATION}_{\text{FED}}/N = [\Delta W_{\text{pub}/N}](1 - s_{\text{FED}}) \quad (9)$$

Federal compensation s_{fed} is a weighted average of three forms of subsidy: the federal

¹⁹ Excluding the federal deductibility of local taxes, Ladd and Yinger (1991, Appendix, Chapter 6) estimate that in the 1980's about 15 percent of New York City's taxes were exported to non-residents. A recent estimate is that 21 percent of the 2003-2006 PIT surcharge is offset through federal deductibility. (Schlain, 2004)

matching share m for transfer payments (m), federal direct compensation for increased service costs, expressed here as a subsidy rate s , and the rate d at which the increase in local taxes can be deducted from federal taxes. Thus,

$$\text{Net Cost} = \{\Delta W_{\text{pub}} - [m(\Delta T) + s(\Delta \text{SERV})]\}(1-d) \quad (10)$$

The overall subsidy or compensation rate is a weighted average of the three types of subsidies. The way in which deductibility affects costs, i.e. multiplying the entire expression in brackets by (one minus) the deductibility rate, implies that all of the net increase in costs and the loss in tax base is made up through an increase in tax rates. This reflects the assumption that service levels are maintained. In fact, there is likely to be some decline in the level or quality of public services after a disaster, and cities will spread the fiscal cost of the attack over time by increased borrowing. In that sense, (10) indicates the maximum potential role of deductibility in affecting net cost.

II. The state role.

The aggregate loss to the state is given by

$$\Delta \text{TAX STATE}_{9/11} = \tau_{\text{ST}} \Delta \mathbf{B}_{\text{st}} (\text{attack})$$

where τ_{ST} is the state tax rate, and $\Delta \mathbf{B}_{\text{st}} (\text{attack})$ is the loss in state fiscal base due to the attack. Since the loss in tax revenues is a cost to all residents of the state, the cost to residents of New York is the aggregate loss divided by the entire state population, or $\Delta \text{TAX STATE}_{9/11}/N_{\text{S}}$. Assuming there are no required expenditure changes at the state level, then the required change in the state tax rate is

$$\Delta \tau_{\text{s}} = \tau_{\text{s}} (\Delta \mathbf{B}_{\text{st}} / \mathbf{B}_{\text{st}}) = \tau_{\text{st}} (\Delta \mathbf{B}_{\text{NYC}} / \mathbf{B}_{\text{NYC}}) (\mathbf{B}_{\text{NYC}} / \mathbf{B}_{\text{NYS}}) \quad (12)$$

As expressed in (12), the effect of a city disaster on the state's fiscal capacity depends the city's share of the state tax base, as well as the magnitude of the disaster within the city. Over 50 percent of Gross State Product is produced within New York City.²⁰ In no other state is the largest city even close to NYC in terms of its relative importance in the state. Because the New York City economy is so large relative to the entire state, the fiscal shock to NYC was also a fiscal shock at the state level. The correlation is magnified by the fact that the city and the state share common tax bases for the sales tax and the personal and corporate income tax.

²⁰ About 42 percent of the total number of state jobs are in NYC, and about 45 percent of state personal income is received by residents of NYC. Because a substantial portion of income generated in New York City is received by non-residents (37 percent of earned income in 1996), the share of New York State output produced within the borders of NYC is well over 50 percent.

References

- Bram, J. 2003. "New York City's Economy before and after September 11," *Current Issues in Economics and Finance*, Vol. 9, No. 2, February.
- Bram, J., J. Orr, and C. Rapaport, 2002. "Measuring the Effect of the September 11 Attack on New York City," *Economic Policy Review*, Vol. 8, No. 2, November.
- Chicago Fire, available at http://en.wikipedia.org/wiki/Great_Chicago_Fire
- Comptroller, City of New York. "Comprehensive Annual Financial Report, 2005. _____, "Review of the Financial Plan of the City of New York," February 2006)
- Glaeser, E. and J. Shapiro, 2002. "Cities and Warfare: The Impact of Terrorism on Urban Form," *Journal of Urban Economics*, Vol. 51, pp. 205-224.
- Haughwout, A. 2005 "The long-term impact of 9-11 on the New York City economy: Evidence from real estate markets," unpublished manuscript.
- Haughwout, A. and R. Inman, 2001, "Fiscal Policy in Open Cities with Firms and Households," *Regional Science and Urban Economics*, 31(2-3), April.
- Haughwout, A., R. Inman, S. Craig and T. Luce, 2004. "Local Revenue Hills: Evidence from Four Cities," *Review of Economics and Statistics* 86(2), pp.570-585.
- Melitz, Jacques and Fredric Zumer. 2002. "Regional Redistribution by the Center in Canada, France, the U.K. and the US: A reassessment and New Tests," *Journal of Public Economics* 86: 263_286.
- Mills, E. 2002. "Terrorism and US Real Estate," *Journal of Urban Economics*, Vol. 51, pp. 198-204.
- Orr, J., R. Rich, and R. Rosen, 1999. "Two New Indexes Offer a Broad View of Economic Activity in the New York–New Jersey Region." *Current Issues in Economics and Finance* Vol. 5, No. 14 (October).
- Schlain, Karen. 2004. "New York City and the Federal AMT: The Future is Now." *State Tax Notes*, February 23.
- Stock, J. and M. Watson, 1989. "New Indexes of Coincident and Leading Economic Indicators," *NBER Macroeconomics Annual*, Cambridge, Mass.: MIT Press.

Table 1: 2002 Price and Rent Effects in New York and Selected Sub-City Areas*

	Citywide (1)	Manhattan (2)	Lower Manhattan, LES, NW Brooklyn (3)	Lower Manhattan, LES (4)	Lower Manhattan (5)
<i>a. Monthly Rents (N=34,586)</i>					
\$	39.6 (5.8)	169.1 (8.0)	91.1 (12.2)	161.0 (6.8)	365.4 (25.3)
Natural log	0.05 (0.01)	0.12 (0.01)	0.02 (0.02)	0.12 (0.03)	0.37 (0.04)
<i>b. Prices (N = 16,672)</i>					
\$	68,714 (3,732)	151,883 (7,244)	102,709 (11,153)	57,771 (16,742)	113,733 (23,465)
Natural log	0.78 (0.02)	1.30 (0.07)	1.03 (0.10)	1.23 (0.15)	2.01 (0.22)

Notes to Table 1:

All regressions include controls for structural traits, survey year, rent control status, whether unit is a condominium or cooperative (price regressions), whether the owner lives in the building (rent regressions), and year acquired (price regressions) or year the current occupant moved in (rent regressions).

- (1) Coefficient and standard error estimates on a dummy variable for 2002 prices, relative to 1999 prices.
- (2) Coefficient and standard error estimates on a dummy variable for 2002 Manhattan prices, relative to 1999 Manhattan prices.
- (3) Coefficient and standard error estimates on a dummy variable for 2002 prices in Lower Manhattan, Chinatown and Lower East Side and Western Brooklyn, relative to 1999 prices in the same areas.
- (4) Coefficient and standard error estimates on a dummy variable for 2002 prices in Lower Manhattan, Chinatown and Lower East Side relative to 1999 prices in the same areas.
- (5) Coefficient and standard error estimates on a dummy variable for 2002 Lower Manhattan prices, relative to 1999 Lower Manhattan prices.

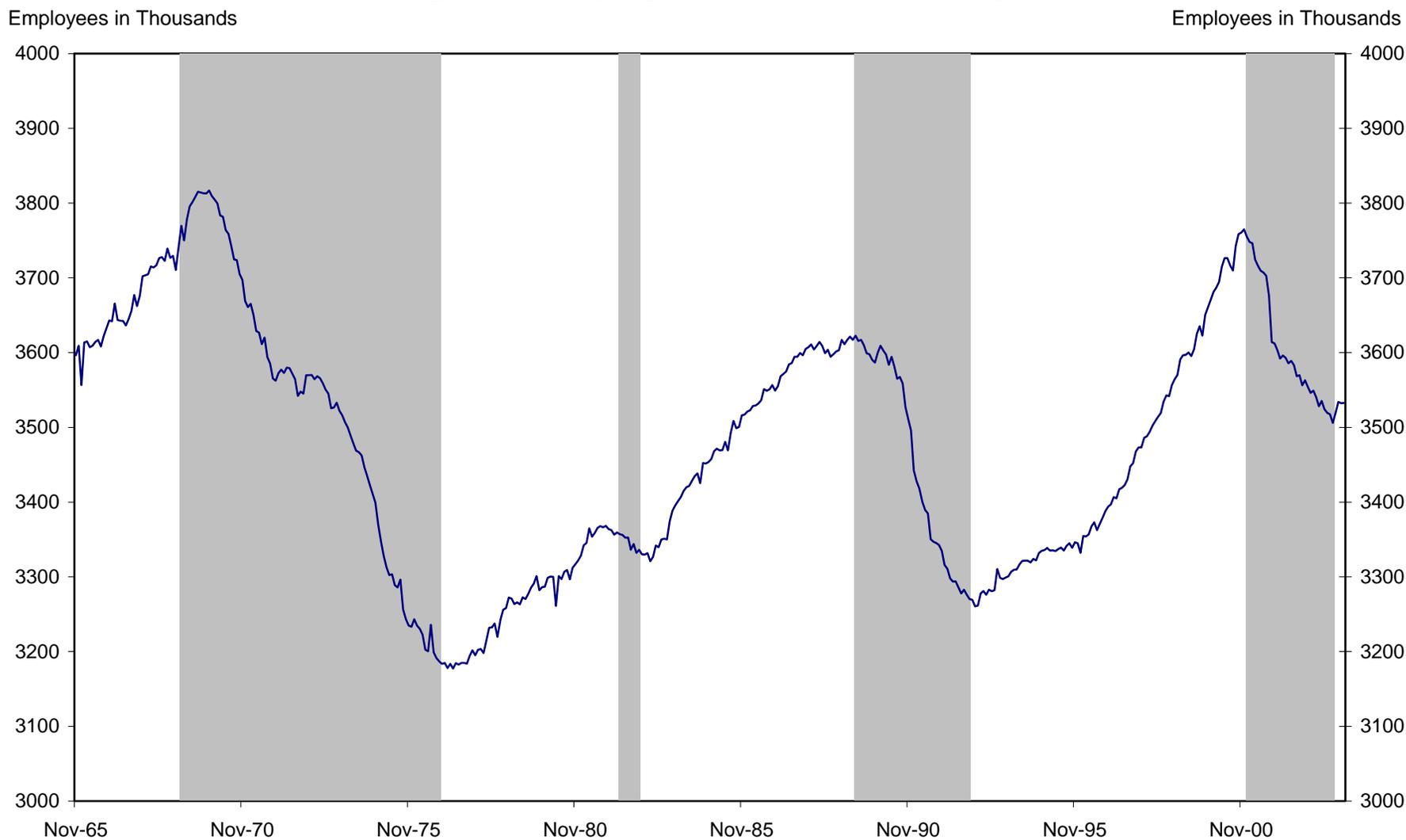
*Figures in **bold** represent increases that are significantly greater than national average increases in the shelter component of the CPI between 1999 and June 2002 (11.1%).

Table 2: Downtown Residential Development 1995 - 2004

Date Open	Conversion	New Development	Total by Year
1995	8	0	8
1996	0	0	0
1997	46	0	46
1998	1,454	152	1,606
1999	102	398	500
2000	811	209	1,020
2001	2,139	439	2,578
2002	1,366	25	1,391
2003	545	449	994
2004	867	915	1,782
Totals	7,338	2,587	9,925

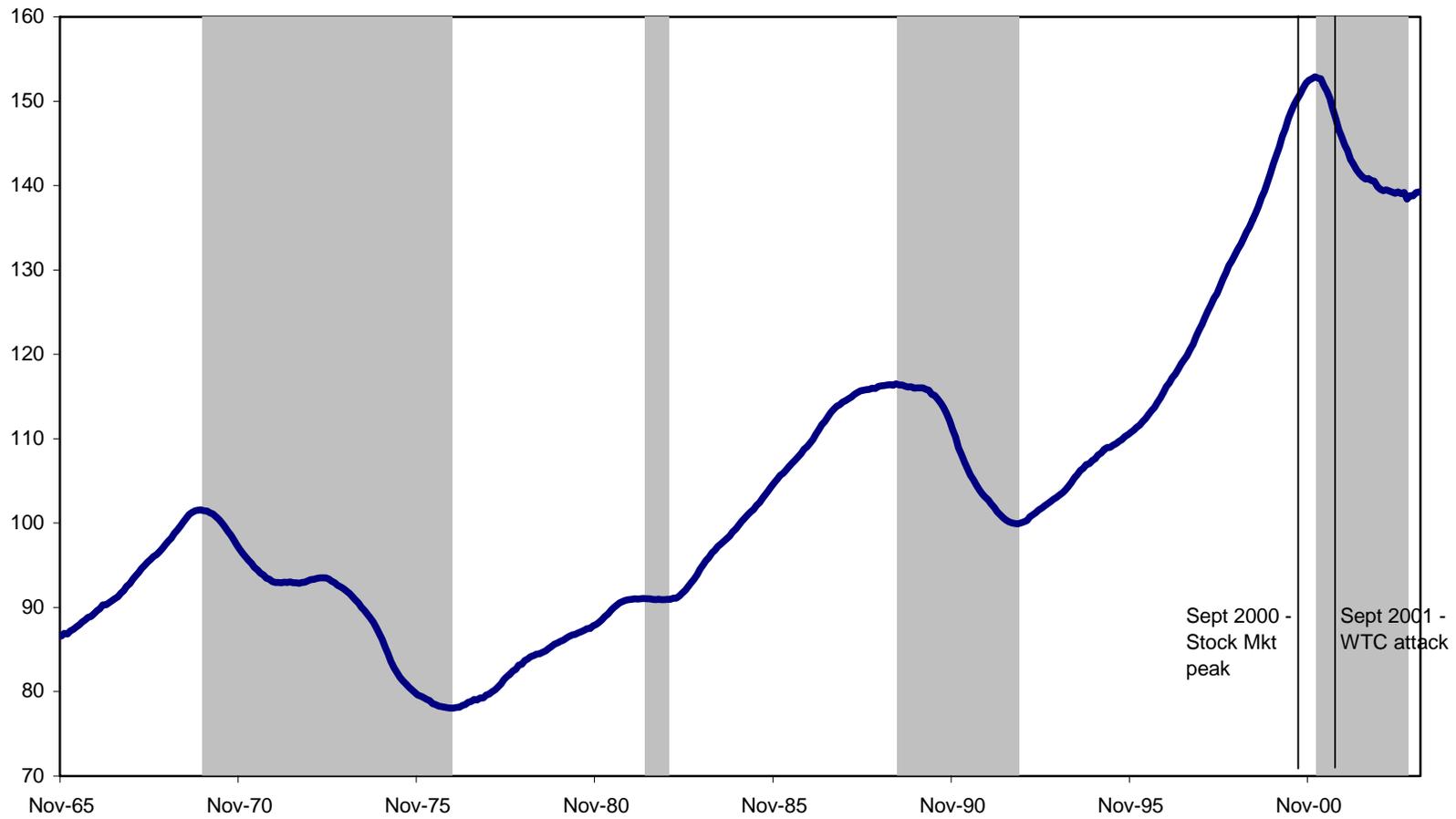
Source: Alliance for Downtown New York,
New York City Department of Housing Preservation and Development

Figure 1: Employment in New York City



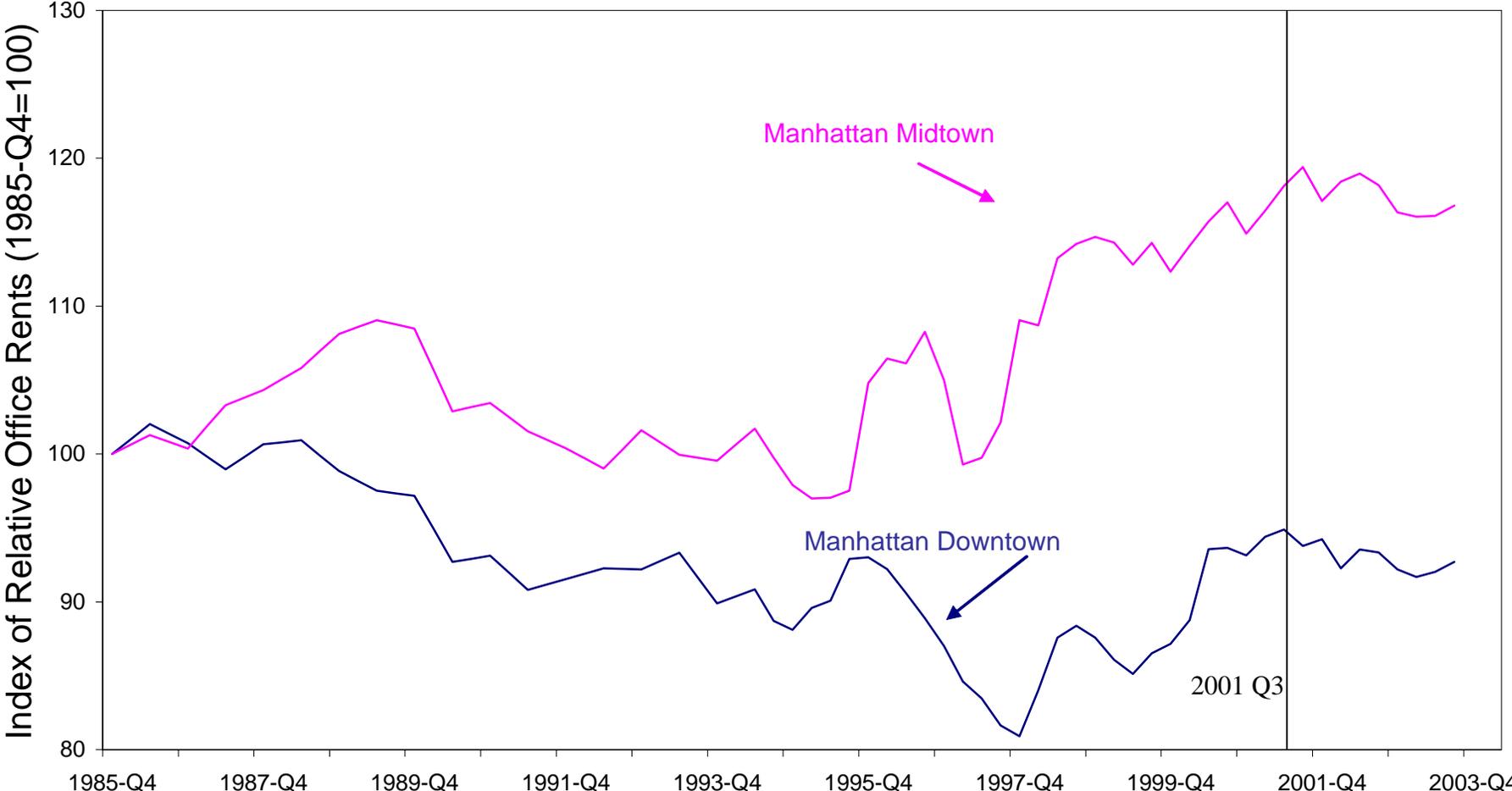
Source: BLS, Seasonally adjusted

Figure 2: New York City Index of Coincident Economic Indicators



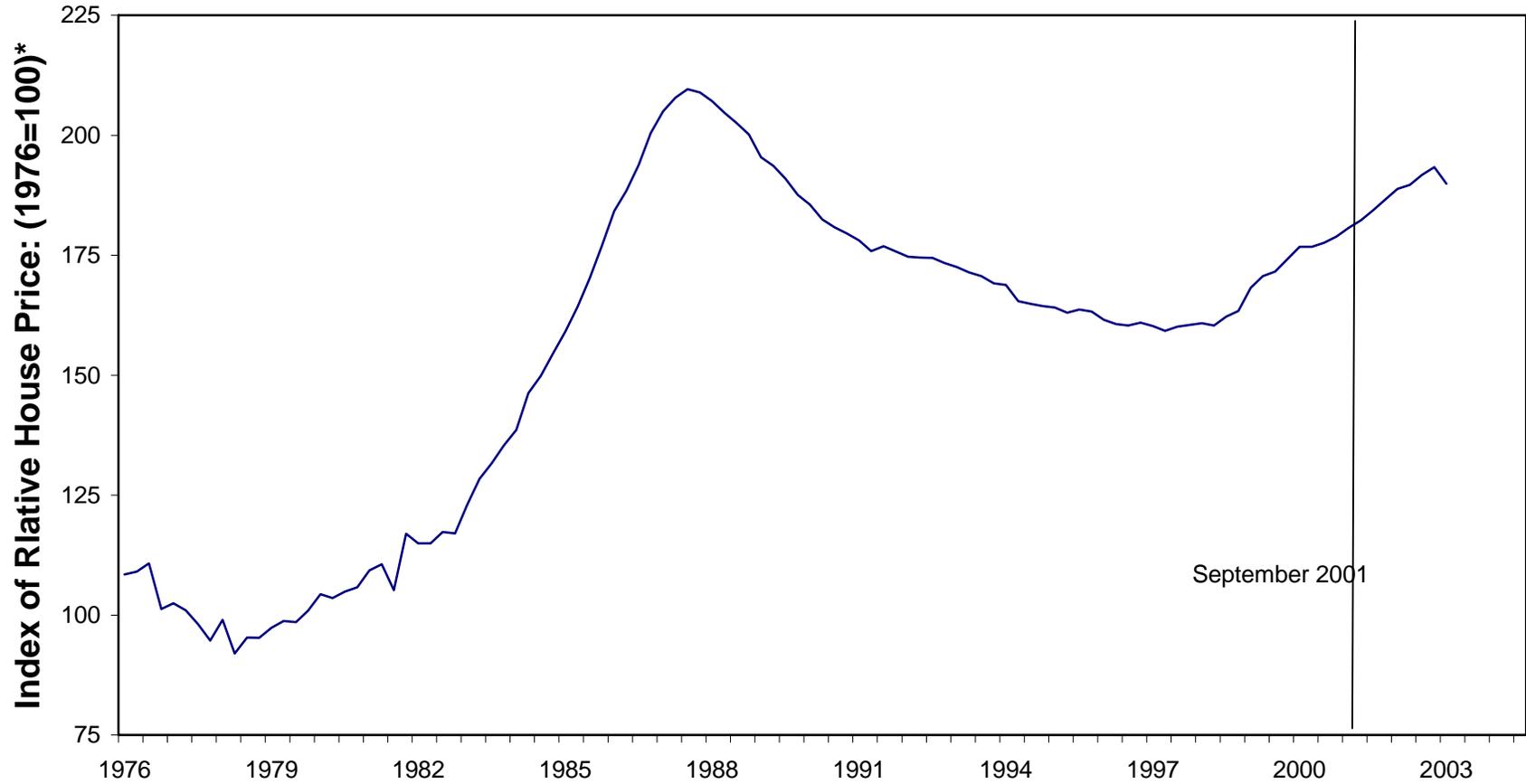
Source: Federal Reserve Bank of New York

Figure 3: Office Rent Indices
 Class A Space, Manhattan Markets Relative to National Average



Source: National Real Estate Index; FRBNY Calculations
 *Index is based on ratio of Office Prices in Manhattan to that of the US overall

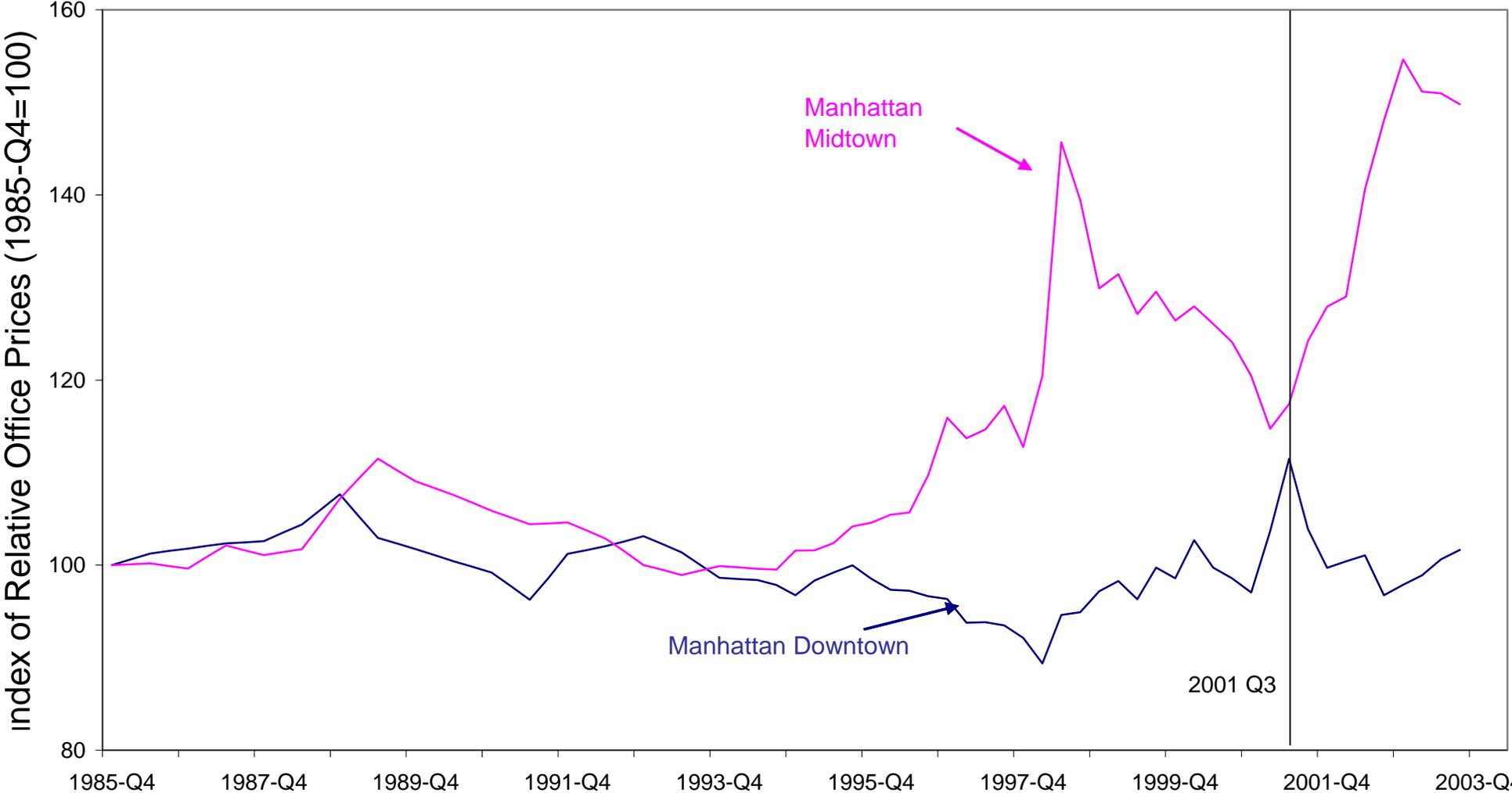
Figure 4: NYC-Area House Prices Relative to US Average



Source: Office of Federal Housing Enterprise Oversight; FRBNY Calculations

*Index is based on ratio of repeat-sales price measure for existing single-family homes in the NYC metro area to that of the US overall.

Figure 5: Office Price Indices
Class A Space, Manhattan Markets Relative to National Average



Source: National Real Estate Index; FRBNY Calculations
*Index is based on ratio of Office Prices in Manhattan to that of the US overall

Figure 6

PA, FS and Medicaid Number of Recipients

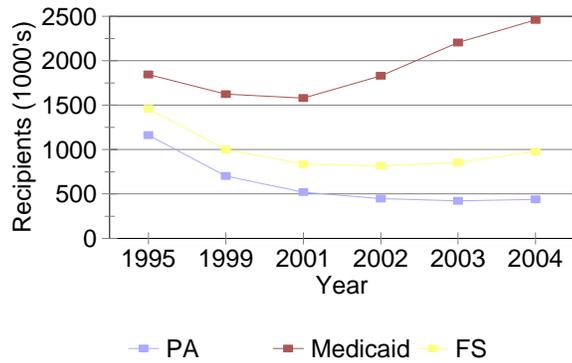
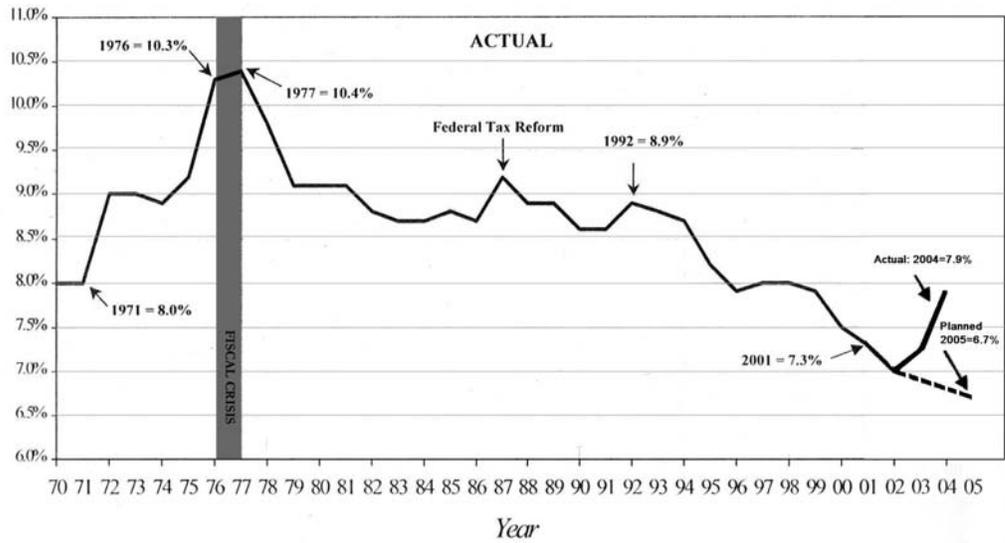


Figure 7
City Tax Revenue as the Share of Personal Income



: The City of New York Executive Budget FY2001: Budget Summary (Office of Management of Budget, 2001)