Choosing the Best Mix of Taxes for Philadelphia: An Econometric Analysis of the Impacts of Tax Rates on Tax Bases, Tax Revenue, and the Private Economy



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The Philadelphia Tax Reform Commission
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Econsult Corporation

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EXECUTIVE SUMMARY

Econsult Corporation was retained by the Philadelphia Tax Reform Commission (hereafter TRC), to conduct an econometric study of the likely impacts of potential changes in the tax rates of the City of Philadelphia. Econsult has provided various interim reports, both oral and written, to the TRC and its staff. This final report brings together all of the results of our study in a single document for the use of the TRC and others who may be interested. All conclusions expressed herein are those of Econsult Corporation. This report has been substantially improved by input from the TRC and its staff, but the reported conclusions should not necessarily be attributed to the TRC, its staff, or any other person or institution.

The dominant view among policy analysts regarding the effect of inter-jurisdictional differences in taxes and services is that business, population, and property values decline in areas offering an unattractive mix of taxes and services. That is, businesses and populations will "vote with their feet" when confronted with a tax structure and services that are not competitive with surrounding areas.

As a result of this phenomenon, the relationship between changing local tax rates and local tax revenue may not be represented by a simple formula where one multiplies the new tax rate times the old tax base. When a tax rate falls by X percent, tax revenue will not necessarily fall by X percent. Rather, most economists believe that tax revenue is likely to fall by less than X percent. For example a decrease in a local wage tax rate is expected to result in more jobs and more wages and salaries. Economists refer to such a phenomenon as a "supply side effect." While there is a lot of debate among economists about whether *federal* taxes have supply side effects, there is widespread agreement that *local* taxes do have supply side effects because it is much easier for an employer or a person to leave a city than to leave a country.

While economic theory clearly establishes the direction of the impacts of lower local tax rates on local tax bases, it does not establish the size of the effect. When a tax rate falls by 50 percent, for example, its corresponding base should increase, but by how much? If the base increases by 100 percent, tax revenue would be unchanged; if the base increases by less than 100 percent, tax revenue would fall. If the base increases by more than 100 percent, tax revenue would rise.

The purpose of this study is to shed some light on this issue by conducting an econometric analysis of historic data to estimate the size of the supply side effects, if any, relating to changes in Philadelphia's wage tax, property tax, and gross receipts tax rates. We then use those estimates as the basis of a simulation model that we can use to assess the likely

impacts of changes in tax rates. This approach is commonly used in economic impact analyses to compare alternative economic programs and to provide a coherent methodology that can be used to evaluate the economic ramifications of a given policy action. The goal of the study is to provide objective information, which will assist the TRC in the development of its policy recommendations.

Our econometric analyses reveal consistent empirical evidence that:

- Reductions in tax rates expand the base of the particular tax being reduced
- Changes in wage, property and gross receipts tax rates have cross-base effects
- Loss in tax revenues are partially offset by growth in base resulting from tax reductions
- Reductions in wage taxes significantly increase employment in the City of Philadelphia

The estimation results indicate that reductions in tax rates expand the base of the particular tax being reduced and that changes in wage and gross receipts tax rates have cross-base effects as well as significant impacts on the number of jobs in the City. In other words, lowering the wage tax rate will increase not only the wage tax base but also the property tax base and employment; lowering the gross receipts tax rate is expected to lead to increases in all three tax bases and employment; lowering the property tax rate will produce increases in the wage tax base and the property tax base. These changes in the tax bases and jobs suggest that losses in tax revenues resulting from a reduction in tax rates will be partially offset by the growth in the bases, which result from tax reductions.

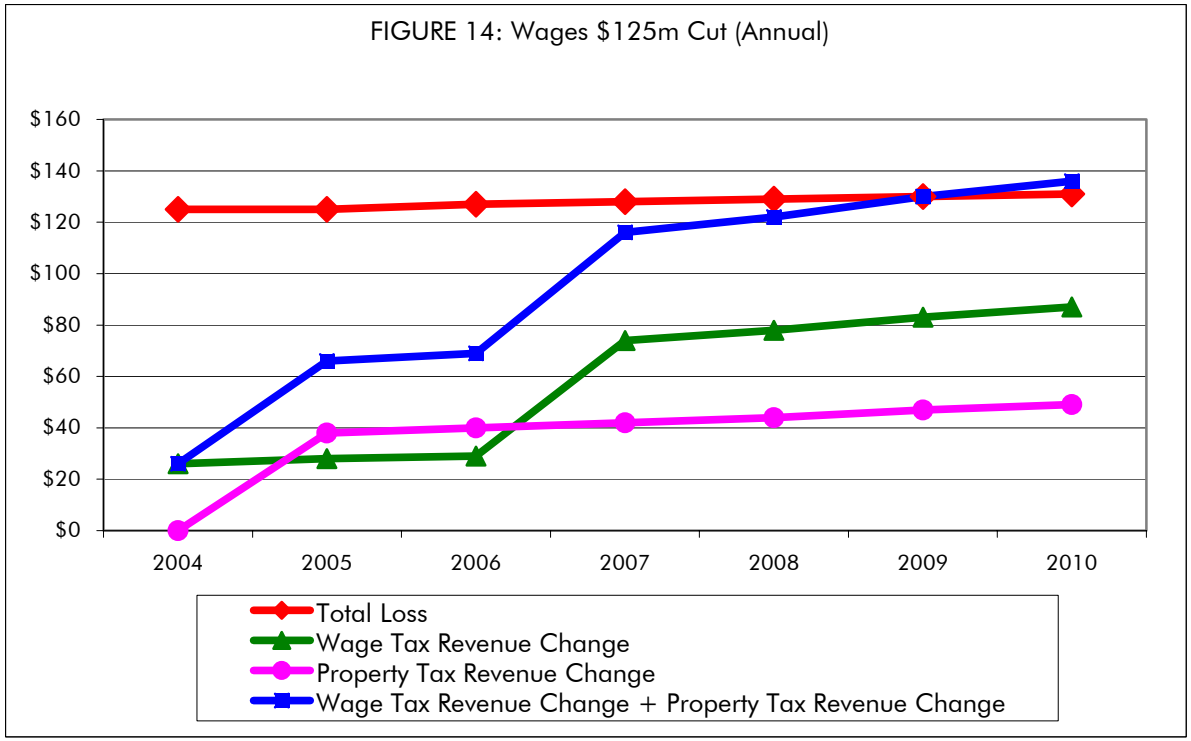
The estimation results described above provide the basis for six simulations:

- A baseline scenario in which tax rates are assumed to stay at their current levels
- Alternative 1 – A substantial immediate lowering of the wage tax rate
- Alternative 2 – The immediate elimination of the gross receipts wage tax rate
- Alternative 3 – A substantial immediate lowering of the property tax rate
- Alternative 4 – A phased reduction of the wage and gross receipts tax rates as proposed by the TRC
- Alternative 5 – A phased reduction of the wage and gross receipts tax rates as proposed by the TRC combined with the Rendell Plan for a New Pennsylvania

It should be noted that the TRC also proposed a phased reduction of the Net Income Tax. Due to data limitations, however, we were unable to include the Net Income Tax reductions in our simulations.

To enhance comparability Alternatives 1, 2, and 3 are designed so that each would imply the same revenue reduction in the first year in the absence of any supply side response.

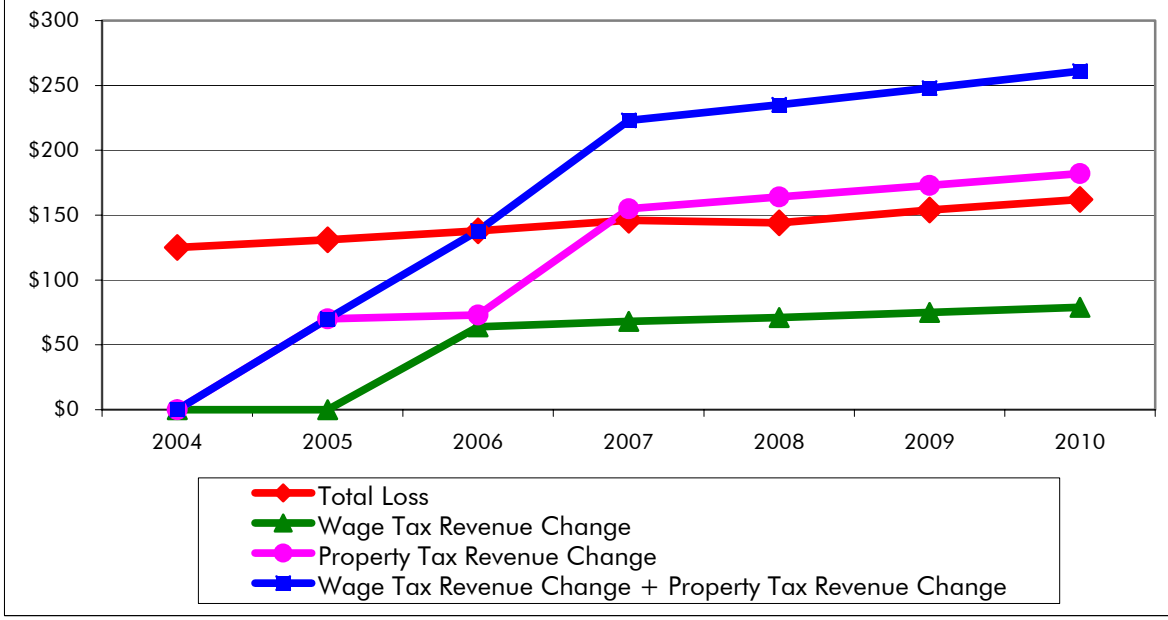
When we compare alternative 1 to the baseline, we see that the wage tax decrease is anticipated to lead to significant increases in both the wage tax base and the property tax base. If assessments were to keep pace with rising property values in the City, and the effective property tax rate is held constant, then property tax revenues would increase. Whether the City would be able to collect additional tax revenue due to the increase in property values is unclear. An increase in assessed value and maintenance of current millage rates might not be politically acceptable. Figure 14, taken from the report, shows the annual impact of the additional growth in the wage and property bases on tax revenues. It suggests that if the additional property tax revenue can be collected, then revenues will exceed the annual loss beginning in 2009. This point is where the red line in the chart, which represents the annual loss in revenue, intersects the blue line, which is the sum of the increases from the growth in the wage and property tax bases. If none of the potential property tax revenues are collected, the annual deficit would correspond to the difference between the increase in wage tax collections, the green line, and the loss due to the decrease in the wage tax rate, the red line.



When we compare Alternative 2 to the baseline, we see that the elimination of the gross receipts tax is anticipated to lead to significant increases in both the wage tax base and the property tax base. Since the gross receipts tax rates go to zero, the gross receipts base no longer has a supply side revenue impact apart from its cross-base impact. If property assessments were to keep pace with rising property values in the City, and the effective property tax rate is held constant, then property tax revenues would increase. Figure 16, taken from the report, shows that, if we can assume that the additional property tax revenue can be collected, the actual tax collections will begin to exceed the annual losses from the tax decrease by 2007. If none of the potential property tax revenues increase is collected, then the annual deficit would correspond to the difference between the increase in wage tax collections, the green line, and the loss due to the decrease in gross receipts tax, the red

line. In other words, the supply side effects would not be sufficient to offset the revenue losses associated with the tax decrease.

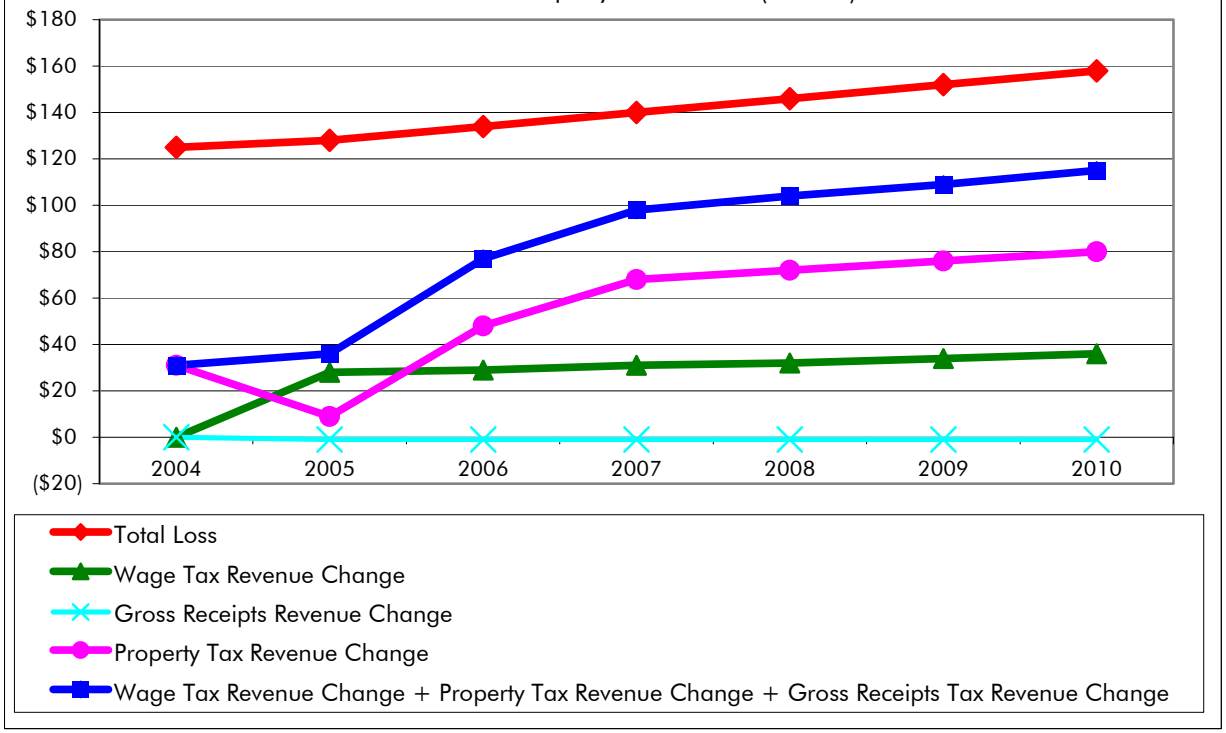
FIGURE 16: Gross Receipts $125m Cut (Annual)



When we compare Alternative 3 to the baseline, we see that the reduction of the property tax rate is anticipated to lead to a significant increase in the property tax base and a modest increase in the wage tax base. If property assessments were to keep pace with rising property values in the City, then property tax revenues would increase. Figure 18, taken from the report, shows the projected impacts. As in the previous graphs, the red line represents the annual loss in revenue caused by the reduction of the property tax and the blue line equals the sum of the supply side effects, which includes both the increase in property tax revenues and the increase in wage tax revenues. The fact that these lines do not intersect over the

forecast horizon suggests that the supply side effects of this tax reduction will be insufficient to compensate for the revenue losses.

FIGURE 18: Property $125m Cut (Annual)

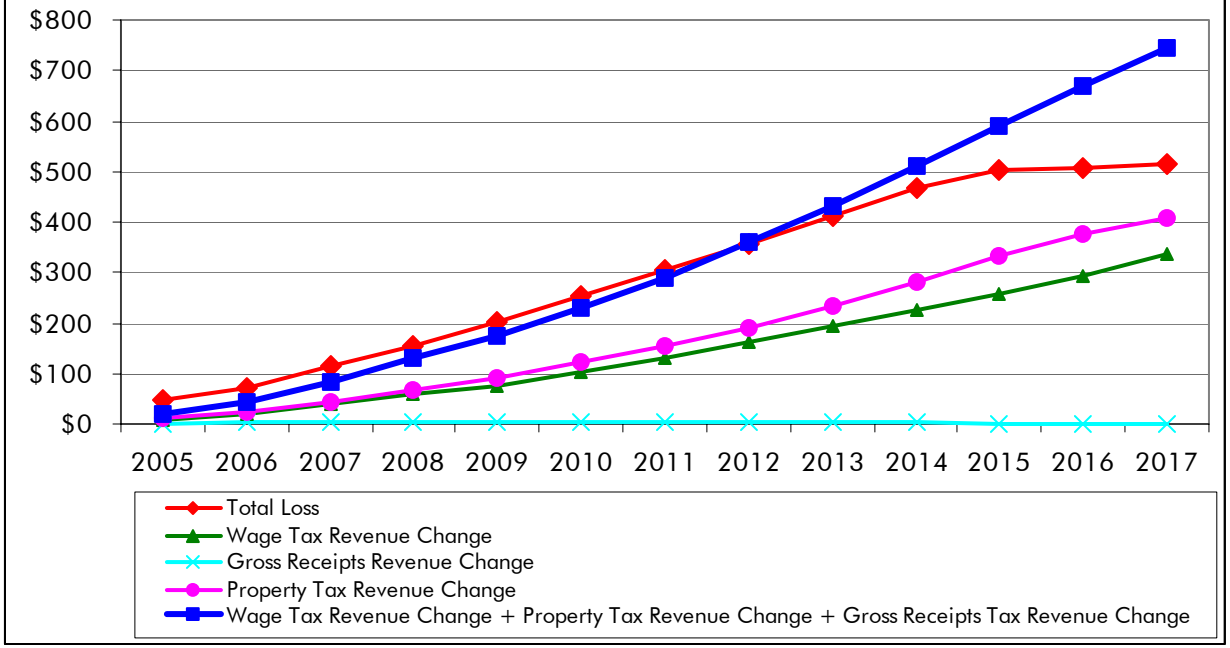


A comparison of Alternatives 1, 2,and 3 indicates that the determination of the optimal tax structure is dependent upon the economic measure used for the comparison. If we assume that assessments follow property values, then in terms of revenue losses, the gross receipts tax will have the greatest supply side effects. In terms of private income generated, the wage tax reduction generates about the same level of private income as the gross receipts tax and a much greater increase in private income than the property tax reduction. The increase in jobs in the City will be highest from a wage tax reduction.

After examining the three alternatives described above, we consider two additional scenarios that are based on the proposed recommendations of the TRC. Scenario 4 is based on a combination of the Business Tax Working Group and Wage Tax Working Group proposals. This scenario assumes a phased elimination of the gross receipts tax over the next ten years as well as a phased reduction in the resident portion of the wage tax from 4.4625 percent in 2004 to 3.5 percent in 2014 and a reduction in the non-resident portion of the tax from 3.8801 to 3.0 percent. The final scenario, Scenario 5, assumes similar reductions in the gross receipts and wage taxes combined with the implementation of the Rendell Plan for a New Pennsylvania.

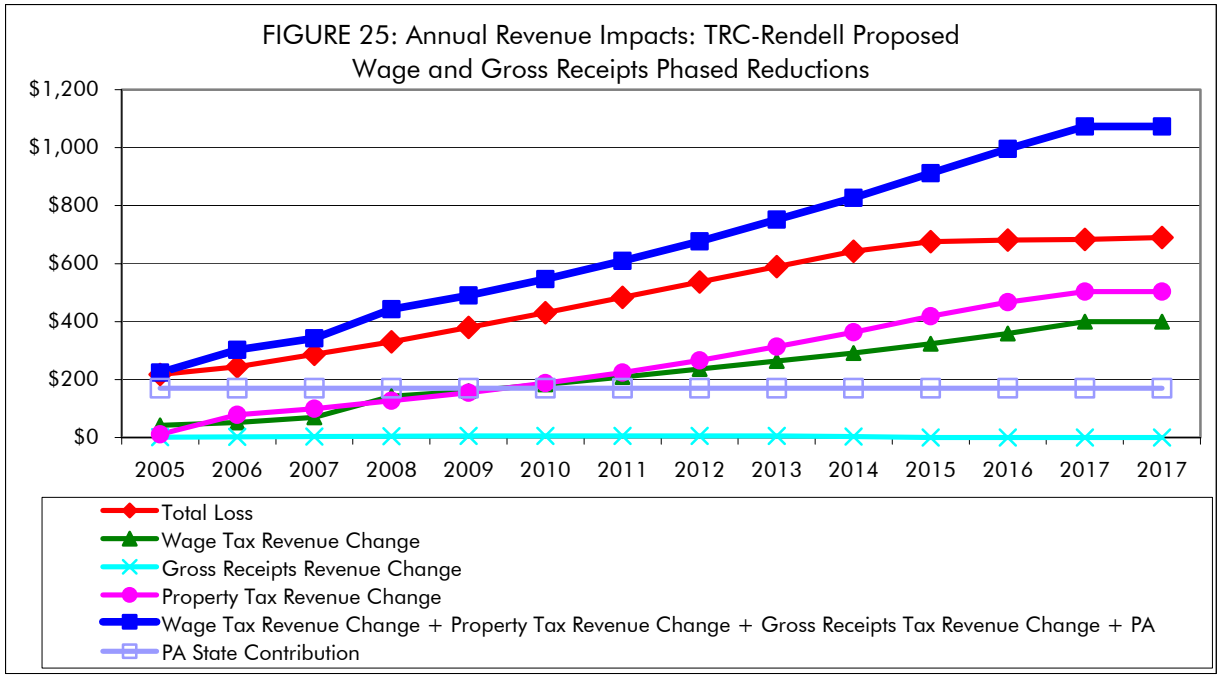
When we compare Scenario 4 with the baseline, we see that the phased reductions proposed by the TRC are expected to result in significant wage and property tax base growth. This proposal is attractive because it combines the gross receipts tax cuts, which tend to have favorable revenue implications, with wage tax reductions, which tend to have stronger income and employment impacts. The revenue impacts of the proposal are summarized in Figure 23 from the report, which shows the revenue impact of the tax decrease as well as the annual wage, gross receipts and property tax gains resulting from the increase in the respective tax bases. Figure 23 shows the annual impact of the additional growth in the wage, gross receipts and property bases on tax revenues. If one looks only through 2010, the revenue losses will exceed the annual supply side gains every year through 2010. After 2012, however, the revenues are larger each subsequent year than they would have been without the tax cuts (assuming, again that real estate tax revenues rise with real estate values.)

FIGURE 23: Annual Revenue Impacts: TRC Proposed Wage and Gross Receipts Phased Reductions



The comparison of Scenario 5 with the baseline indicates that the combination of the Rendell Plan for a New Pennsylvania and the phased reductions in wage and gross receipts tax rates proposed b the TRC result in significant wage and property tax base growth. Like the TRC proposal alone, this program is attractive because it combines the gross receipts tax cuts, which tend to have favorable revenue implications with wage tax reductions, which tend to have stronger income and employment impacts. The revenue impacts of the proposal are summarized in Figure 25, which shows the revenue impact of the tax decrease as well as the annual wage, gross receipts and property tax gains resulting from the increase in the respective tax bases. Figure 25 shows the annual impact of the additional growth in the wage, gross receipts and property bases on tax revenues as well as the revenue provided by the state. It shows that with the contribution from the state, the revenue gains will immediately offset the annual revenue losses.

FIGURE 25: Annual Revenue Impacts: TRC-Rendell Proposed Wage and Gross Receipts Phased Reductions



The report ends with a discussion of caveats, concerns, critiques, and conclusions. Our greatest concern regarding the revenue impacts of reducing the gross receipts and wage tax rates is whether the City can increase its property tax revenues in proportion to the predicted rise in property values associated with the tax reductions. The question is whether the City will resist the inevitable pressure to slow the growth of assessments and/or lower the effective property tax rate as property values rise. Our principal conclusions are those described above. Following the final section of the main report are several appendices containing technical information and discussions of supplemental analyses.

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Econsult Corporation was founded in Philadelphia in 1979 for the purpose of providing high quality economic research and statistical & econometric analysis in support of litigation. Today the practice has expanded beyond litigation to include economic consulting services to assist business and public policy decision-makers. Known for its sophisticated economic and statistical analyses, Econsult brings analytical rigor and a deep understanding of institutions and political realities to its policy consulting. For more information go to www.econsult.com.

I. INTRODUCTION

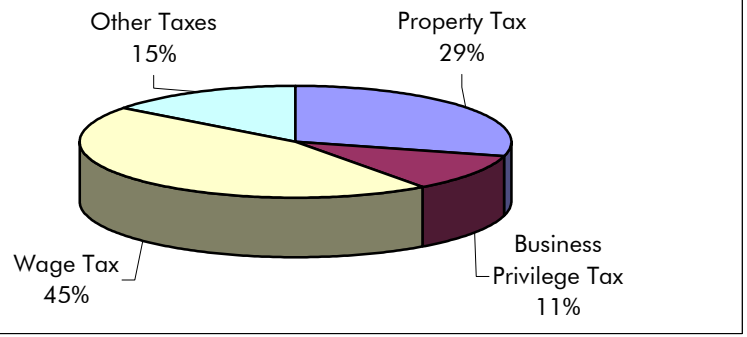
Econsult Corporation was retained by the Philadelphia Tax Reform Commission (hereafter TRC), to conduct an econometric study of the likely impacts of potential changes in the tax rates of the City of Philadelphia. Econsult principals Drs. Richard Voith and John Del Roccili conducted that study. Econsult has provided various interim reports, both oral and written, to the TRC and its staff. This final report brings together all of the results of our study in a single document for the use of the TRC and others who may be interested. All conclusions expressed herein are those of Econsult Corporation. This report has been substantially improved by input from the TRC and its staff, but the reported conclusions should not necessarily be attributed to the TRC, its staff, or any other person or institution.

There are nine sections in this report, including this first section. In the second section, we describe the history of Philadelphia's tax rates and tax revenues. Then, in the third section, we discuss the economic theory of local tax impacts. The fourth section contains non-technical discussions of our estimation and simulation models. (Technical details are reported in Appendices A, B, and C.) In the fifth section, we discuss several subtle issues that shape how one evaluates and compares alternative tax policies. We present, in the sixth section, a baseline scenario, which is a forecast of Philadelphia's economic future under the assumption that all tax rates will remain at their current values. Then, in section seven, we discuss three alternative tax reduction scenarios; one in which the wage tax is lowered, one in which the gross receipts tax is eliminated, and one in which the effective property tax rate is lowered. In all three scenarios, tax rates are assumed to fall suddenly and dramatically. In the eighth section, we discuss two scenarios based on the TRC's proposal of phased reductions in the wage tax and gross receipts tax rates. The first scenario considers only those two changes; the second assumes those changes along with the implementation of the Rendell Plan for a New Pennsylvania. In the final section, we present a few caveats and concerns about our study, discuss a recent critique of our study, and restate our major conclusions. Following this final section of the report are several appendices containing technical information and discussions of supplemental analyses that are mentioned briefly in the report.

II. PHILADELPHIA'S HISTORICAL TAX RATES AND TAX REVENUES

The City of Philadelphia derives most of its tax revenue from four sources: the property tax, the wage tax, the business gross receipts tax, and the business net income tax. Figure 1 shows the relative sizes of these four sources. The City differs significantly from most municipalities in its very heavy reliance on taxes related to economic activity (wages, gross receipts, and net income) rather than property taxes. As shown in Figure 1, the property tax yields 29 percent of the City's tax revenues (including tax revenues that go to the Philadelphia School District), while three other taxes that are directly related to economic activity in the City generate 56 percent of the City's revenues.[1] The wage tax, which is imposed on residents as well as nonresidents working in the City, is by far the largest generator of revenues for the City, providing 45 percent of tax revenue. The combination of the gross receipts and net income taxes yields 11 percent of local tax revenues.

FIGURE 1



It is instructive to compare Philadelphia's reliance on the property tax with that of other cities. To get a clean comparison across cities, it is best to remove any tax revenues that go to schools. On that basis Philadelphia derives 21 percent of its

[1]These Data are based on Philadelphia City Controller's *Tax Structure Analysis Report* (2001); the figures are for fiscal year 2000. Philadelphia imposes a number of other taxes including the Business Use and Occupancy Tax, Parking Tax, Realty Transfer, Liquor Sales Tax, Amusement Tax, Hotel Tax, and Vehicle Rental Tax.

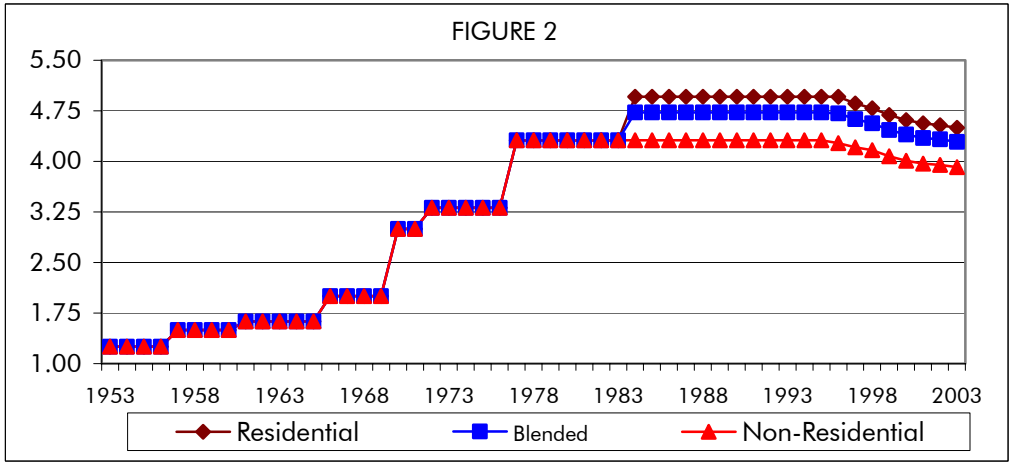
tax revenue from property taxes. The corresponding average percentage for cities with at least 300,000 residents is 40 percent.[2]

II.A. Wage Tax Rates and Revenue

Philadelphia first imposed a wage tax in 1939. The tax is paid by all wage earners living in the City of Philadelphia whether or not they work in the city, and by all nonresidents who work in the city.[3] Wage tax rates were increased six times from 1.25 percent in 1952 to 4.3125 percent in 1976. In 1983 wage taxes were increased again for residents to 4.96 percent, but there was no change for nonresidents, creating a two-tiered rate system.

There were no additional changes in tax rates until 1996, when the Rendell Administration embarked on a series of modest wage tax reductions for both residents and nonresidents. The blended wage tax rate declined from 4.73 percent in 1995 to 4.29 percent in 2003. The pattern of wage tax changes is shown in Figure 2, which shows the resident, non-resident and "blended" wage tax rates.[4]

FIGURE 2



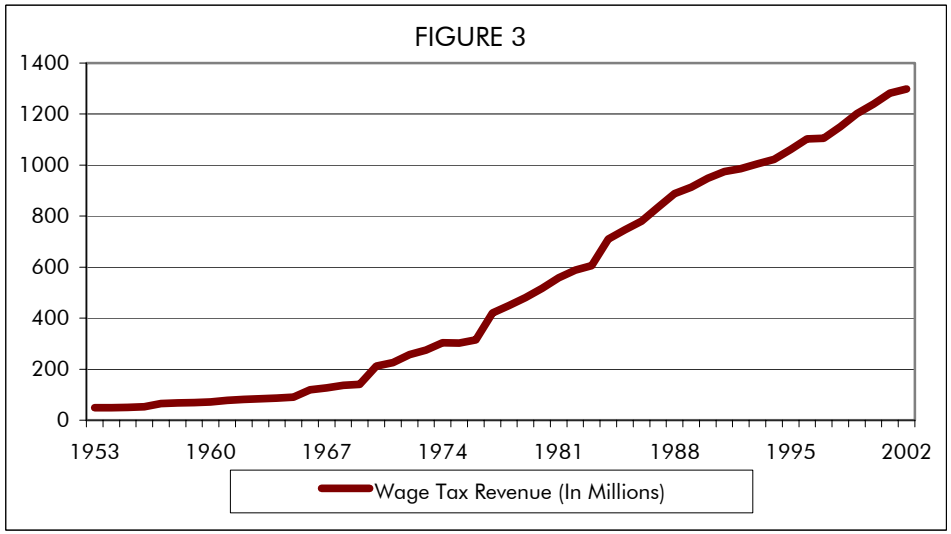
[2] The Philadelphia figure is again based on the *Tax Structure Analysis Report* (2001). The national figures are based on the 1997 Census of Governments. The four-year divergence between the sources is extremely unlikely to have much impact on the comparison.

[3] As commonly discussed, the wage tax is really a combination of three taxes—the wage tax, the earnings tax, and the net profits tax, all of which have the same rate. In our analysis, we investigated tax rate/tax base relationships based on both the sum of wage and earnings tax bases and on the sum of wage, earnings and net profits taxes. The findings are very similar across the two.

[4] Based on City of Philadelphia Revenue Department estimates, the fraction of revenues derived from residents and nonresidents has remained relatively constant at 64 percent from residents of the City and 36 percent from nonresidents. We computed the "blended" wage tax rate as the weighted average of the resident and nonresident rates using the fraction of revenue from each group as the weights.

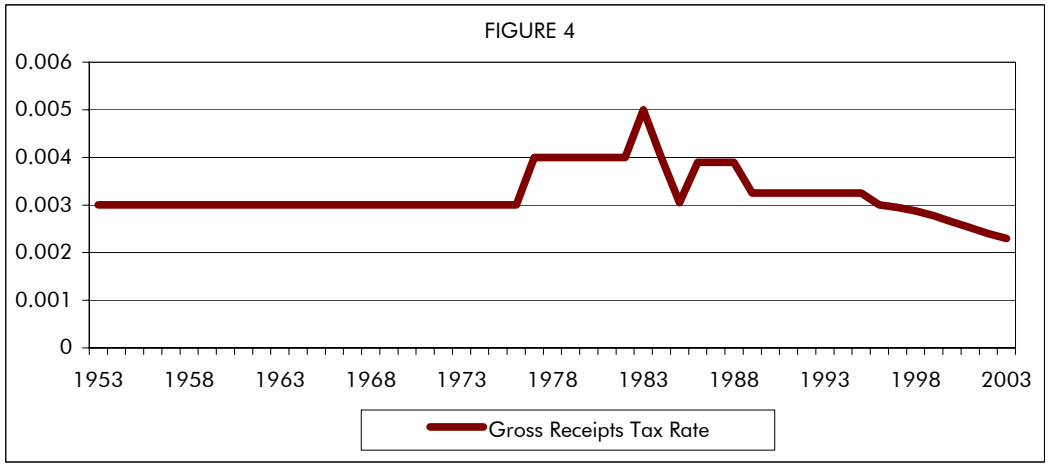
Figure 3 shows wage tax revenues collected by the City, 1953-2002. These revenues are sharply increasing for two reasons: (1) tax rates increase sharply over time, and (2) the revenue figures, which are nominal, reflect the impacts of inflation over the period. It should be noted that employment fell sharply from 1969 to 2002, and growth in real earnings per person did not offset the employment decline, so total real wage earnings fell in the City of Philadelphia during this period.

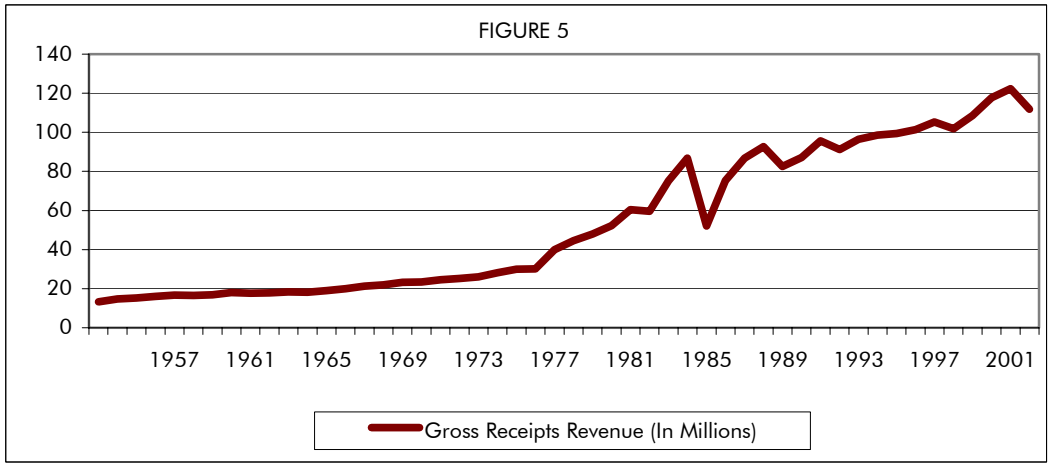
FIGURE 3



II.B. Gross Receipts Tax Rates and Revenue

Philadelphia has employed business gross receipts taxes since at least 1952. In 1952 the General Business Tax contributed 1 mill of gross receipts to help fund the Philadelphia school system. In 1968 this tax was changed to the lower of 2 mills of gross receipts or 2 percent of net income. In 1953, Philadelphia adopted a tax called the Mercantile License Tax. This tax was 3 mills at the start, increased to 4 mills in 1977, 5 mills in 1983, and then fell to 4 mills in 1984, before it was replaced by the Business Privilege Tax.





The Business Privilege Tax was adopted in 1985, replacing the Mercantile License Tax and the General Business Tax with the Gross Receipts Tax and the Net Income Tax. The gross receipts part of the Business Privilege Tax stood at 3.05 mills in 1985, but increased to 3.9 mills in 1986. The tax was reduced to 3.25 mills in 1989 where it stood until 1996. As part of the Rendell program of tax cuts the gross receipts tax was cut in each subsequent year and standing at 2.3 mills in FY 2003. The historical Gross Receipts Tax rates are graphed in Figure 4.

Figure 5 shows gross receipts revenue collected through both the Mercantile License and Business Privilege Taxes.[5]

[5] The City publishes the total Business Privilege tax revenues, aggregating the sum of the two taxes. Working with the revenue department we obtained a revenue series of gross receipts revenues. Earlier work examining the relationship between business tax bases and tax rates were forced to make assumptions regarding the business tax revenues to calculate the business tax base because of the gross receipts data were not previously available.

II.C. Net Income Tax Rates and Revenue

The City has had some form of business net income tax since 1968 when the General Business Tax was changed to allow businesses a choice of paying the gross receipts tax or a 2 percent net income tax. In 1985, a net income tax was adopted as part of the Business Privilege Tax. The tax rates associated with these two taxes are shown in Figure 6.

FIGURE 6

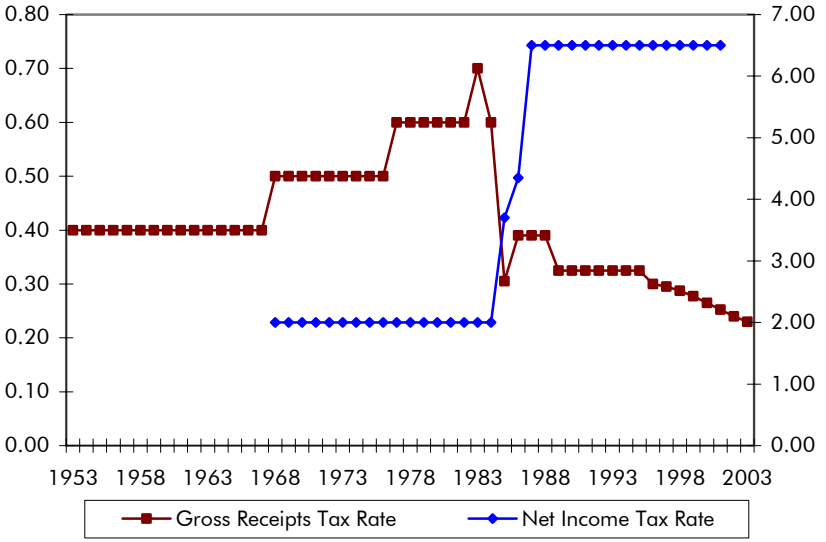
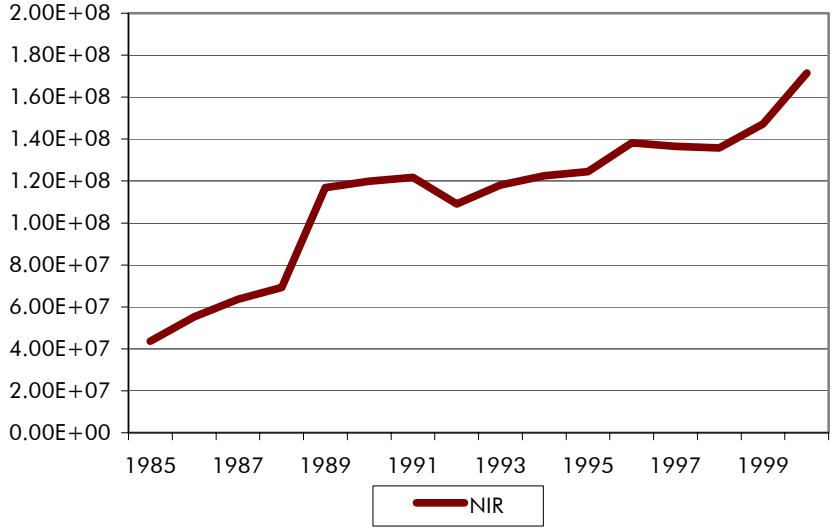


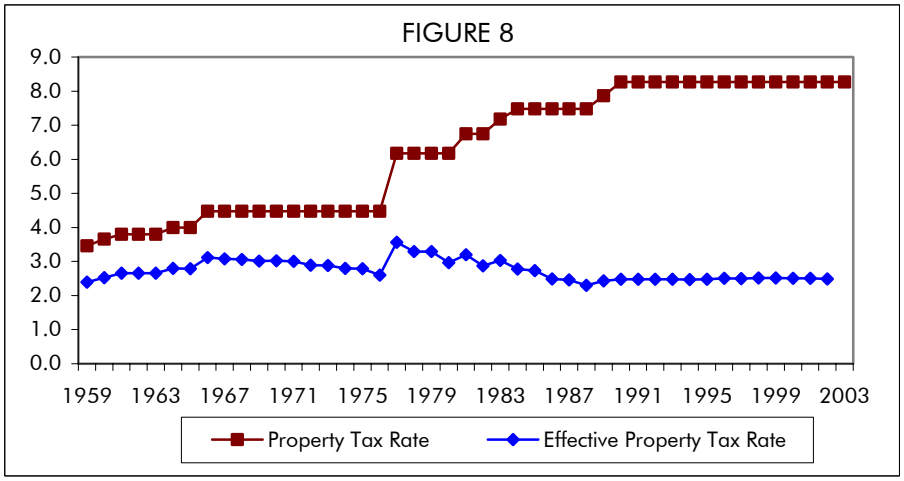
FIGURE 7



II.D. Property Tax Rate and Revenue

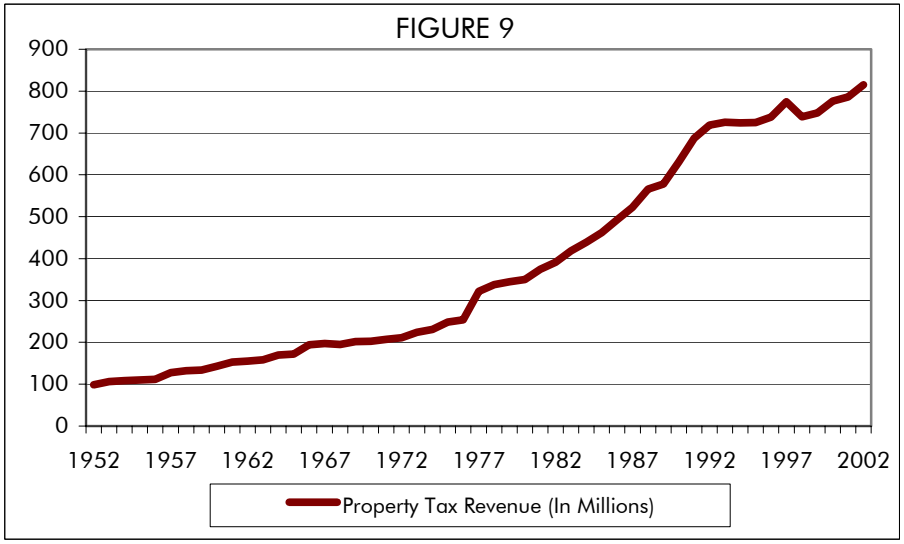
Effective property tax rates depend on both the legislated mill rate applied to assessed value and the relationship of the property's tax assessment to market value. The Pennsylvania State Tax Equalization Board maintains an annual series expressing the fraction of market value that is reflected in the assessments of each county. In Philadelphia, the relationship between assessed properties and market values has varied considerably over time, as have the City's legislated mill rates. Figure 8 shows the property and effective property tax rates for 1959-2003.

FIGURE 8



Although the mill rate rose continuously throughout the sample period, the effective property tax rate has fluctuated between 2.3 and 3.6 percent over the sample. Effective property taxes fell considerably from 1977 through 1988 and have remained relatively stable through the 1990s. Note that the 1977-88 period corresponds to a period of significant mill rate increases, but these increases were offset by changes in the relationship between assess value and market value. The property tax revenues generated from these rates are shown in Figure 9.

FIGURE 9



II.E. From Historical to Optimal

In this section we have described the history of Philadelphia's tax structure. The following sections of this report describe the work performed by Econsult Corporation on behalf of the Philadelphia Tax Reform Commission ("TRC") to develop a rational analytical framework to help choose the best mix of City taxes for the future by quantifying and comparing the effect of alternative tax reform initiatives. These objectives were accomplished through the estimation and simulation of a set of econometric equations that describe the relationship between key tax instruments including the wage, property and gross receipts taxes and corresponding tax bases, employment and tax revenues.

III. THE ECONOMICS OF LOCAL TAXES

Many older American cities have experienced secular declines in population, employment and relative income over the last fifty years. Confronted with declining tax bases, increasingly poor populations, politically powerful municipal unions, the inability to annex adjacent land, and a decline in federal aid after 1980, many cities increased tax rates in an attempt to maintain service levels. Such actions have fueled a heated debate regarding the impacts of local tax structure on city economies.

The dominant view among policy analysts regarding the effect of inter-jurisdictional differences in taxes and services is that business, population, and property values decline in areas offering an unattractive mix of taxes and services. That is, businesses and populations will "vote with their feet" when confronted with a tax structure and services that are not competitive with surrounding areas.

From an empirical perspective, the concern is that the relationship between changing local tax rates and local tax revenue may not be represented by a simple formula where one multiplies the new tax rate times the old tax base. When a tax rate falls by X percent, tax revenue will not necessarily fall by X percent. Rather, most economists believe that tax revenue is likely to fall by less than X percent because the tax base is likely to increase. For example a decrease in a local wage tax rate is expected to result in more jobs and more wages and salaries. Economists refer to such a phenomenon as a "supply side effect."[6] While there is a lot of debate among economists about whether *federal* taxes have supply side effects, there is widespread agreement that *local* taxes do have supply side effects because it is much easier for an employer or a person to leave a city than to leave a country. Thus the cost of local tax avoidance is much lower. Wasylenko (1997) reviews the literature on the effects of state and local taxation on economic development and concludes that while state taxes have only small impacts, local taxation has more significant impacts on the intra-metropolitan distribution of economic activity. McGuire, Mark and Papke (2000) examine the effect of a variety of local taxes on jurisdictions in the Washington D.C. metropolitan area, using panel data, and found increases in business taxes to have significant negative effects on

[6] The underlying sources of supply side growth are very different at the national and local levels. Many believe that supply side growth at the national level, which is thought to be largely related to increased investment and labor effort, can be of only modest size. At the local level, supply side impacts, which are thought to be caused by the shifting of activity from one jurisdiction to another, could be quite large.

employment. Similar results were found by Inman (1992) who examined the relationship between tax rates and tax bases in Philadelphia.

Haughwout and Inman (2001) have developed theoretical models of the responses of households and businesses to differential tax rates in a metropolitan area. Their analysis, calibrated to the Philadelphia area, presents a theoretical basis for economically significant effects of tax rates on their bases. In addition, they find that tax rates should have impacts that extend beyond their own bases to the bases of other taxes.

There are three basic behaviors that underlie the supply side effects of local taxes. The first is the residential location decisions of individuals and families. Holding other factors constant, people will move toward lower taxes (away from higher tax rates). As people move to an area with lower tax rates, we expect to see increased earnings, sales, and property values in that area. Because of these multiple impacts, a decrease in one tax rate (e.g., the wage tax rate) could increase not only its own tax base (e.g., total wages) but also other tax bases (e.g., gross receipts tax base or property tax base).

The second basic behavior is the location decisions of business, which will also move toward lower taxes (away from higher tax rates). As businesses move to an area with lower tax rates, we expect to see increased sales, payrolls, and commercial property values in that area. Again because of the multiple impacts, a decrease in the rate for one tax should increase the base of its own and other taxes.

The third behavior is a bit different because it relates to the typical workings of markets for residential and non-residential real estate. Changes in property taxes are quickly reflected in property values so that when the property tax rate is lowered, property values tend to increase by the long-term property tax savings so as to leave the total cost of the house (purchase price plus value of the anticipated taxes) unchanged.

While economic theory clearly establishes the direction of the impacts of lower local tax rates on local tax bases, it does not establish the size of the effect. When a tax rate falls by 50 percent, for example, its corresponding base should increase, but by how much? If the base increases by 100 percent, tax revenue would be unchanged; if the base increases by less than 100 percent, tax revenue would fall. If the base increases by more than 100 percent, tax revenue would rise.
The purpose of this study is to shed some light on this issue by conducting a statistical analysis of historic data to determine the size of the supply side effects, if any, relating to changes in Philadelphia's wage tax, property tax and gross receipts tax

rates. The goal of the study is to provide objective information, which will assist the TRC in the development of its policy recommendations.

Other issues that are considered in this analysis relate to tax structure. For example, there has been considerable debate regarding the economic ramifications of differentially taxing residents' and non-residents' earnings in Philadelphia and other urban areas. Such policies create conflicting incentives, the implications of which are difficult to discern. Theoretical research by Haughwout and Inman[7] suggests that non-resident taxes may have larger negative impacts on the city. The effect on the tax bases is not clear cut, however, an increase in the disparity between resident and non-resident tax rates would provide an incentive for residents to leave the city, which would result in erosion of the city wage and property tax base. Unfortunately, as we discuss in Section IX, we have been unable to measure individual impacts of the resident and non-resident wage taxes in Philadelphia. The two rates have moved together over so many years that it is virtually impossible to discern individual effects from the available data.

We have also attempted to address such issues as the impact of services, the differential impact of property taxes on residential and commercial property values and the differential impact of taxes by industry. These issues are discussed in later sections of this report.

[7] Haughwout and Inman (2001)

IV. THE ECONSULT MODELS

In this study we estimate and simulate statistical models based on the economic literature discussed above. Our results are based on models originally developed by Econsult Corporation for the Pennsylvania Economy League.[8] The model simulation approach is commonly used in economic impact analysis to compare alternative economic programs and to provide a coherent methodology that can be used to evaluate the economic ramifications of a given policy action. Econsult's model simulations provide a rational analytical framework that can capture the combined impacts of changes in Philadelphia's wage, property, and gross receipts tax rates.

Econsult's approach to evaluating tax changes involves estimating econometric relationships among Philadelphia's tax rates, tax bases and employment. These estimated relationships then form the basis of a simulation model that is used to evaluate the impacts of changes in tax rates. Our analyses proceed in 5 steps:

1. Development of models of the relationships among tax rates, tax bases, and employment;

2. Calculation of baseline simulations based on the assumption that the current tax structure will remain unchanged;

3. Calculation of alternative simulations based on different assumptions regarding future tax rates;

4. Comparison of alternative simulations with the baseline simulations;

5. Evaluation of results.

[8] These models extend prior work by Robert Inman (1992) and by Robert Inman, Andrew Haughwout, Tom Luce, and Steve Craig (2000). The modeling approach used here is presented in Voith and Del Roccili (2003).

IV.A. Econometric Models

There is a common structure across our econometric models: each tax base is measured as a share of a corresponding national base.[9] That is, the wage tax base is measured as the ratio of total wages earned in Philadelphia to total wages earned in the U.S., the gross receipts tax base is measured as the ratio of gross receipts in Philadelphia to an estimate of gross receipts for the U.S., and the property tax base is measured as the ratio of the value of taxable property in Philadelphia to the value of taxable property in the U.S. Similarly, employment is measured as the ratio of Philadelphia employment to U.S. employment. We used these ratio measures for two reasons. First, because Philadelphia is effectively competing nationally for business and household location, its share of the nation is a good indicator of its relative growth and success. Second, by using the local share we are effectively controlling for national trends in growth and inflation. We thereby avoid ascribing changes in the Philadelphia tax bases, resulting from inflation or general national growth, to changes in its tax rates.

Another key feature of the models is that they measure the impact of each particular tax rate, such as the wage tax rate, on all three tax bases (wage tax, property tax, and gross receipts). Throughout this report, we refer to the impact of a tax rate change on the size of its own base as an "own-base" effect and the impact of a tax rate on the base of a different tax as a "cross-base" effect. In the wage base share equation, for example, the wage tax has an "own-base" effect, and the gross receipts tax and the property tax have "cross-base" effects.

As discussed in Section III, economic theory suggests that local tax rates should be negatively related to local tax bases and employment, if other factors are held constant.[10] Unfortunately, economic theory gives little guidance regarding the magnitude or timing of the impacts of tax rate changes on tax bases and employment, so we have to rely on the data to guide us. Guided by well-established econometric principles, we selected the models that did the best job of fitting the data. By "letting the data speak" in this way, we minimized the effect of our or others' preconceptions about the structure of the regional economy and the impact of taxes. In fact, our approach allowed the possibility of impacts whose directions

[9] The tax base data are discussed in Appendix A.
[10] An implicit assumption in our analysis is that changes in other factors, which might affect City employment and tax bases, such as public services, are not correlated with changes in City tax rates.

contradicted economic theory, though happily, no such contradictory results were found. A more technical discussion of our econometric models and our estimates of those models can be found in Appendices B and C, respectively.

Table 1 provides a summary of the impacts of wage, property, and gross receipts tax rates on tax bases and employment. The econometric results indicate that reductions in tax rates expand the base of the particular tax being reduced and that changes in wage and gross receipts tax rates have cross-base effects as well as significant impacts on the number of jobs in the City. These changes in the tax bases and jobs suggest that losses in tax revenues resulting from a reduction in tax rates will be partially offset by the growth in the base, which results from tax reductions. The resulting implications for the alternative tax reduction scenarios are significant although not surprising: wage and gross receipts tax rate reductions will have the effect of increasing the base which, in part, will offset the revenue losses associated with lower rates. Reductions in these tax rates have relatively large positive impacts on employment and the private economy. These impacts, as well as the optimal mix of taxes, are discussed in depth below.

Table 1: Summary of Own Base and Cross Base Impacts

	Wage Base	Gross Receipts Base	Property Base	Employment
Wage Tax	x		x	x
Gross Receipts Tax	x	x	x	x
Property Tax	x		x	

IV.B. Simulation Models

The impact of a change in tax rates is evaluated using a simulation model. The simulation model is based on the estimated equations for the tax base shares in conjunction with a projection of future national economic growth. Because our econometric equations essentially link the size of the local economy to the national economy, the projection of national economic growth is translated into a projection of City economic growth or decline. The econometric models provide

estimates of how Philadelphia's share of national wages and salaries, property, and gross receipts changes over time.[11] Using these data, we provide projections of the tax bases and revenues given alternative assumptions regarding local tax rates. These econometric estimates tell us how Philadelphia's share of the nation's tax base will change with a change in a given tax rate. This information, in turn, provides us with estimates of the impacts of the tax rate change on the Philadelphia base.

For example, the Philadelphia wage tax base is estimated by multiplying the estimated tax coefficients (given assumptions relating to national economic growth and future tax rates) by an estimate of the corresponding national base. Tax revenues are then computed by multiplying the estimated base times the wage tax rate assumption employed. In this way, we can evaluate the changes in tax bases, tax revenues and employment resulting from a change in tax rates.

[11] In general, Philadelphia's share of the nation's wages and salaries and property has been declining. We do not have a good estimate of national gross receipts, so Philadelphia gross receipts base was measured relative to national Gross Domestic Product (GDP). Our best estimate for the relationship between Philadelphia gross receipts and national GDP was for it to remain unchanged.

V. COMPARING ALTERNATIVE TAX CHANGES

The relative evaluation of alternative tax policies will depend in significant part on the economic barometer(s) chosen as the appropriate comparator(s). For example, some might argue that the tax instrument with the greatest supply side revenue impact would be the best. Alternatively, the tax reduction that has the greatest positive impact on the number of jobs or the level of private income could be considered best. There is no reason to believe that the ranking of alternatives will be invariant with respect to the economic yardstick chosen. In other words, optimality is sensitive to the barometer of economic activity used for comparing the alternatives. In this report, we present the readings of several barometers and leave it to the reader to choose among them.

One consideration that will crucially influence the appraisal of alternative tax policies is essentially political. The question is whether increased property values lead to increased property tax revenues. If the property values are projected to rise as a result of a tax rate reduction, the City would expect to achieve a corresponding increase in property tax revenue, unless an explicit decision is made to keep assessments artificially low or to reduce millage rates so that property value increases do not yield proportional property tax revenue increases. One of the key decisions that must be addressed in evaluating alternative tax rate reductions is the extent to which one can count on revenue increases if property values grow.

Another consideration is that growth in each of the tax bases has different implications for private economic activity. How we value growth in each of the tax bases will affect how we evaluate the relative merits of alternative tax cuts. For example, an increase in the wage tax base, which delivers a flow of revenue to the City and its residents each year, should have a greater value than an increase in the property tax base of a similar magnitude because the property base is a onetime increase in household and commercial wealth. Similarly, an increase in the gross receipts tax base reflects an increase in business activity predominantly reflected in wage and salary growth, which would be best measured by growth in the wage tax base. A comparison that sums an increase in the gross receipts tax base and an increase in the wage tax base would result in substantial double counting. Thus, in the comparisons presented below, property value was measured as a private flow of economic activity by applying a capitalization rate equal to 7.5 percent times the change in property value. Also, to avoid double counting of similar economic activities only the increased value of wages and salaries was included in our measure of growth.

Finally, the choice of national growth rate can make a modest difference in the evaluation of alternative tax reductions. This influence occurs because each of the base shares has different trends relative to the nation. The alternative scenarios assume the national economy will grow at the rate projected by the U.S. Congressional Budget Office in *The Budget and Economic Outlook: Fiscal Years 2004–2013*, January 29, 2003. These suggest that the U.S. economy will grow at the average annual rate of 5.4 percent in nominal terms between 2004 and 2008 and at 5.3 percent per annum through 2010.

VI. THE BASELINE SCENARIO

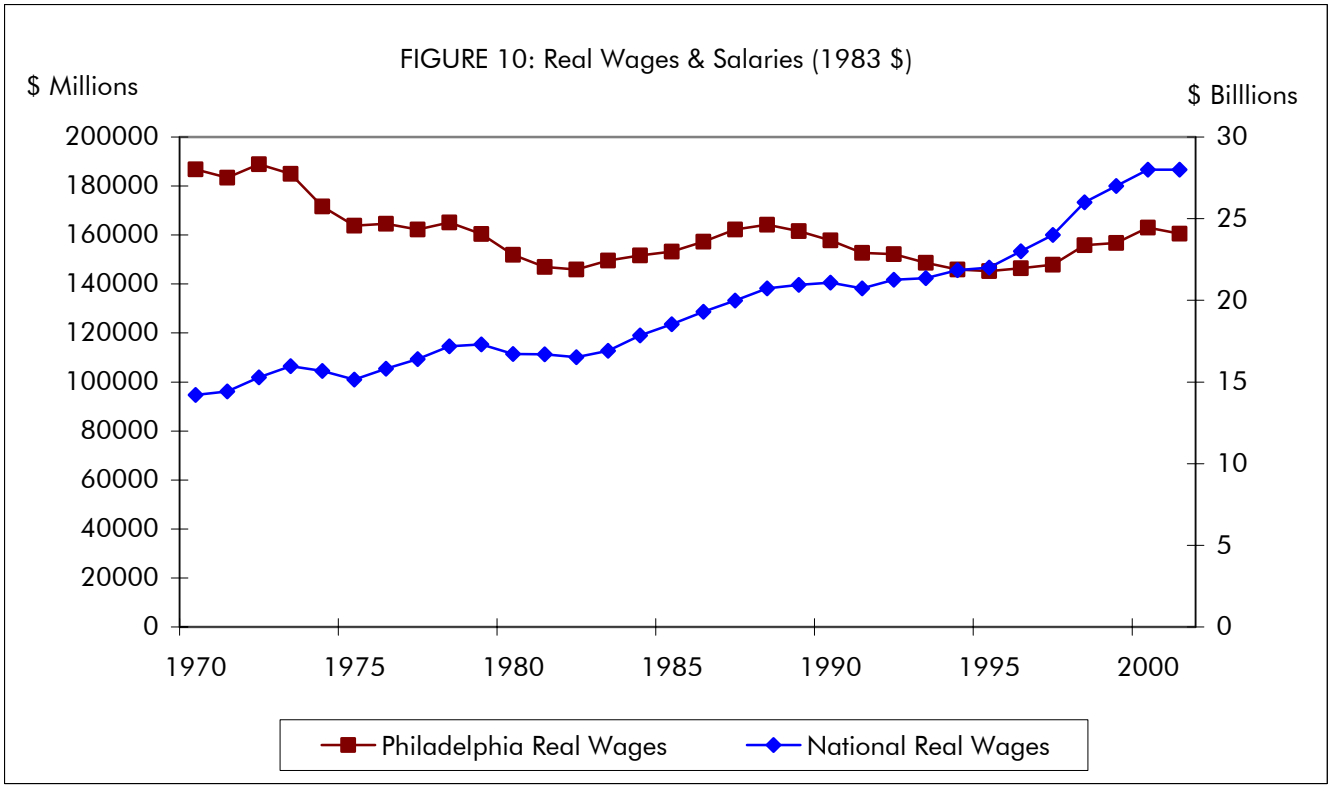
The baseline forecast, which is summarized in Table 2, shows that the wage tax base is expected to grow slightly over the 2004 to 2010 period at an annual average rate of 0.71, or less than 1 percent. This result is consistent with the pattern of growth exhibited in real wages and salaries that is shown in Figure 10. That is, the wage tax base is expected to grow over this period but by less than the rate of inflation. Wage tax revenues will increase over the first seven years of the forecast period but by considerably less than the rate of inflation. This result assumes a continuation of past trends that are determined directly from the statistical analysis of the wage base data. In other words, if past trends persist and tax rates are not changed, Philadelphia's share of the nation's wages and salaries will fall over the next several years.

Table 2. Baseline Tax Base and Tax Revenue Projections

Wage Taxes				
	Tax Base	Share of the U.S. tax base	Change in the tax base	Revenue
2004	$ 29,819,331,226	0.56%	$ (35,799,711)	$ 1,278,822,893
2005	$ 29,914,514,166	0.54%	$ 95,182,941	$ 1,282,904,880
2006	$ 30,310,178,596	0.52%	$ 395,664,430	$ 1,299,873,226
2007	$ 30,690,434,521	0.50%	$ 380,255,924	$ 1,316,180,768
2008	$ 30,991,426,676	0.48%	$ 300,992,155	$ 1,329,089,027
2009	$ 31,235,432,677	0.45%	$ 244,006,001	$ 1,339,553,395
2010	$ 31,385,614,424	0.43%	$ 150,181,747	$ 1,345,994,045

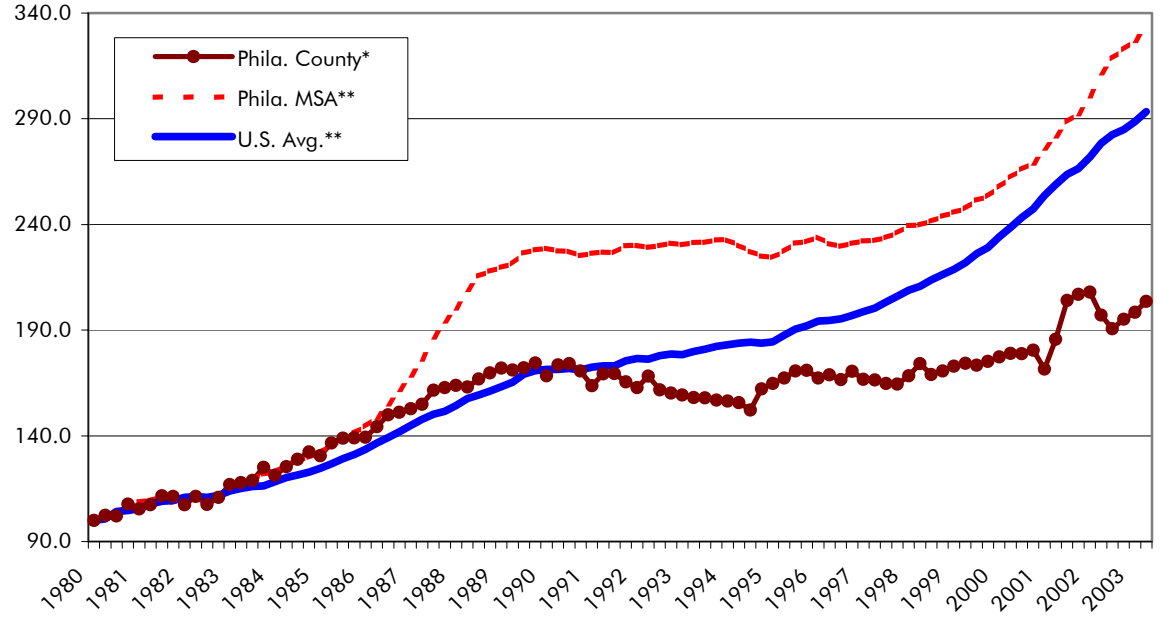
Property Taxes				
	Tax Base	Share of the U.S. tax base	Change in the tax base	Revenue
2004	$ 33,687,830,474	0.17%	$ 833,545,637	$ 843,540,580
2005	$ 34,738,843,976	0.17%	$ 1,051,013,501	$ 869,857,874
2006	$ 36,231,216,901	0.17%	$ 1,492,372,926	$ 907,226,773
2007	$ 37,819,315,326	0.17%	$ 1,588,098,425	$ 946,992,630
2008	$ 39,435,090,450	0.17%	$ 1,615,775,124	$ 987,451,510
2009	$ 41,115,088,164	0.16%	$ 1,679,997,714	$ 1,029,518,518
2010	$ 42,820,867,316	0.16%	$ 1,705,779,152	$ 1,072,231,092

Gross Receipts Taxes				
	Tax Base	Share of the U.S. tax base	Change in the tax base	Revenue
2004	$ 54,128,631,621	0.48%	$ 5,536,669,853	$ 124,495,853
2005	$ 57,051,577,729	0.48%	$ 2,922,946,108	$ 131,218,629
2006	$ 60,189,414,504	0.48%	$ 3,137,836,775	$ 138,435,653
2007	$ 63,439,642,887	0.48%	$ 3,250,228,383	$ 145,911,179
2008	$ 66,865,383,603	0.48%	$ 3,425,740,716	$ 153,790,382
2009	$ 70,409,248,934	0.48%	$ 3,543,865,331	$ 161,941,273
2010	$ 74,140,939,127	0.48%	$ 3,731,690,193	$ 170,524,160



The Philadelphia property tax base is anticipated to grow at just under 4 percent per year, on average, over the forecast horizon. This rate means that the Philadelphia property tax base is expected to grow more slowly than that of the nation, which is forecast to grow 5.3 percent annually. However, the growth in property tax revenues is expected to exceed the rate of anticipated inflation.

FIGURE 11: House Price Indices 1980-2003
Philadelphia County v. Philadelphia MSA and U.S. Average: 1980 Q1=100

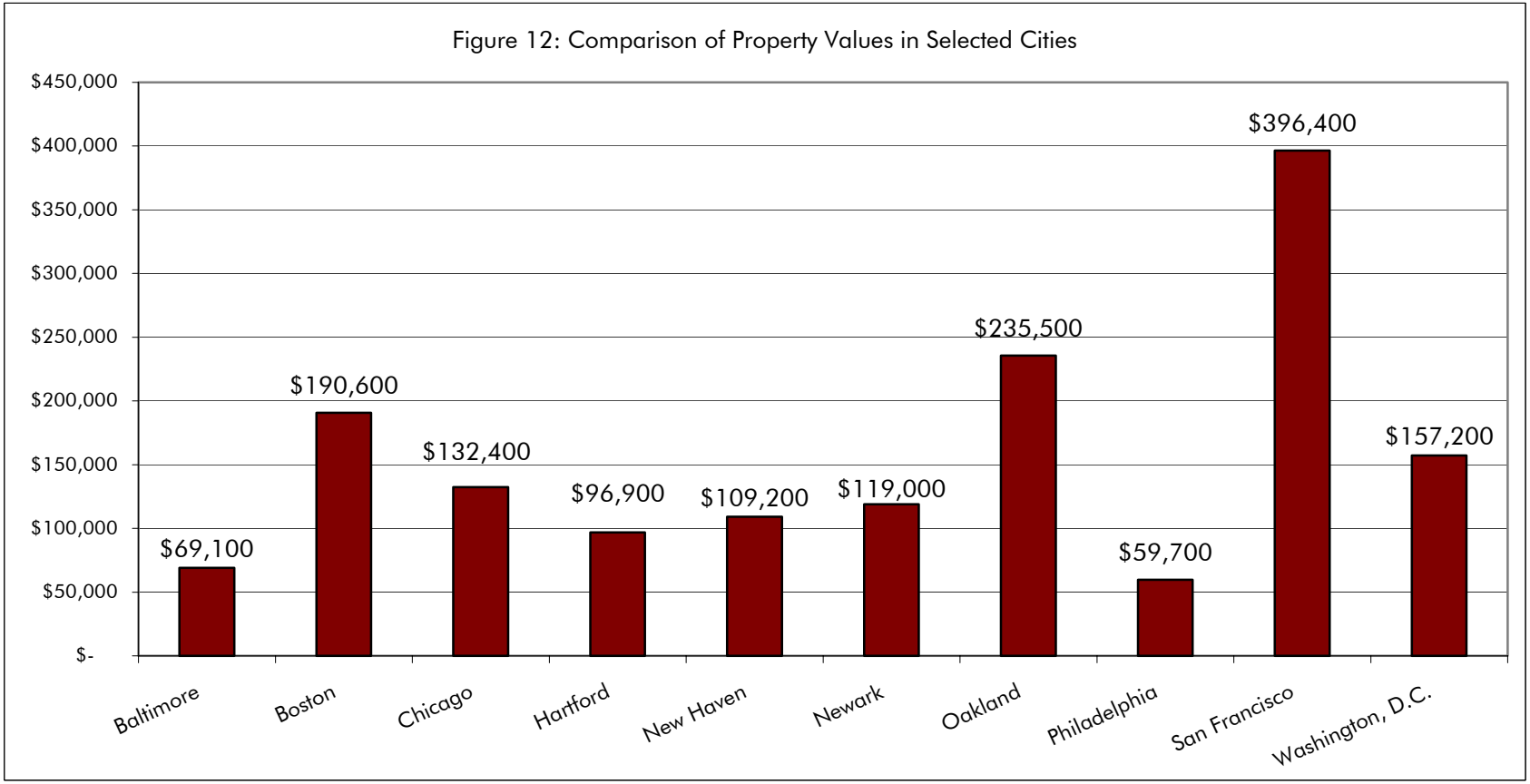


*Empirically estimated by Kevin Gillen, PhD Student

*Provided by Dept. HUD, Ofc of Federal Housing Enterprise

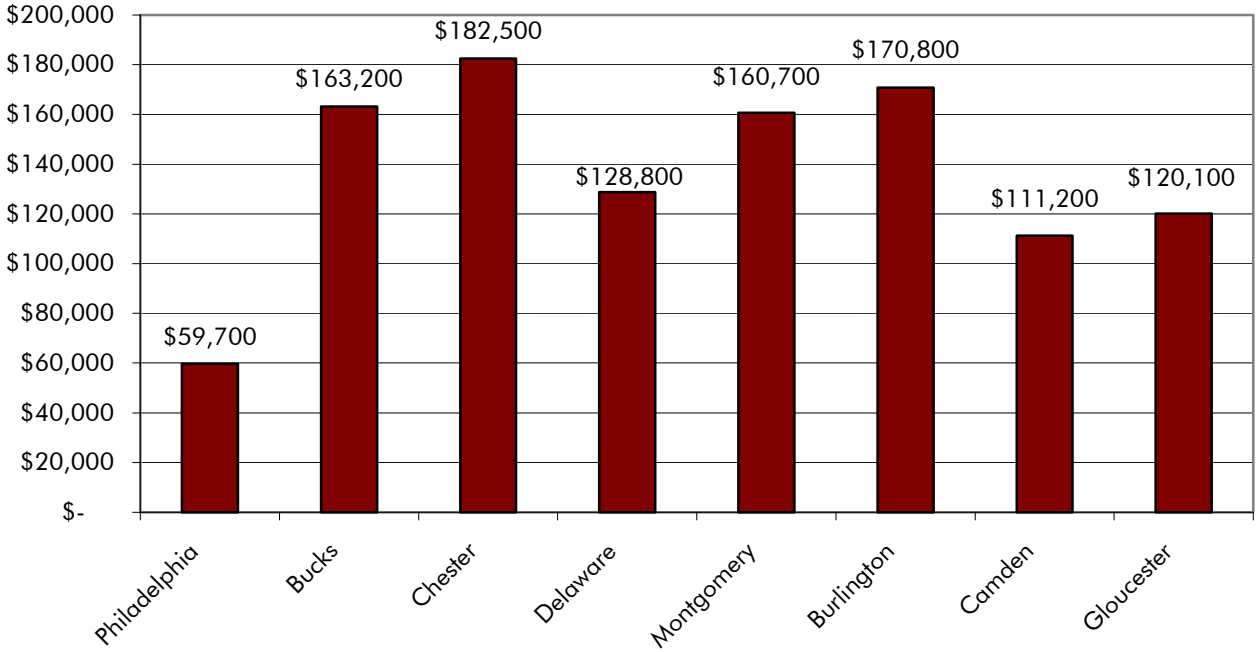
This forecast mirrors the pattern of historical growth in property values as evidenced by the data shown in Figure 11. The chart presents an index of property values for the U.S., the Philadelphia metropolitan area, and the City. It shows that residential property values have increased over the last ten years but by less than that of either the U.S. or the surrounding counties.

Figure 12, which provides a comparison of median property values in selected cities, reflects the consequence of this pattern of slower than average growth. That is, property values in Philadelphia are considerably lower than those of other cities. For example, the median value of a residential property in 2000 was $59,900 in Philadelphia compared to $190,000 in Boston, $69,100 in Baltimore and $396,400 in San Francisco.



A similar pattern is evident when Philadelphia property values are compared to suburban Philadelphia property values, as shown in Figure 13.

Figure 13: County Comparison of Property Values



The gross receipts tax base is projected to grow more rapidly over the forecast period than either the wage or property tax base. This growth rate is based on the assumption of no change in the city's share of U.S. gross receipts over the forecast horizon, which assumption is consistent with the historical pattern of growth in the city over the last 20 years or so. This assumption results in an increase in the gross receipts base over the 2004 to 2010 period of approximately 5.4 percent per annum causing the gross receipts tax base to grow from approximately $54.1 million in 2004 to $74.1 million in 2010.

VII. ESTIMATED IMPACTS OF REDUCING INDIVIDUAL TAX RATES

We have examined three scenarios to assess and compare the impacts of reducing the wage tax rate, the gross receipts tax rate, and the property tax rate. The three scenarios have been designed so that each would imply the same revenue reduction in the first year of $125 million in the absence of any supply side response. The $125 million figure was chosen as the common value because it was the estimated gross tax receipts tax revenue (the smallest of the three revenues) for the first year in the baseline scenario. The three scenarios allow us to estimate the relative impacts of the cuts on City revenue collections and on the private economy.[12]

In Scenario 1, the blended wage tax rate (a weighted average equal to 0.64 times the resident wage tax rate plus .36 times the nonresident wage tax rate) is lowered immediately by 0.4175 percentage points to 3.87107 percent while the gross receipts and property tax rates remain constant. We attempted to measure the separate impacts of resident and non-resident wage tax rates. As we noted above, theoretical analyses have been unable to resolve how the two rates should individually affect the City economy. Given the theoretical ambiguity, we wanted to explore the matter empirically but were unable to do so because of two limitations of the available data. First, the Commission has been unable to collect separate data for the resident and non-resident wage tax bases before 1993. Second, when we tried to get by with the aggregated base data, we quickly discovered that the two tax rates are highly but not perfectly correlated with each other because, except for one occurrence, any time the resident wage tax rate changes, the non-resident wage tax rate changes in a very similar way. If two variables are related in this manner, it is virtually impossible to discern individual effects. Unfortunately, we were unable to obtain reliable measures of individual impacts of the resident and non-resident wage taxes. (See Appendix D for more discussion of this point.) Because of these problems, we focused on models based on the blended wage tax rate.

[12] Other scenarios were examined as well but are not reported here. In particular, we examined a $300 million reduction, which was sufficiently large to allow for a full 1 percentage-point reduction in the wage tax. The basic patterns that are revealed in the smaller reduction discussed in the first three scenarios here hold for the larger reduction, but the losses in City revenues are large. Private economic gains are larger as well for the larger reduction. Note, however, that as tax cuts increase in magnitude, the likelihood that City services could be unchanged (assuming no external aid) diminishes. Our estimates of revenue and private economic impacts depend on the validity of the assumption that City services remain unchanged.

In Scenario 2, the gross receipts tax is eliminated immediately while the wage and property tax rates remain constant.

In Scenario 3, the property tax rate is lowered immediately from 8.264 percent to 7.04434 percent while the wage and gross receipts tax rates remain constant.

VII.A. Scenario 1: A $125 Million Reduction in the Wage Tax Rate

Scenario 1 assumes that, in the absence of any supply side effects, wage tax revenues would be reduced by $125 million in 2004, bringing the blended wage tax rate to 3.87107 percent, a decrease of 0.4175 percentage points. This reduction amounts to about 9.7 percent of wage tax revenues. The wage tax decrease is anticipated to have a significant positive wage tax base effect as well as cross-base effect with respect to property taxes.

Table 3 shows the effect of the tax decrease on the wage and property tax bases. Note that our models do not imply any impact on the gross receipts tax base or revenue. The wage tax base is anticipated to grow an additional $2.25 billion between 2004 and 2010 as a result of the supply side effects of the wage tax cut. This anticipated growth implies that the Philadelphia economy will be generating roughly 7.5 percent more in wages and salaries than it would be without the wage tax reduction.

The wage tax reduction would also result in higher property values. The property tax base will grow an additional $1.96 billion, about 4.6 percent.[13] If assessments were to keep pace with rising property values in the City, and the effective property tax rate is held constant, then property tax revenues would increase by a similar percentage. It is unclear, however, whether the City would collect additional tax revenue due to the increase in property values. An increase in assessed value and maintenance of current millage rates might not be politically acceptable. The growth in the property tax base will also result in an increase in revenues from the business use and occupancy tax but that increase is not reflected in

[13] A more disaggregated analysis that separately measured impacts of the wage tax on the residential and non-residential components of the property tax base indicates that the wage tax rate has a somewhat larger effect on non-residential property values. (See Appendix E.)

our projections. Assuming the assessed value of commercial property keeps pace with the increases in property value, revenues will increase by 4.6 percent or $4.3 million in 2010.

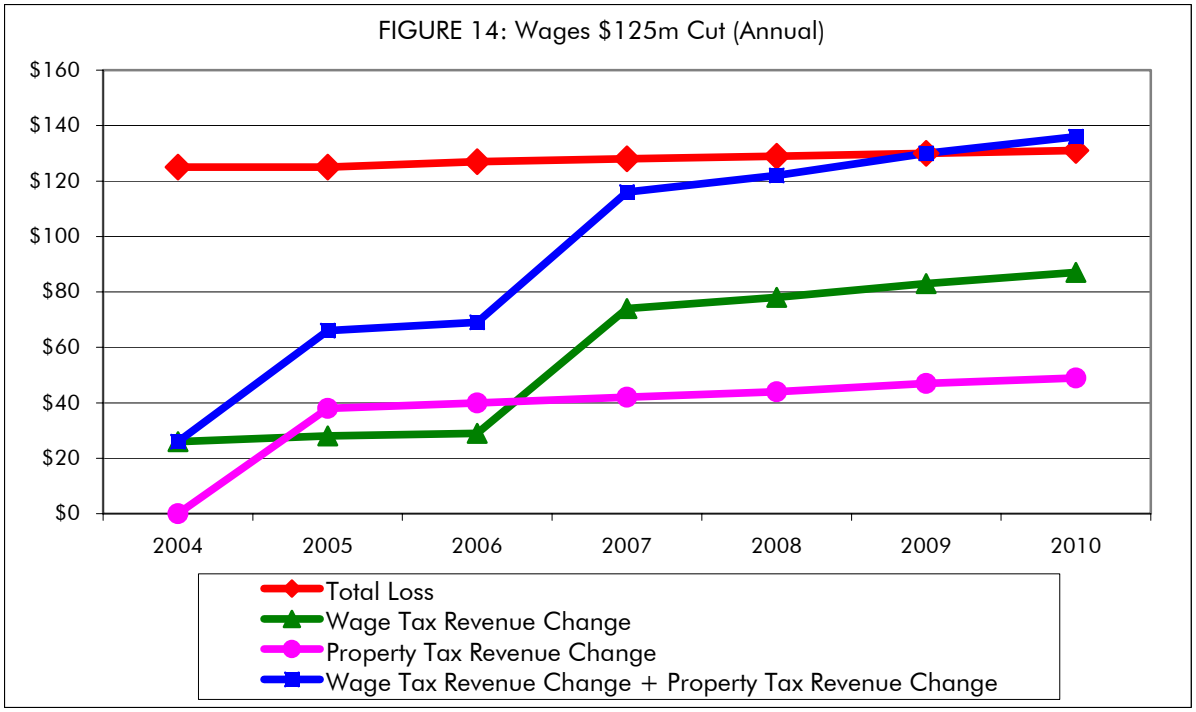
The annual revenue impacts of the change in the wage tax rate are presented graphically in Figure 14. The red line in the chart represents the annual loss in revenue caused by the reduction of the wage tax rate in 2004 assuming no supply side effect. The green line denotes the increase in wage tax revenue stemming from the increase in the wage tax base caused by the supply side effect on the wage tax base. The pink line shows the increase in property tax revenues assuming that the increase in market value translates into a corresponding increase in assessed value and that millage rates remain unchanged. The blue line equals the sum of the increase in property tax revenues and the increase in wage tax revenues. Figure 14 suggests that if the property tax can be collected, then revenues will exceed the annual loss beginning in 2009. That is when the red line in the chart, which represents the annual loss in revenue, intersects the blue line, which is the sum of the increases from the growth in the wage and property tax bases. If none of the potential property tax revenues are collected, the annual deficit would correspond to the difference between the increase in wage tax collections, the green line, and the loss due to the decrease in the wage tax rate, the red line.

Table 3: $125 Million Reduction in Wage Tax Revenue

Wage Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$30,503,688,832	0.57%	$ 684,357,607
2005	$30,627,614,793	0.55%	$ 713,100,626
2006	$31,061,786,656	0.53%	$ 751,608,060
2007	$32,612,102,920	0.53%	$ 1,921,668,399
2008	$33,016,865,168	0.51%	$ 2,025,438,492
2009	$33,370,244,848	0.49%	$ 2,134,812,171
2010	$33,633,571,640	0.47%	$ 2,247,957,216

Property Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$ 33,687,830,474	0.17%	$ -
2005	$ 36,242,814,985	0.18%	$ 1,503,971,010
2006	$ 37,816,402,346	0.18%	$ 1,585,185,444
2007	$ 39,491,685,970	0.18%	$ 1,672,370,644
2008	$ 41,197,769,109	0.17%	$ 1,762,678,658
2009	$ 42,972,951,470	0.17%	$ 1,857,863,306
2010	$ 44,777,197,377	0.17%	$ 1,956,330,061

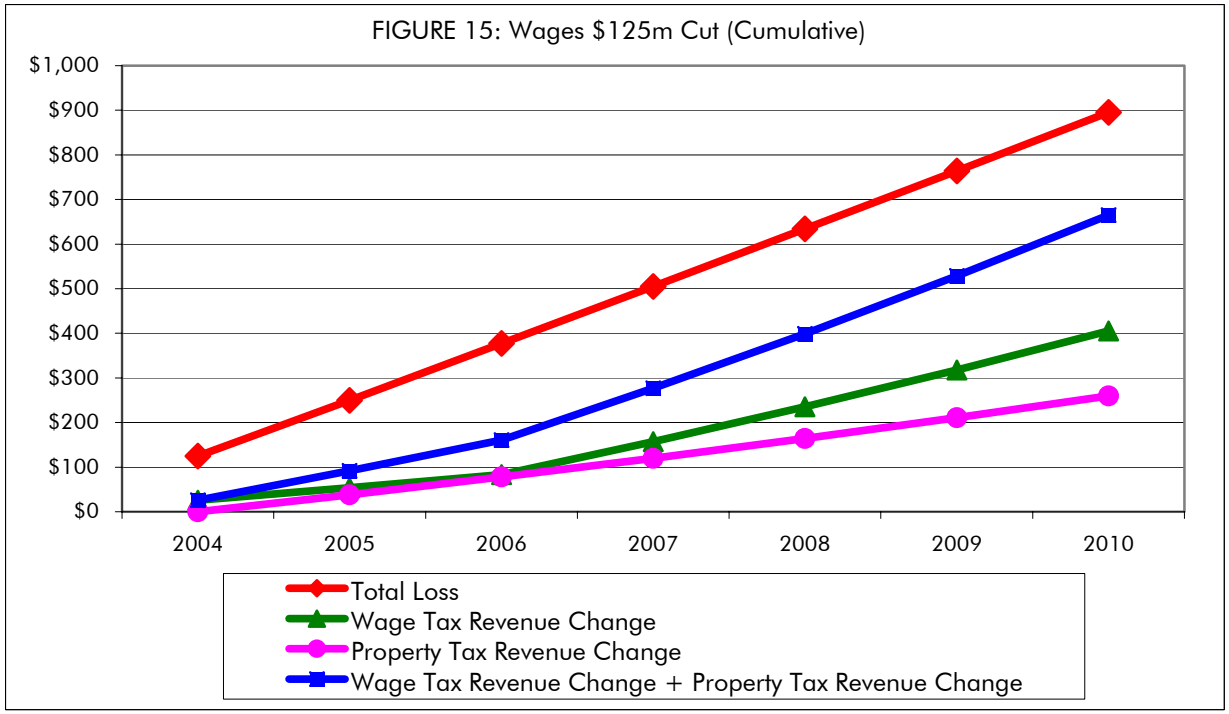
Gross Receipts Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$ 54,128,631,621	0.48%	$ -
2005	$ 57,051,577,729	0.48%	$ -
2006	$ 60,189,414,504	0.48%	$ -
2007	$ 63,439,642,887	0.48%	$ -
2008	$ 66,856,383,603	0.48%	$ -
2009	$ 70,409,248,934	0.48%	$ -
2010	$ 74,140,939,127	0.48%	$ -



Wages $125m Cut (Annual) - in $ Millions

	2004	2005	2006	2007	2008	2009	2010
Total Loss	$ 125	$ 125	$ 127	$ 128	$ 129	$ 130	$ 131
Wage Tax Revenue Change	$ 26	$ 28	$ 29	$ 74	$ 78	$ 83	$ 87
Property Tax Revenue Change	$ -	$ 38	$ 40	$ 42	$ 44	$ 47	$ 49
Wage Tax Revenue Change + Property Tax Revenue Change	$ 26	$ 66	$ 69	$ 116	$ 122	$ 130	$ 136

The cumulative loss in tax revenues is shown in Figure 15. This graph shows that the supply side effects are not sufficient to offset the revenue losses through 2010, even if property tax revenues are collected. The cumulative loss in 2010 is $895 million compared with the cumulative gains as a result of the increase in wages and salaries of $405 million and potential property tax revenues of $260 million. The net loss including both wage and property tax revenue gains is $230 million, which increases to $490 million if only wage tax revenue gains are included.



Wages $125m Cut (Cumulative) - in $ Millions

	2004	2005	2006	2007	2008	2009	2010
Total Loss	$ 125	$ 250	$ 377	$ 505	$ 634	$ 764	$ 895
Wage Tax Revenue Change	$ 26	$ 54	$ 83	$ 157	$ 235	$ 318	$ 405
Property Tax Revenue Change	$ -	$ 38	$ 78	$ 120	$ 164	$ 211	$ 260
Wage Tax Revenue Change + Property Tax Revenue Change	$ 26	$ 92	$ 161	$ 277	$ 399	$ 529	$ 665

VII.B. Scenario 2: A $125 Million Reduction in the Gross Receipts Tax Rate

Scenario 2 assumes that the gross receipts tax will be eliminated in 2004 causing a $125 million reduction in tax revenues in 2004. In this scenario the wage and property tax rates remain constant. The elimination of the gross receipts tax is anticipated to have significant, positive cross-base effects on the wage tax base and the property tax base, generating additional tax revenue for the City. Since the gross receipts tax rates go to zero, the gross receipts base no longer has a revenue impact apart from its cross-base impact.

Table 4 shows the effect of the elimination of the gross receipts tax on each of the tax bases. In particular, the wage tax base is anticipated to grow from $29.9 billion to $33.2 billion between 2004 and 2010 as a result of the cross-base effects of the gross receipts tax cut on the wage tax base. The net increase in the wage tax base resulting from the tax cut is $1.8 billion. The property tax base increases in value from $42.8 billion to $50.1billion over the 2004 to 2010 period.[14] The net increase in the property tax base due to the gross receipts tax cut is $7.3 billion. The growth in the property tax base will result in an increase in revenues from the property tax and the business use and occupancy tax, assuming the assessed value of commercial property increases with property value.[15]

The annual revenue impact of the changes in tax revenues is presented graphically in Figure 16. The red line in the chart represents the annual loss in revenue caused by the elimination of the gross receipts tax in 2004. The green line denotes the increase in wage tax revenue stemming from the increase in the wage tax base caused by the elimination of the gross receipts tax. The pink line shows the increase in property tax revenues assuming that the increase in market value translates into a corresponding increase in assessed value and that millage rates remain unchanged. The blue line equals the sum of the increase in property tax revenues and the increase in wage tax revenues. Figure 16 shows that, if we can assume that the additional property tax revenue will be collected, the actual tax collections will begin to exceed the annual losses from the tax decrease by 2007. If none of the potential property tax revenue increase is collected, then the annual deficit would correspond to the difference between the increase in wage tax collections, the green line, and the loss due to the decrease

[14] A more disaggregated analysis that separately measured impacts of the gross receipts tax on the residential and non-residential components of the property tax base indicates that the gross receipts tax rate has a somewhat smaller impact on non-residential property. (See Appendix E.)
[15] Again, the increase in revenue from the business use and occupancy tax is not reflected in our projections.

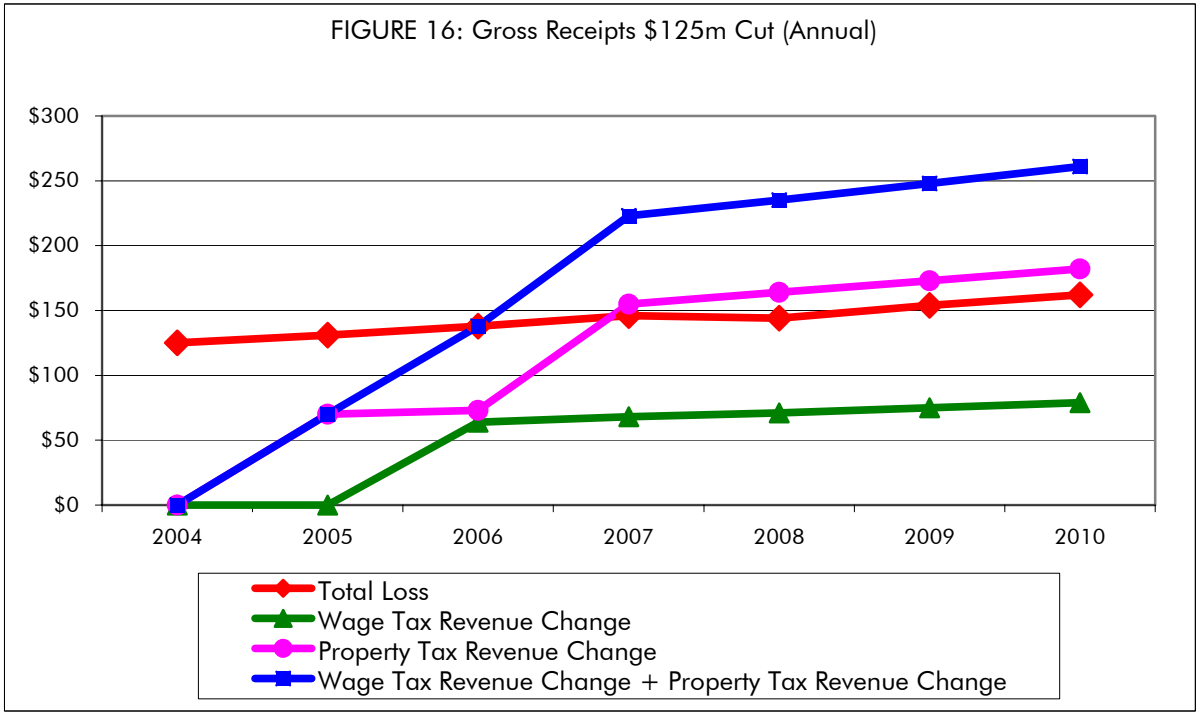
in gross receipts tax, the red line. In other words, the supply side effects would not be sufficient to offset the revenue losses associated with the tax decrease.

Table 4: $125 Million Reduction in Gross Receipts Revenue

Wage Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$ 29,819,331,226	0.56%	$ -
2005	$ 29,914,514,166	0.54%	$ -
2006	$ 31,806,214,792	0.54%	$ 1,496,036,195
2007	$ 32,268,752,707	0.52%	$ 1,578,318,186
2008	$ 32,654,974,044	0.50%	$ 1,663,547,368
2009	$ 32,988,811,603	0.48%	$ 1,753,378,926
2010	$ 33,231,922,433	0.46%	$ 1,846,308,009

Property Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$ 33,687,830,474	0.17%	$ -
2005	$ 37,519,788,877	0.19%	$ 2,780,944,901
2006	$ 39,162,332,828	0.18%	$ 2,931,115,926
2007	$ 44,026,795,545	0.20%	$ 6,207,480,219
2008	$ 45,977,774,600	0.19%	$ 6,542,684,150
2009	$ 48,011,077,258	0.19%	$ 6,895,989,094
2010	$ 50,082,343,832	0.19%	$ 7,261,476,516

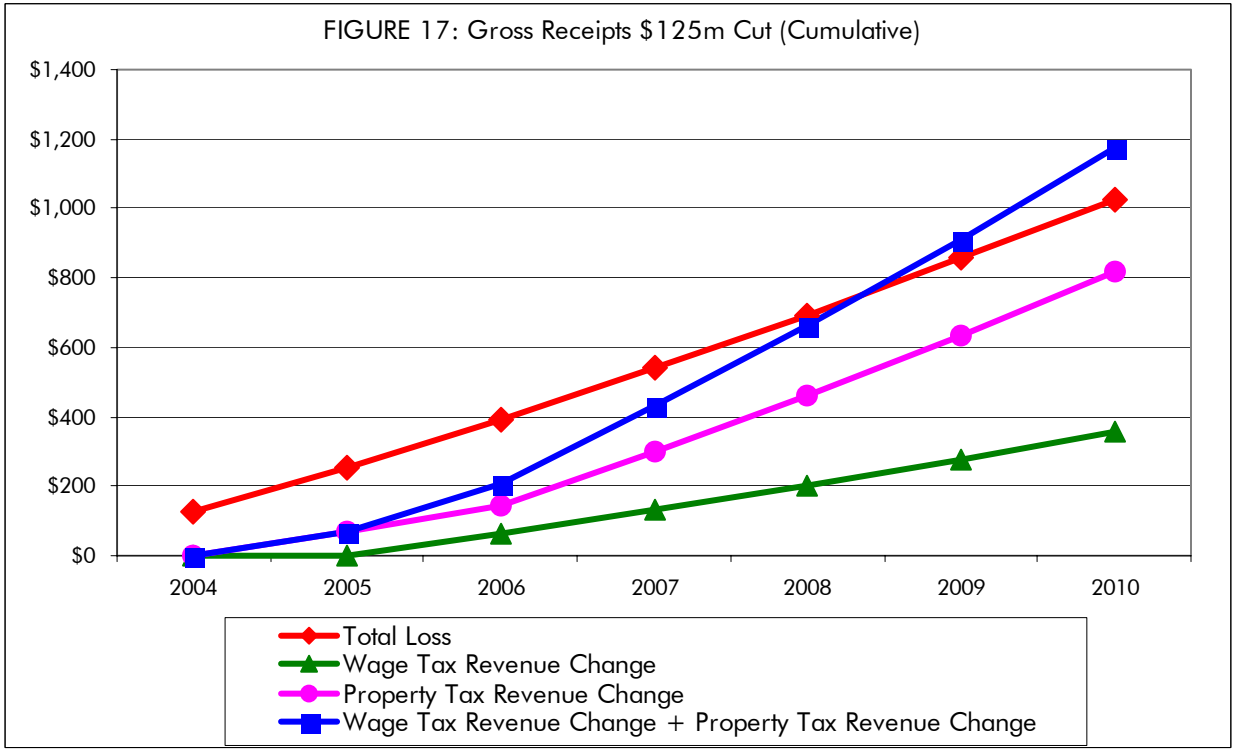
Gross Receipts Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$ 56,125,347,755	0.50%	$ 1,996,716,134
2005	$ 59,156,116,534	0.50%	$ 2,104,538,805
2006	$ 65,980,910,188	0.53%	$ 5,791,495,685
2007	$ 69,543,879,338	0.53%	$ 6,104,236,451
2008	$ 73,299,248,823	0.53%	$ 6,433,865,220
2009	$ 77,184,109,010	0.53%	$ 6,774,860,077
2010	$ 81,274,866,788	0.53%	$ 7,133,927,661



Gross Receipts $125m Cut (Annual) - in $ Millions

	2004	2005	2006	2007	2008	2009	2010
Total Loss	$ 125	$ 131	$ 138	$ 146	$ 144	$ 154	$ 162
Wage Tax Revenue Change	$ -	$ -	$ 64	$ 68	$ 71	$ 75	$ 79
Property Tax Revenue Change	$ -	$ 70	$ 73	$ 155	$ 164	$ 173	$ 182
Wage Tax Revenue Change + Property Tax Revenue Change	$ -	$ 70	$ 138	$ 223	$ 235	$ 248	$ 261

The cumulative losses in tax revenues and corresponding supply side gains are shown in Figure 17. This graph indicates that if the gross receipts tax is eliminated, then the cumulative revenue loss will be eliminated in 2008 as a result of the increase in wages and salaries and in property values. Again, this conclusion assumes that increases in property values translate into increases in property tax revenues. By 2010, the gross receipts tax reduction would result in a *surplus* of $148 million. As noted above, however, it is not clear whether the City would collect additional tax revenue due to the increase in property values is unclear because an increase in assessed value and maintenance of current millage rates might not be politically acceptable. If the City cannot collect the additional property revenue then the deficit will persist. In this case, in 2010 the cumulative loss would be $668 million. This loss is shown in the chart by the continued divergence between the green line representing the gains from the increase in the wage base and the red line that shows the revenue loss from the tax decrease.



Gross Receipts $125m Cut (Cumulative) - in $ Millions

	2004	2005	2006	2007	2008	2009	2010
Total Loss	$ 125	$ 256	$ 394	$ 540	$ 694	$ 856	$ 1,026
Wage Tax Revenue Change	$ -	$ -	$ 64	$ 132	$ 203	$ 278	$ 358
Property Tax Revenue Change	$ -	$ 70	$ 143	$ 298	$ 462	$ 635	$ 817
Wage Tax Revenue Change + Property Tax Revenue Change	$ -	$ 70	$ 207	$ 430	$ 665	$ 913	$ 1,174

VII.C. Scenario 3: A $125 Million Reduction in the Property Tax Rate

This scenario assumes that the property tax rate would be reduced from 8.264 percent to 7.04434 percent, a revenue decrease of approximately $125 million in 2004. This reduction amounts to about 14.8 percent of property tax revenues. The property tax decrease is anticipated to have significant positive property tax base effects as well as modest cross-base effects with respect to the wage tax base and a slight negative impact on the gross receipts tax base.

Table 5 shows the effect of the tax decrease on the property and wage tax bases. The regression models do not imply any impact on the gross receipts tax base or revenue. Under this scenario the property tax base is anticipated to grow from $35 billion to $46.6 billion between 2004 and 2010. Absent the rate cut, the property tax base is projected to grow to $42.8 billion, so the increase in property value due to the tax cut is $3.8 billion. This result implies that the property values will be roughly 8.9 percent higher than they would be without this tax reduction.[16] The growth in the property tax base will also result in an increase in revenues from the business use and occupancy tax.[17] If the assessed value of commercial property increases at the same rate as property value, revenues will increase by 8.9 percent or $8.2 million in 2010.

The property tax reduction would also result in higher wages and salaries. The wage tax base is projected to increase by $837 million as a result of the change. The gross receipts tax base, on the other hand, is expected to decrease by .45% by 2010.

The annual impact of these changes on tax revenues is shown in Figure 18 below. As in the previous graphs, the red line represents the annual loss in revenue caused by the reduction of the property tax and the blue line equals the sum of the supply side effects, which includes both the increase in property tax revenues and the increase in wage tax revenues. The fact that these lines do not intersect over the forecast horizon suggests that the supply side effects of this tax reduction will be insufficient to compensate for the revenue losses. This insufficiency is also indicated by Figure 19, which shows the divergence of the cumulative losses (red line) from the cumulative gains from the supply side effects (blue line). In the year

[16] A more disaggregated analysis that separately measured impacts of the property tax on the residential and non-residential components of the property tax base failed to find statistically significant separate effects of the property tax on the two components. (See Appendix E.)
[17] The increase in revenue from the business use and occupancy tax is not reflected in our projections.

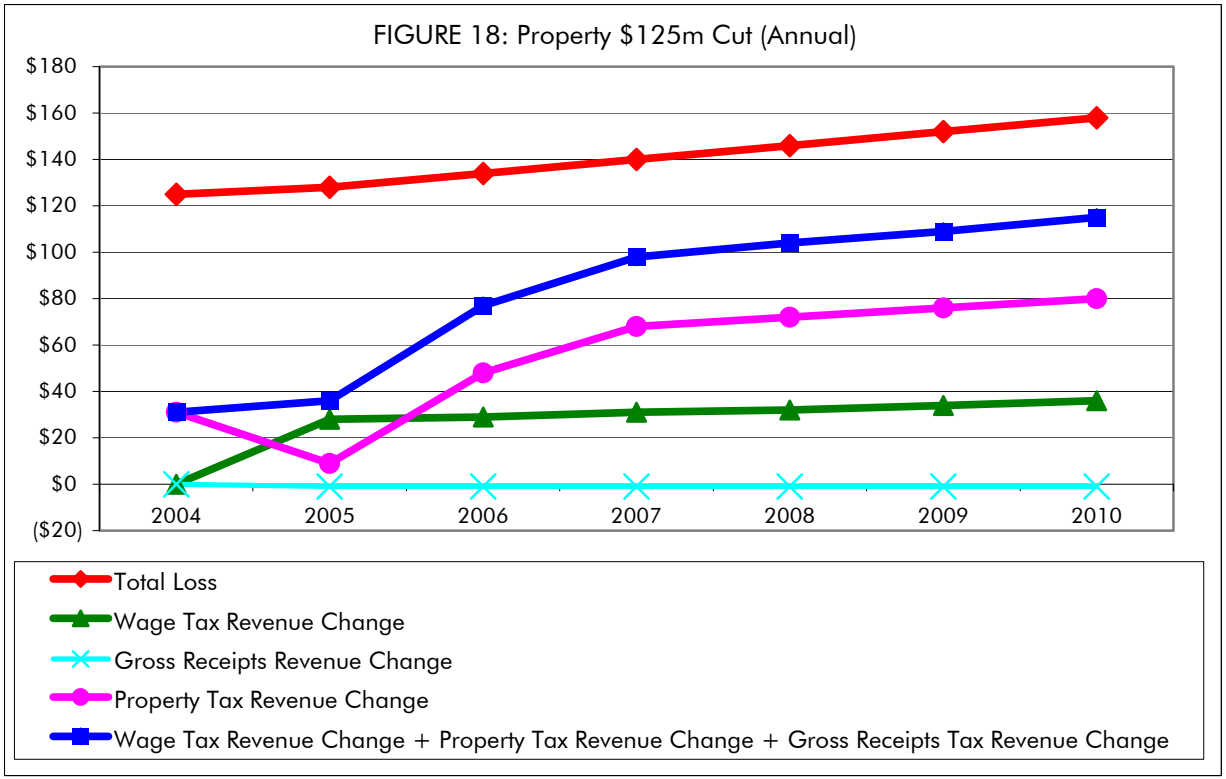
2010 the cumulative losses are $409 million if additional revenues from property value increases are available and $793 million if they are not.

Table 5: $125 Million Reduction in Property Tax Revenue

Wage Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$ 29,819,331,226	0.56%	$ -
2005	$ 30,558,063,344	0.55%	$643,549,168
2006	$ 30,988,479,419	0.53%	$678,300,823
2007	$ 31,406,041,889	0.51%	$715,607,368
2008	$ 31,745,676,842	0.49%	$754,250,166
2009	$ 32,030,412,352	0.47%	$794,979,675
2010	$ 32,222,728,021	0.45%	$837,113,598

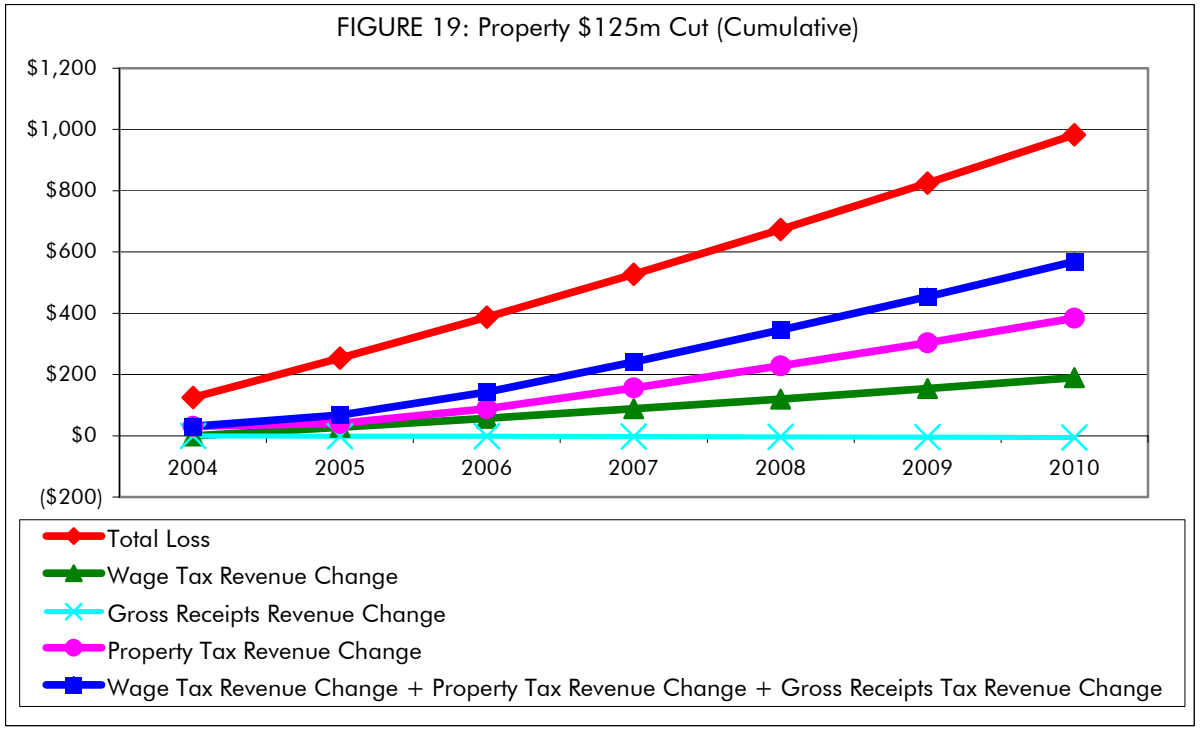
Property Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$ 35,137,697,144	0.18%	$1,449,866,670
2005	$ 35,157,668,827	0.17%	$ 418,824,851
2006	$ 38,493,604,041	0.18%	$2,262,387,139
2007	$ 41,022,808,218	0.18%	$3,203,492,892
2008	$ 42,811,571,958	0.18%	$3,376,481,508
2009	$ 44,673,899,673	0.18%	$3,558,811,510
2010	$ 46,568,295,835	0.18%	$3,747,428,520

Gross Receipts Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2004	$ 54,128,631,621	0.48%	$ -
2005	$ 56,803,403,716	0.48%	$ (248,174,012)
2006	$ 59,927,590,921	0.48%	$ (261,823,583)
2007	$ 63,163,680,830	0.48%	$ (275,962,057)
2008	$ 66,574,519,595	0.48%	$ (290,864,008)
2009	$ 70,102,969,134	0.48%	$ (306,279,800)
2010	$ 73,818,426,498	0.48%	$ (322,512,630)



Property $125m Cut (Annual) - in $ Millions

	2004	2005	2006	2007	2008	2009	2010
Total Loss	$ 125	$ 128	$ 134	$ 140	$ 146	$ 152	$ 158
Wage Tax Revenue Change	$ -	$ 28	$ 29	$ 31	$ 32	$ 34	$ 36
Gross Receipts Revenue Change	$ -	$ -1	$ -1	$ - 1	$ -1	$ -1	$ - 1
Property Tax Revenue Change	$ 31	$ 9	$ 48	$ 68	$ 72	$ 76	$ 80
Wage Tax Revenue Change + Property Tax Revenue Change + Gross Receipts Tax Revenue Change	$ 31	$ 36	$ 76	$ 98	$ 103	$ 109	$ 115



Property $125m Cut (Cumulative) - in $ Millions

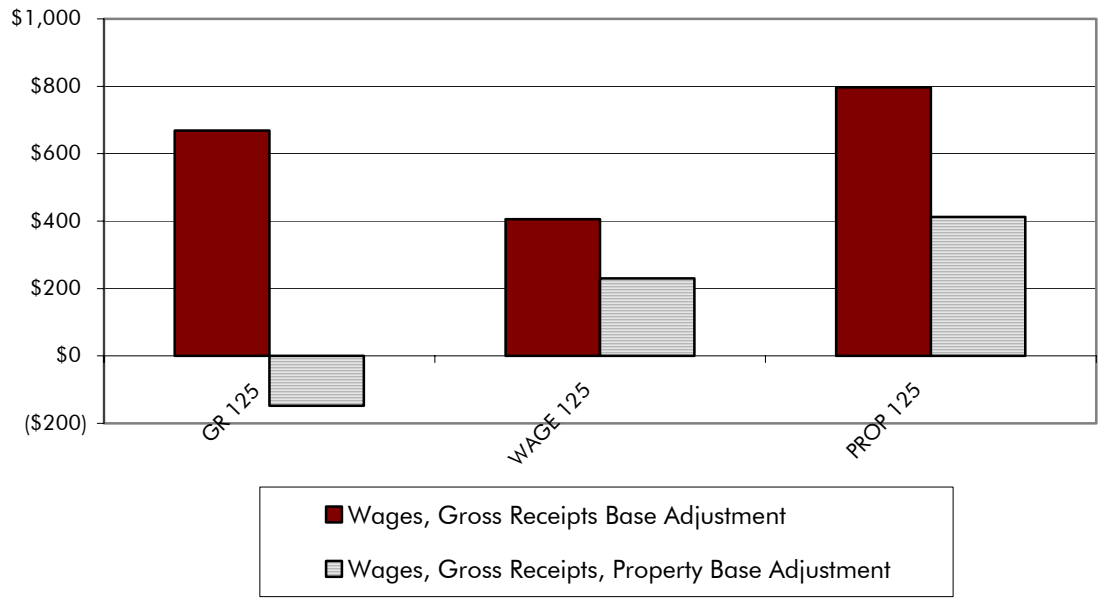
	2004	2005	2006	2007	2008	2009	2010
Total Loss	$ 125	$ 253	$ 387	$ 527	$ 673	$ 825	$ 983
Wage Tax Revenue Change	$ -	$ 28	$ 57	$ 88	$ 120	$ 154	$ 190
Gross Receipts Revenue Change	$ -	$ -1	$ -2	$ -3	$ -4	$ -5	$ -6
Property Tax Revenue Change	$ 31	$ 40	$ 88	$ 156	$ 228	$ 304	$ 384
Wage Tax Revenue Change + Property Tax Revenue Change + Gross Receipts Tax Revenue Change	$ 31	$ 67	$ 143	$ 241	$ 345	$ 454	$ 569

VII.D. Comparison of the Alternatives

The three alternative scenarios discussed above employ comparable assumptions relating to the size of the tax reductions in 2004. A comparison of these three alternative tax scenarios indicates that the determination of the optimal tax structure is dependent upon the economic measure used for the comparison. Figure 20 presents the cumulative revenue losses for each of the three scenarios discussed above. It shows that if we assume that assessments follow property values, then in terms of revenue losses the gross receipts tax will have the greatest supply side effects. This assumption is represented in the graph by the first striped bar, which shows that the losses under this policy will be negative by 2010. In other words, the elimination of the gross receipts tax will actually improve the City's revenue position over the long run due to the supply side effects. The model predicts a net gain of $148 million in revenues over the 7-year period from 2004 to 2010 in contrast to a loss of $230 million for the wage tax reduction and $412 for the property tax reduction. Of course, this assumes that ongoing reassessment is politically feasible and that the property tax revenue predicted by the model will be realized.

The solid bars in Figure 20 show the losses associated with the alternative scenarios if the additional property tax revenue is not collected. These indicate that the wage tax cut will have the lowest cumulative revenue loss at $406 million compared to $669 million for the gross receipts tax cut and $797 for the property tax reduction.

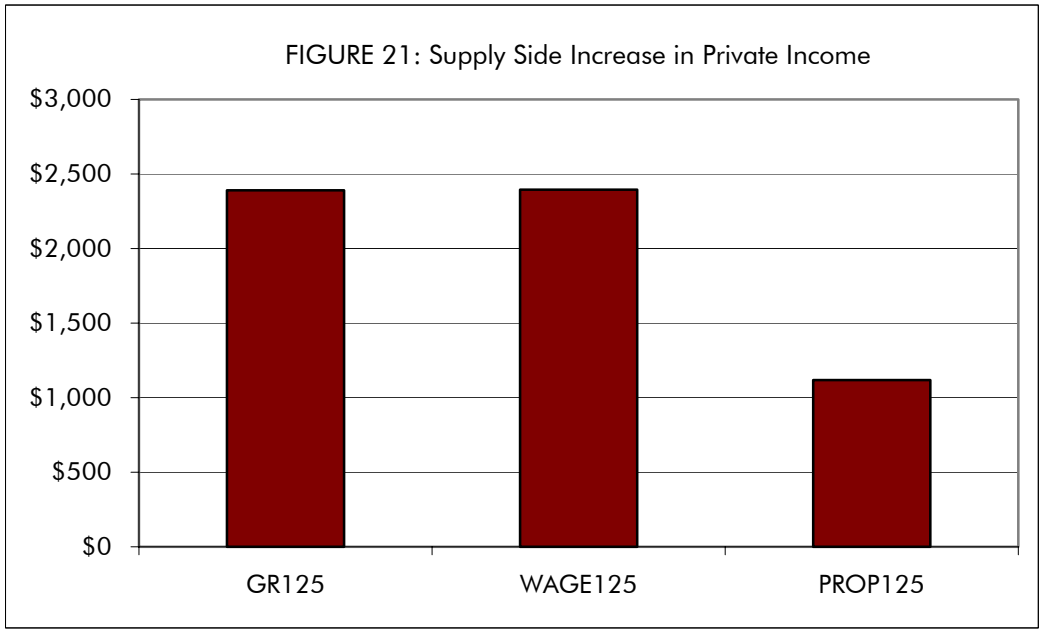
FIGURE 20: Cumulative Revenue Losses



Cumulative Revenue Losses – in $ Millions

	GR 125	WAGE 125	PROP 125
Wages, Gross Receipts Base Adjustment	$ 669	$ 406	$ 797
Wages, Gross Receipts, Property Base Adjustment	$ -148	$ 230	$ 412

In terms of private income generated, which is shown in Figure 21, the wage tax reduction generates about the same level of private income as the gross receipts tax and a much greater increase in private income than the property tax reduction. The graph shows that the cumulative amount of income generated, which is defined as the sum of wages plus an imputed value for the increase in property value (calculated as the sum of the increase in value times 7.5 percent per year) is equal to about $2.4 billion for the wage tax cut and for the gross receipts tax cut. The increase in income associated with the property tax cut is about half that of the other two taxes.



Supply Side Increase in Private Income - in $ Millions

	GR125	WAGE125	PROP125
Real Activity	2,390	2,395	1,118

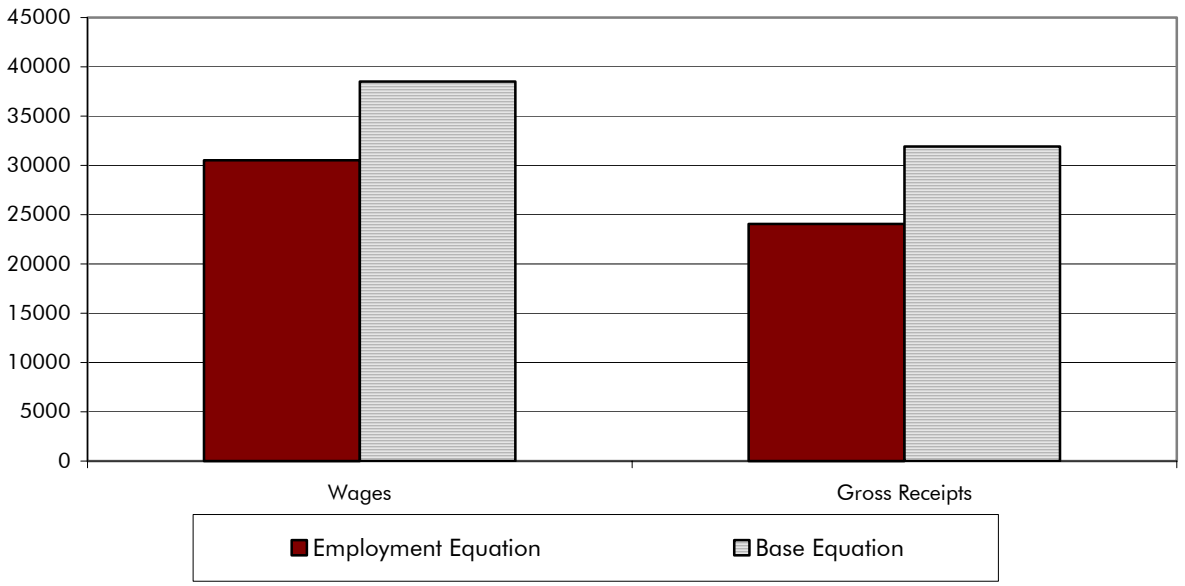
VII.E. Tax Rate Reductions and Jobs

Our analysis of the impact of taxes on employment used two alternative approaches. The results of these alternative approaches are identified in Figure 22 as the "employment equation" and the "base equation." The first approach directly estimated the relationship between employment and tax rates and found a statistically significant relationship between the number of jobs and the wage and gross receipts tax rates. The second approach estimated the number of jobs in 2010 by dividing the wage and salary increase by an estimate of the average wage rate.[18] The results of this analysis presented below Figure 22 show that 30,500 jobs will be created from the wage tax reduction compared to 24,100 for gross receipts tax reduction. The number of jobs estimated by using the average wage and the increase in the base is 38,800 for the wage and 31,900 for the gross receipts. The disparity between the two estimates could be reconciled if the jobs that will be gained as a result of wage and gross receipts tax decreases are higher than average wage jobs. The discrepancy may also be the result of forecast error associated with the different approaches. Nevertheless, either method shows that the increase in jobs in the City will be higher from a wage tax reduction than from a gross receipts tax reduction.

We extended the aggregate employment analysis described above by investigating how changes in the City's tax structure have impacted different industry segments. This analysis, which is described in detail in Appendix F, is focused on estimating the statistical relationship among changes in the City's wage, gross receipts, and property tax rates and the City's share of US employment for the six major private sector industry divisions. Emphasis was placed on identifying local industry segments that lost ground as a result of the City's tax structure. The findings of the industry level employment analysis were broadly consistent with the findings for the relationship between employment and City tax rates. For sectors containing over 75 percent of the City's private employment, wage and gross receipts tax rates are found to have negative impacts on jobs. That is, reductions in these tax rates are expected to increase employment. The only positive relationships between wage tax rates and employment, and between gross receipts tax rates and employment, appear to be in the construction and trade industries. There appear to be strong negative relationships between the wage tax rate and employment in manufacturing, services, and transportation and public utilities. For the gross receipts tax, finance, insurance, and real estate can be added to the list. The reader is referred to Appendix F for more information.

[18] In this calculation, we assumed that the average wage taken from the Bureau of Economic Analysis Regional Data increased by 4 percent per year. This resulted in an average wage of $51,445 in 2004 and $57,868 in 2010.

FIGURE 22: Tax Cut Induced Job Growth ($125m Cut)



Tax Cut Induced Job Growth ($125m cut)

	Employment Equation	Base Equation
Wages	30,512	38,512
Gross Receipts	24,063	31,905

VIII. PHILADELPHIA TAX REFORM COMMISSION SCENARIOS

In this section we consider two additional scenarios that are based on the proposed recommendations of the TRC. Scenario 4 is based on a combination of the Business Tax Working Group and Wage Tax Working Group proposals. This scenario assumes a phased elimination of the gross receipts tax over the next ten years as well as a phased reduction in the resident portion of the wage tax from 4.4625 percent in 2004 to 3.5 percent in 2014 and a reduction in the non-resident portion of the tax from 3.8801 to 3.0 percent.[19] Table 6 shows the rates over the phase-out period. This approach implies considerably less revenue risk for the City compared to the complete elimination of the gross receipts tax in 2004. It should be noted that the TRC also proposed a phased reduction of the Net Income Tax. Due to data limitations, however, we were unable to include the Net Income Tax reductions in our simulations. See Appendix A for a discussion of the data problem.

Table 6: TRC Proposed Gross Receipts and Wage Tax Phase Out

Fiscal Year	Gross Receipts Tax Rate	Wage Tax Rate, Resident	Wage Tax Rate, Non-Resident
2004	0.21%	4.4625	3.8801
2005	0.19%	4.3500	3.8500
2006	0.18%	4.3000	3.8000
2007	0.16%	4.2000	3.7000
2008	0.15%	4.1000	3.6000
2009	0.13%	4.0000	3.5000
2010	0.11%	3.9000	3.4000
2011	0.09%	3.8000	3.3000
2012	0.07%	3.7000	3.2000
2013	0.05%	3.6000	3.1000
2014	0.03%	3.5000	3.0000

[19] This scenario, based on an interim proposal, does not correspond exactly to the final recommendations of the Philadelphia Tax Reform Commission but is quite similar. The scenario modeled in this report is sufficiently similar that its likely effects should be close to those of the final recommendations.

The final scenario, Scenario 5, assumes similar reductions in the gross receipts and wage taxes combined with the implementation of the Rendell Plan for a New Pennsylvania.

VIII.A. Scenario 4: Combined Gross Receipts and Wage Tax Reduction

In this scenario two key elements of the TRC's tentative proposals are examined together: the phasing out of the gross receipts tax and the phased wage tax reductions. These phased reductions result in significant wage and property tax base growth. This program is attractive because it combines the gross receipts tax cuts, which tend to have favorable revenue implications (assuming that the City real estate collections increase with property values) with wage tax reductions, which tend to have stronger income and employment impacts.

The tax base implications of this combined scenario are shown in Table 7. In this scenario the wage tax base is anticipated to be $2.7 billion larger in 2010 as a result of the supply side effects of the wage tax cut. This increased wage tax base, in turn, implies that the Philadelphia economy will be generating roughly 8.7 percent more in wages and salaries. By 2017, the wage tax base is expected to be $10.1 billion larger than without the cut.

The wage and gross receipts tax reduction would also result in higher gross receipts and property tax bases. The gross receipts tax base will grow from $74.1 billion to $78.9 billion, a 6.5 percent change in 2010, however, by 2015 the gross receipts tax is completely phased out so that additional growth does not produce additional revenue. The property tax base will grow from $42.8 billion to $47.7 billion, an increase of $4.9 billion or an 11.4 percent increase. By 2017, the real estate tax base will have grown considerably and will be $16.3 billion greater than would have been the case without the tax cut. The growth in the property tax base will also result in an increase in revenues from the business use and occupancy tax.

The gross receipts tax phase out and wage tax reductions have significant impacts on jobs in the City—creating an additional 47,604 jobs by 2010 and 175,165 jobs by 2017.[20] The median house value, in real terms, would increase in value by $7,617, from $67,418 to $75,035 in 2010, and by $19,325 in 2017.[21]

[20] Again, these estimates are calculated based on a constant average real wage and the estimated increases in the size of the wage and salary base.
[21] This calculation assumes that the number of households is constant over the horizon.

Table 7: Base Impacts: TRC Proposed Wage and Gross Receipts Phased Reductions

Wage Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2005	$30,117,034,744	0.54%	$ 202,520,578
2006	$30,743,738,331	0.52%	$ 433,559,734
2007	$31,633,909,414	0.51%	$ 943,474,893
2008	$32,464,914,465	0.50%	$ 1,473,487,789
2009	$33,244,943,909	0.48%	$ 2,009,511,232
2010	$34,140,405,444	0.47%	$ 2,754,791,020

Property Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2005	$35,192,388,366	0.17%	$ 453,544,391
2006	$37,191,168,859	0.17%	$ 959,951,958
2007	$39,504,904,933	0.18%	$ 1,685,589,607
2008	$42,096,547,488	0.18%	$ 2,661,457,038
2009	$44,777,659,110	0.18%	$ 3,662,570,947
2010	$47,658,740,328	0.18%	$ 4,837,873,012

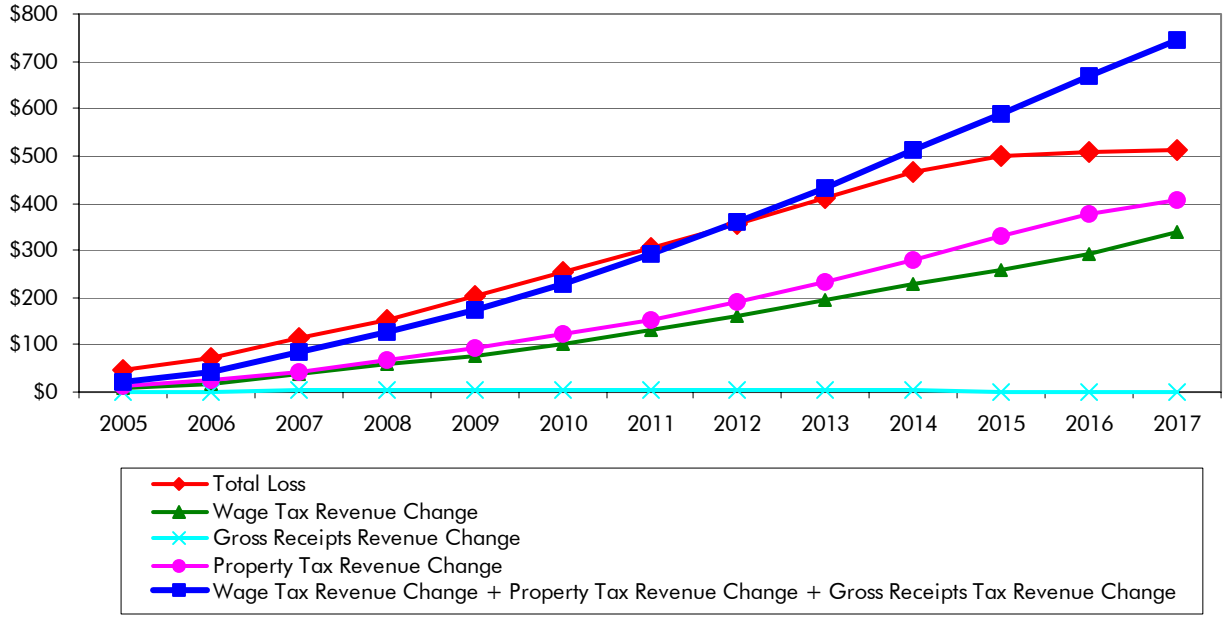
Gross Receipts Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2005	$ 57,554,979,456	0.48%	$ 503,401,728
2006	$ 61,429,359,704	0.49%	$ 1,239,945,200
2007	$ 65,423,708,797	0.50%	$ 1,984,065,910
2008	$ 69,584,073,682	0.50%	$ 2,718,690,080
2009	$ 74,120,336,721	0.51%	$ 3,711,087,787
2010	$ 78,941,981,979	0.51%	$ 4,801,042,851

The revenue impacts of the proposal are summarized in Figure 23, which shows the revenue impact of the tax decrease as well as the annual wage, gross receipts and property tax gains resulting from the increase in the respective tax bases. Figure 23 shows the annual impact of the additional growth in the wage, gross receipts and property bases on tax revenues. If one looks only through 2010, the revenue losses will exceed the annual supply side gains every year through 2010. After 2012, however, the revenues are larger each subsequent year than they would have been without the tax cuts (assuming, again that real estate tax revenues rise with real estate values.)

The cumulative pattern of gains and losses is shown in Figure 24. Assuming that real estate revenues increase, cumulative losses are $164 million in 2010 and peak at $178 million in 2011. By 2017, we project that revenues will be $143 million larger than they would have been without the tax. Thus, in the very long term, there is no cumulative deficit. However, if additional revenues from real estate are not captured, this tax reduction program results in a deficit of $521 million in 2010, which expands to nearly $2 billion in 2017.

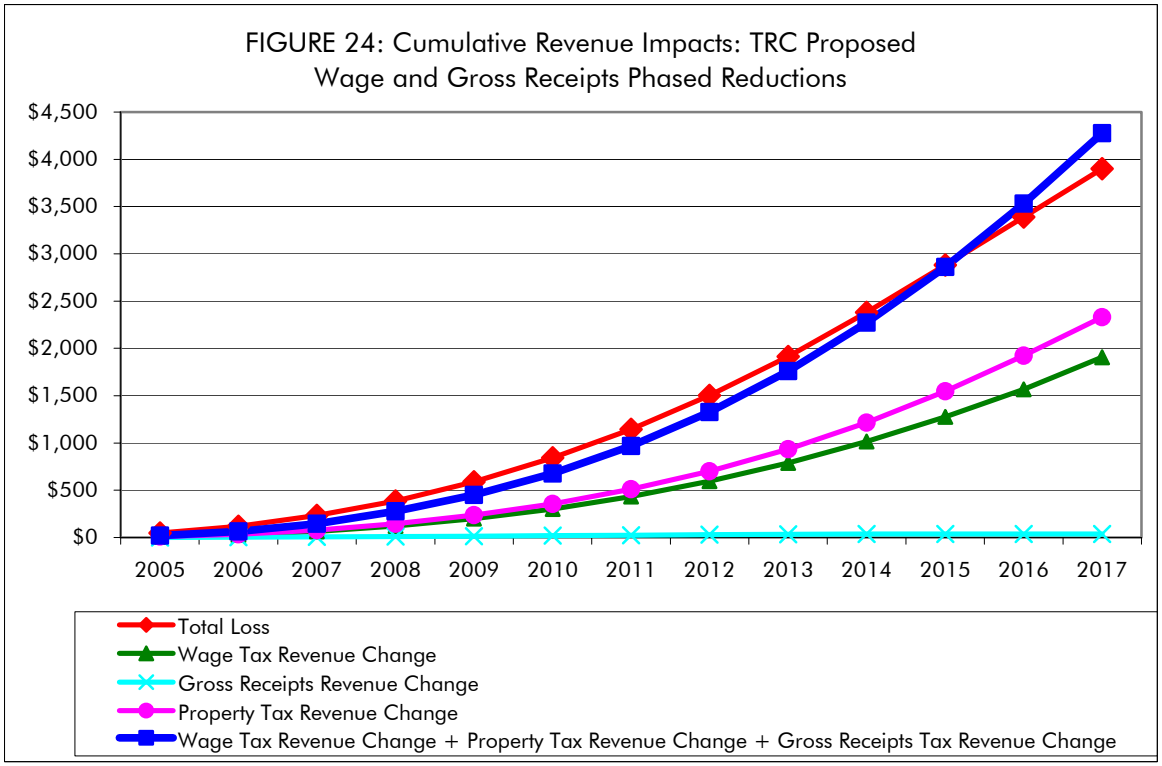
It should be noted that the TRC business tax reform proposal goes beyond the gross receipts tax reduction scenarios presented in this report. For example, the business privilege tax phase out also includes the net income portion of the business privilege tax. We were not able to analyze the net income tax base in the same manner as the other tax rates because of the short time it has been in effect and because of the lack of variation in the rate. It should be realized that a reduction in the net income tax rate is also likely to produce supply side effects.

FIGURE 23: Annual Revenue Impacts: TRC Proposed Wage and Gross Receipts Phased Reductions



TRC Proposed Wage and Gross Receipts Phased Reductions - Annual Revenue Impacts – in $ Millions

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Loss	$47	$ 72	$113	$154	$203	$253	$304	$357	$411	$466	$501	$507	$513
Wage Tax Revenue Change	$8	$ 18	$38	$58	$77	$102	$132	$162	$194	$227	$259	$294	$337
Gross Receipts Revenue Change	$1	$ 2	$3	$4	$5	$5	$5	$5	$5	$3	$ -	$ -	$ -
Property Tax Revenue Change	$11	$ 24	$42	$67	$92	$121	$153	$192	$234	$281	$331	$376	$407
Wage Tax Revenue Change + Property Tax Revenue Change + Gross Receipts Tax Revenue Change	$20	$ 44	$83	$129	$174	$228	$290	$359	$433	$511	$590	$670	$744



TRC Proposed Wage and Gross Receipts Phased Reductions - Cumulative Revenue Impacts - in $ Millions

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Loss	$47	$119	$232	$386	$589	$842	$1,146	$1,503	$1,914	$2,380	$2,881	$3,388	$3,901
Wage Tax Revenue Change	$8	$26	$64	$122	$199	$301	$433	$595	$789	$1,016	$1,275	$1,569	$1,906
Gross Receipts Revenue Change	$1	$3	$6	$10	$15	$20	$25	$30	$35	$38	$38	$38	$38
Property Tax Revenue Change	$11	$35	$77	$144	$236	$357	$510	$702	$936	$1,217	$1,548	$1,924	$2,331
Wage Tax Revenue Change + Property Tax Revenue Change + Gross Receipts Tax Revenue Change	$20	$64	$147	$276	$450	$678	$968	$1,327	$1,760	$2,271	$2,861	$3,531	$4,275

VII.B. Scenario 5: The TRC Gross Receipts and Wage Tax Reduction with the Rendell Plan for a New Pennsylvania

This analysis assumes both that the tax reform aspects of Governor Rendell's proposal are enacted and that the TRC's gross receipts tax reduction and wage tax reduction described above are implemented. The scenario does not examine the consequences of other aspects of Governor Rendell's proposed budget, which provides more revenue for the Philadelphia public schools, but reduces funding for other programs in the City. The state tax reform proposed by the Rendell Administration increases the state personal income tax by 0.95 percentage points. This tax increase is used for four purposes: 1) lowering local property taxes everywhere but Philadelphia—where the wage tax is reduced; 2) increasing state aid to local school districts; 3) filling the deficit in the current budget; and 4) creating a fund for economic development. This analysis focuses on the reduction of local taxes. The proposed tax reform will provide $170 million for wage tax reduction in the City of Philadelphia. For fiscal year 2005, we estimate that this sum would allow the reduction of the blended wage tax rate from 4.17 percent to 3.60171 percent, a reduction of 0.5683 percentage points.[22]

The scenario also incorporates the TRC's tentative gross receipts tax phase out and the wage tax rate cuts described in Scenario 4. The incorporation of the Rendell proposal permits the wage tax rate to fall from 4.22980 percent in 2004 to 2.75171 percent in 2014.

[22] The blended wage tax rate is equal to .64 times the resident wage tax rate plus .36 times the nonresident wage tax rate.

Table 8: TRC-Rendell Proposed Gross Receipts and Wage Tax Phase Out

Fiscal Year	Gross Receipts Tax Rate	Wage Tax Rate
2005	0.19%	3.60171
2006	0.18%	3.55171
2007	0.16%	3.45171
2008	0.15%	3.35171
2009	0.13%	3.25171
2010	0.11%	3.15171
2011	0.09%	3.05171
2012	0.07%	2.95171
2013	0.05%	2.85171
2014	0.03%	2.75171

In conducting this analysis there are a number of assumptions and considerations to keep in mind. First, we assume that the increase in state personal income tax rate has no aggregate effect on the City of Philadelphia. This assumption may appear odd in light of the fact that our statistical models indicate that local wage taxes (which are akin to income taxes) do have negative impacts; however, we believe that the bulk of the negative impacts of the wage tax are due to its level relative to its suburban neighbors. City residents and firms can avoid the wage tax at relatively low costs by moving within the metropolitan area. Avoiding the state personal income tax would entail much higher costs, and therefore the negative impact of the increase in the state income tax should be relatively small.

Second, the increased differential in property taxes between city and suburban economies will have no negative effect on the city economy. The reduction of property taxes in the suburban counties will also increase their property values. The cost reduction of a suburban location will be less than the full amount of the tax reduction because the tax reduction will be capitalized in the price of the property. This means that the property tax reduction will provide the suburbs with only a modest cost differential, implying that the adverse competitive impacts for the city will be correspondingly smaller.

Third, we have not addressed the implications of the Rendell Administration's budget priorities. To the extent that there are reductions in state aid to the city, the ability to support its current services will be adversely affected. It should be noted, however, that the tax reform proposal increases state financial resources beyond those required for the local tax reform and increases in school aid, so that reductions in state aid may be more severe in absence of reform.

Fourth, we do not factor in the impacts of the increased school aid to the School District of Philadelphia, which are large. These infusions to the School District will have positive direct impacts on the City's economy and education system, and may obviate the need for increases in taxes to support school spending. These considerations are not explicitly taken into account.

Fifth, we assume that the state revenue for wage tax relief is constant at $170 million for the foreseeable future.

The combination of the Rendell proposals and the phased reductions in wage and gross receipts tax rates result in significant wage and property tax base growth. This program is attractive because it combines the gross receipts tax cuts, which tend to have favorable revenue implications (assuming that the City real estate collections increase with property values) with wage tax reductions, which tend to have stronger income and employment impacts. The tax base implications of this combined scenario are shown in Table 9. In this scenario the wage tax base is anticipated to be $5.8 billion larger in 2010 as a result of the supply side effects of the wage and gross receipts tax cut. This increase implies that the Philadelphia economy will be generating roughly 18.5 percent more in wages and salaries. By 2017, the wage tax base is expected to be $14.5 billion larger than without the cut.

Table 9: Base Impacts: TRC-Rendell Proposed Wage and Gross Receipts Phased Reductions

Wage Taxes				
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base	Revenue (plus PA contribution)
2005	$ 31,087,681,696	0.56%	$ 1,173,167,530	$ 31,087,681,696
2006	$ 31,766,800,218	0.54%	$ 1,456,621,622	$ 31,766,800,218
2007	$ 32,713,239,705	0.53%	$ 2,022,805,184	$ 32,713,239,705
2008	$ 35,221,868,570	0.54%	$ 4,230,441,894	$ 35,221,868,570
2009	$ 36,150,773,536	0.53%	$ 4,915,340,859	$ 36,150,773,536
2010	$ 37,200,244,042	0.51%	$ 5,814,629,618	$ 37,200,244,042

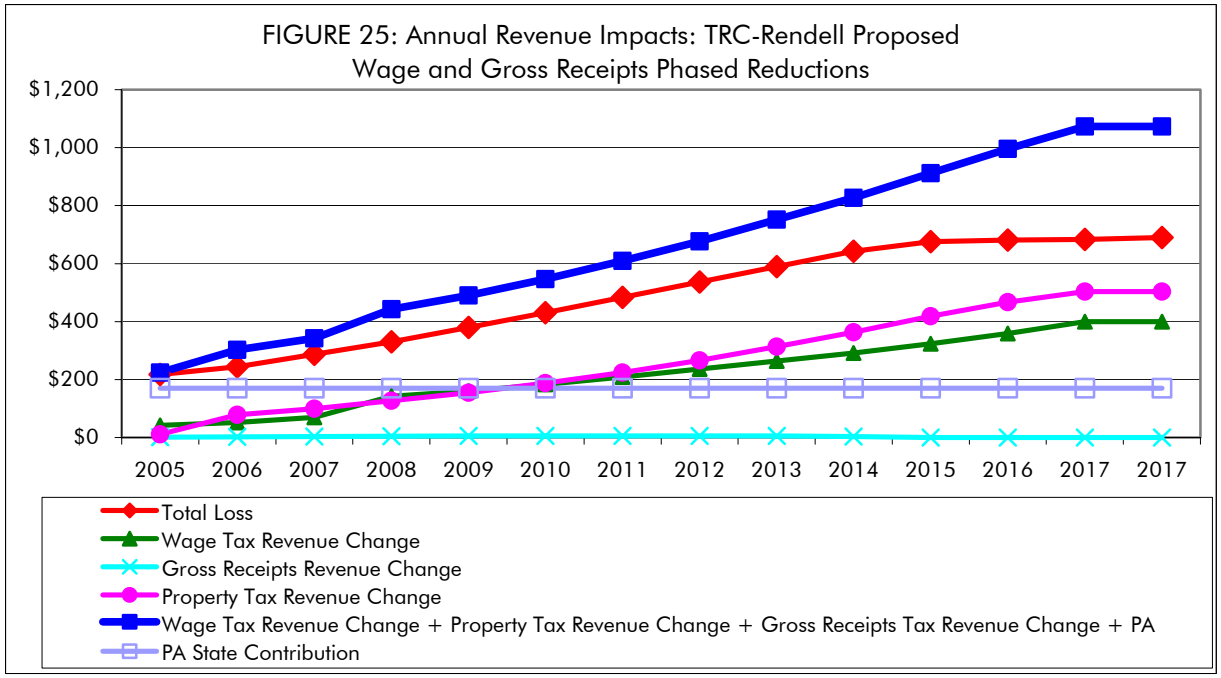
Property Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2005	$ 35,192,388,366	0.17%	$ 453,544,391
2006	$ 39,348,866,333	0.18%	$ 3,117,649,432
2007	$ 41,781,275,768	0.19%	$ 3,961,960,442
2008	$ 44,495,842,348	0.19%	$ 5,060,751,898
2009	$ 47,306,515,893	0.19%	$ 6,191,427,729
2010	$ 50,321,626,520	0.19%	$ 7,500,759,204

Gross Receipts Taxes			
	Tax Base	Share of the U.S. tax base	Supply side change in the tax base
2005	$ 57,554,979,456	0.48%	$ 503,401,728
2006	$ 61,429,359,704	0.49%	$ 1,239,945,200
2007	$ 65,423,708,797	0.50%	$ 1,984,065,910
2008	$ 69,584,073,682	0.50%	$ 2,718,690,080
2009	$ 74,120,336,721	0.51%	$ 3,711,087,787
2010	$ 78,941,981,979	0.51%	$ 4,801,042,851

The wage and gross receipts tax reduction would also result in higher gross receipts and property tax bases. The gross receipts tax base will grow from $74.1 billion to $78.9 billion, a 6.5 percent change in 2010. However, by 2014 the gross receipts tax is completely phased out so that additional growth does not produce additional revenue. The property tax base will grow from $42.8 billion to $50.3 billion, an increase of $7.5 billion or a 17.5 percent increase. By 2017, the property tax base will have grown considerably and will be $20.1 billion greater than would have been the case without the tax cut. The increase in property value will allow the City to generate additional funds for both the City and School District without increasing tax rates. Revenues generated via the business use and occupancy tax will grow proportionally to the increase in commercial property values assuming commercial assessments grow at the same pace as property value. Thus, a 17.5 percent increase in commercial property value would result in approximately $16.4 million in additional revenues for the schools.

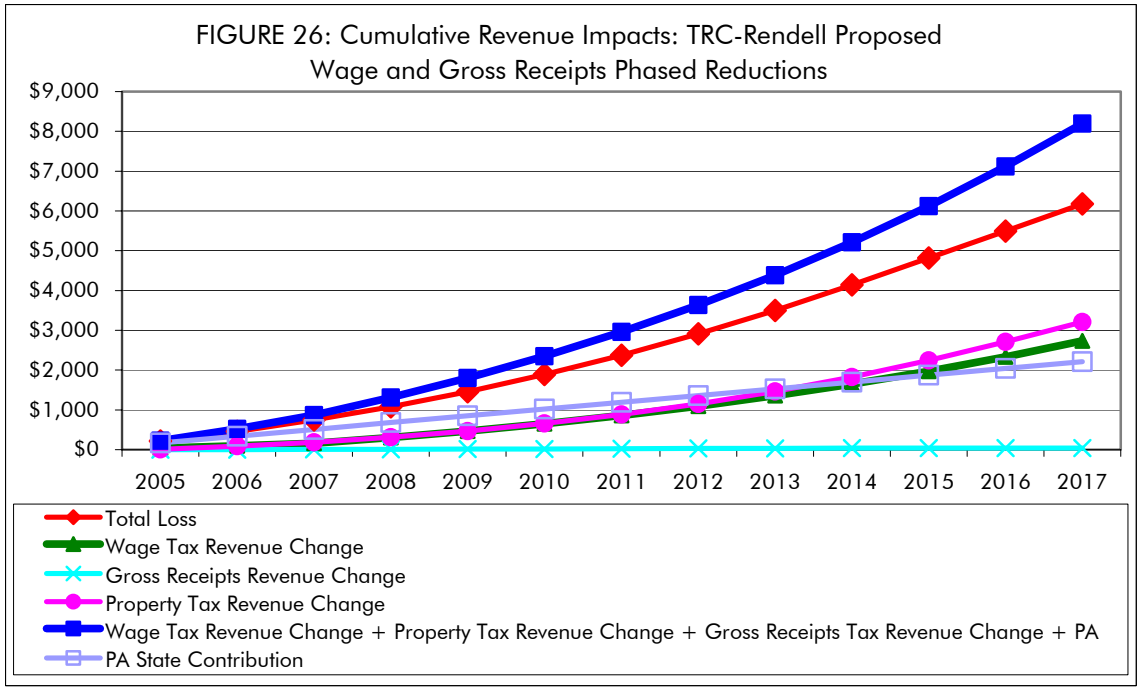
The revenue impacts of the proposal are summarized in Figure 25, which shows the revenue impact of the tax decrease as well as the annual wage, gross receipts and property tax gains resulting from the increase in the respective tax bases. Figure 25 shows the annual impact of the additional growth in the wage, gross receipts and property bases on tax revenues as well as the revenue provided by the state. It shows that with the contribution from the state, the revenue gains will immediately offset the annual revenue losses.

The cumulative pattern of gains and losses is shown in Figure 26. Assuming that property tax revenues increase and that the state continues to contribute $170 million to the City, cumulative losses are $1,889 million in 2010 but gains are $2,347 million, a net gain of $458 million. The bottom line is that the Rendell–TRC tax reduction scenario is likely to increase the size of the Philadelphia economy and increase the City's property values. This growth will increase City revenues so that wage taxes plus the state aid to the City will significantly exceed baseline revenue forecasts.



TRC-Rendell Proposed Wage and Gross Receipts Phased Reductions - Annual Revenue Impacts - in $ Millions

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Loss	$217	$244	$287	$330	$380	$431	$483	$536	$589	$643	$676	$681	$683
Wage Tax Revenue Change	$42	$52	$70	$142	$160	$183	$209	$236	$264	$291	$324	$359	$400
Gross Receipts Revenue Change	$1	$2	$3	$4	$5	$5	$6	$5	$5	$3	$0	$0	$0
Property Tax Revenue Change	$11	$78	$99	$127	$155	$188	$224	$266	$313	$363	$418	$467	$503
Wage Tax Revenue Change + Property Tax Revenue Change + Gross Receipts Tax Revenue Change + PA	$224	$302	$342	$443	$490	$546	$609	$677	$752	$827	$912	$996	$1,073
PA State Contribution	$170	$170	$170	$170	$170	$170	$170	$170	$170	$170	$170	$170	$170



TRC-Rendell Proposed Wage and Gross Receipts Phased Reductions - Cumulative Revenue Impacts - in $ Millions

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Loss	$217	$461	$748	$1,078	$1,458	$1,889	$2,372	$2,908	$3,497	$4,140	$4,816	$5,497	$6,180
Wage Tax Revenue Change	$42	$94	$164	$306	$466	$649	$858	$1,094	$1,358	$1,649	$1,973	$2,332	$2,732
Gross Receipts Revenue Change	$1	$3	$6	$10	$15	$20	$26	$31	$36	$39	$39	$39	$39
Property Tax Revenue Change	$11	$89	$188	$315	$470	$658	$882	$1,148	$1,461	$1,824	$2,242	$2,709	$3,212
Wage Tax Revenue Change + Property Tax Revenue Change + Gross Receipts Tax Revenue Change + PA	$224	$526	$868	$1,311	$1,801	$2,347	$2,956	$3,633	$4,385	$5,212	$6,124	$7,120	$8,193
PA State Contribution	$170	$340	$510	$680	$850	$1,020	$1,190	$1,360	$1,530	$1,700	$1,870	$2,040	$2,210

IX. CAVEATS, CONCERNS, CRITIQUES, AND CONCLUSIONS

Like those of any science, all economic analyses, come implicitly or explicitly, with the caveat that the models are, by design, simplifications of the real world, and therefore cannot capture the influence of every factor that might influence the outcomes of interest. No analysis can ever capture every feature of any real world process, so no prediction is expected to be perfectly accurate. Nevertheless, long experience in economics and other disciplines has shown that useful predictions can sometimes be made with simple models. The models used in this report are similar to tax models that are highly regarded in the economics literature, but as we have said publicly on several occasions, our models should be only one input into decisions about Philadelphia's future tax rates.

IX.A. Our Greatest Concern

Our greatest concern regarding the revenue impacts of reducing the gross receipts and wage tax rates is whether the City can increase its property tax revenues in proportion to the predicted rise in property values associated with the tax reductions. The question is whether the City will resist the inevitable pressure to slow the growth of assessments and/or lower the effective property tax rate as property values rise. If it can, reducing the gross receipts tax rate is particularly attractive, since in a relatively short time horizon, total revenue collections will exceed the forgone revenue of the tax cut. If property tax revenues do not rise, however, reducing the gross receipts tax will have more adverse effects than similarly sized wage tax reductions. Moreover, wage tax reductions have somewhat larger, positive economic impacts on income and jobs than do the gross receipts tax cuts.

Assuming that property tax revenues rise in proportion to property values, the phased in reductions of gross receipts and wage tax rates proposed by the TRC are expected to yield large positive economic benefits with only modest cumulative deficits that diminish over the very long run. On the other hand, if rising property values do not generate additional revenue, these phased in cuts result in sizable deficits that grow over the forecast horizon.

IX.B. Impacts of Changes in City Services

One concern that has been expressed in response to earlier versions of this report is that we had failed to account for the possible impacts of changes in City services that might be associated with changes in tax rates. The dominant view among policy analysts regarding the effect of inter-jurisdictional differences in taxes and services is that business, population and property values decline in areas offering an unattractive mix of taxes and services. Most studies, which attempt to relate investment or location behavior to taxation, neglect the benefits derived from the services provided via city expenditures. In Appendix G we discuss our attempts to address this issue by incorporating measures of the level and quality of City services into the estimated tax base models discussed in the earlier sections of this report. Our goal is twofold: to determine whether such factors have statistically significant impacts and to see if their inclusion alters the estimated relationships among the City tax rates and the levels of economic activity.

It should be noted that our data and methodology might be inadequate to accurately capture the impact of an increase in the level or quality of City services. First, the relevant service data are measures of services as they are valued by City residents and businesses. Unfortunately, most service level measures are actually service input measures—how much is spent on services or how many people are employed delivering services. Input measures of services neglect the fundamental importance of how efficiently the inputs are used and how the services are valued by residents. In addition, while the framework that Econsult has employed is good for capturing impacts of discrete changes such as changes in tax rates, it may be inadequate for capturing the impacts of long run trend changes in factors such as school quality. The services variables included in the tax base shares equations were not found to be statistically significant. Further, their inclusion did not change the results of our analysis of tax impacts. Even though our statistical results do not indicate clear impacts of services on tax bases, it is highly likely that public services are important for the economic health of the City as well as the health of its tax bases. We do not view these results as conclusive regarding the impact of City services but rather as indicative of the need to collect additional data and possibly to consider alternative methodologies that may be more appropriate for determining the impact of City services.

IX.C. Herzenberg's Critiques of "Across the Board" Wage Tax Cuts and Our Analysis

In a paper released after most of our work was completed, Stephen Herzenberg has argued for forgiving the wage tax for low-earning individuals instead of cutting wage taxes for all earners across the board. He summarizes his argument with these four points:

- We know the benefits of targeted relief will go very largely to those who need it.
- We know this would make Philly taxes more equitable relative to other cities – although taxes on low-income families would remain above average.
- We know that Philadelphia consumer demand stimulation would be much greater with targeted tax relief than with across-the-board wage tax relief of the same dollar amount.
- We don't know whether a small additional cut in overall wage tax rates would have a substantially larger positive impact on the city tax base long term.[23]

Taking the first two points together, Herzenberg is correct when he says that forgiveness of the wage tax would add progressivity to the Philadelphia tax system. Our study did not examine equity issues such as this one because we were not asked to do so. Based on the body of existing research, however, we believe that progressive taxation is an extremely good idea at the national level and perhaps at the state level – but not at the local level. Lowering city taxes for low earners necessarily implies raising taxes for high earners, so that progressive local taxes tend to encourage high earners to leave the city to live with other high earners in towns where their tax rates can be lower. In the long run, this self-sorting by earnings level will be bad for Philadelphia or any other city.

Herzenberg makes some compelling arguments for his third point, but he leaves out a potentially important consideration. Forgiveness would certainly increase demand in the City by low earners, but it would also reduce demand in the City by higher earners by reducing the disposable income of those who stay and causing others to leave as discussed in the previous paragraph. The net impact on demand would be ambiguous at a theoretical level.

[23] Herzenberg (2003) p.11.

With regard to Herzenberg's fourth point, we may not know with certainty that an across the board cut would have a greater stimulative effect than forgiveness, but, as we said in the opening caveat of this section certainty is a luxury that is never enjoyed by those who ask questions about economic policies. We do know that the answer to the question is ambiguous at a theoretical level as we argued in the previous paragraph. We also know that there is no hope of completely resolving the question with data analysis because we have no historical data reflecting experience with forgiveness in the City wage tax. And we have the results of our analyses of the available data, which suggest significant employment gains from a wage tax cut with particularly strong evidence of gains in the services industries where low earners are disproportionately employed.

Herzenberg challenges our results as follows:

> … the Econsult analysis does not really tell us with any reliability how important wage tax rates are to sustaining the city tax base. Indeed, it does not even tell us that they are important at all.[24]

He goes on to list his requirements for a reliable analysis:

> In brief, to develop and estimate a reliable causal model, a series of conditions must be met. Here are some of the less technical.
>
> - You need a well-grounded theory of the process that you are seeking to explain that can be expressed in a mathematical form.
> - You need to have good measures of all of the "independent" or causal factors thought to influence the dependent variable.
> - You need to be confident that the relationship you are modeling is stable over the period of time for which you have data.
> - You need to have a good reason for believing that you can treat your entire sample as one group – or you need to estimate separate equations for different groups with different dynamics.[25]

[24] Herzenberg (2003) p.8.
[25] Herzenberg (2003) p.8.

With regard to the first requirement, the existing economic literature provides a quite well developed theoretical context within which one can think about the likely impacts of changes in local taxes. As for the second requirement, one never has good measures of all possibly relevant factors in any policy analysis. Third, one can never be sure that modeled relationships are stable over time, but we found no evidence of such instability in our analyses. We hope that Herzenberg or others will conduct empirical analyses to further explore the possibility. Finally, the question of the aggregation of groups is frequently raised in policy analysis. It is conceptually appealing to think about highly disaggregated models, but the required data often do not exist, and some experience, particularly in macroeconometric forecasting, has shown that highly disaggregated models do not work very well.[26]

The Herzenberg requirements are a counsel of perfection that no policy analysis could ever satisfy. One is left then with the choice of using estimates that are clearly less than perfect or using no estimates at all. It is our view that our estimates provide some useful insights, but we would never assert that they should be the only basis for choosing Philadelphia's tax policy. In fact, we have explicitly argued to the contrary in several public statements.

IX.D. Conclusions

Our econometric and simulation analysis indicates that there are significant, positive impacts of reducing tax rates in the City—especially the gross receipts tax and the wage tax rates. In fact, from a purely economic point of view, the city economy would expand by shifting tax collections away from the gross receipts and wage taxes and shifting toward property taxes.[27]

We find consistent empirical evidence that (1) reductions in tax rates expand the base of the particular tax being reduced; (2) changes in wage, property and gross receipts tax rates have cross-base effects; (3) loss in tax revenues are partially

[26] A major effort by economists to build very highly disaggregated macroeconometric models was both launched and abandoned in the 1960s.
[27] As noted above, this analysis did not examine the net income portion of the business privilege tax. The TRC is also recommending that this tax be phased out and we believe the elimination of this tax is also likely to have supply side effects.

offset by growth in base resulting from tax reductions; and, (4) reductions in wage taxes significantly increase employment in the City of Philadelphia.

The three alternative scenarios, which employ comparable assumptions relating to the size of the tax reductions in 2004, indicate that the determination of the optimal tax structure is dependent upon the economic measure used for the comparison. Further, the cumulative revenue losses for each of the three scenarios depend upon whether we assume that assessments follow property values. If so, then in terms of revenue losses the gross receipts tax will have the greatest supply side effects. In fact, our model predicts that the elimination of the gross receipts tax will actually improve the City's revenue position over the long run due to the supply side effects. However, if the additional property tax revenue is not collected then the wage tax cut will have the lowest cumulative revenue loss. In terms of private income generated, the wage tax reduction generates about the same level of private income as the gross receipts tax and a much greater increase in private income than the property tax reduction. In terms of employment, the increase in jobs in the City will be higher from a wage tax reduction than from either a gross receipts or property tax reduction.

Our analysis of two key elements of the TRC's tentative proposals, the phasing out of the gross receipts tax and the phase in of wage tax reductions, result in significant wage and property tax base growth. This program is attractive because it combines the gross receipts tax cuts, which tend to have favorable revenue implications (assuming that the City real estate collections increase with property values) with wage tax reductions, which tend to have stronger income and employment impacts.

Our analysis of the gross receipts and wage tax reductions proposed by the TRC combined with the Rendell Plan for a New Pennsylvania indicates that this alternative would increase the size of the Philadelphia economy and increase the city's property values. This growth will increase City revenues so that wage taxes plus the state aid to the city will significantly exceed baseline revenue forecasts. Further, increases in property values would generate additional funds for both the City and School District without increasing tax rates. Finally, revenues generated via the business use and occupancy tax will grow proportionally to the increase in commercial property values assuming commercial assessments keep pace with market value.

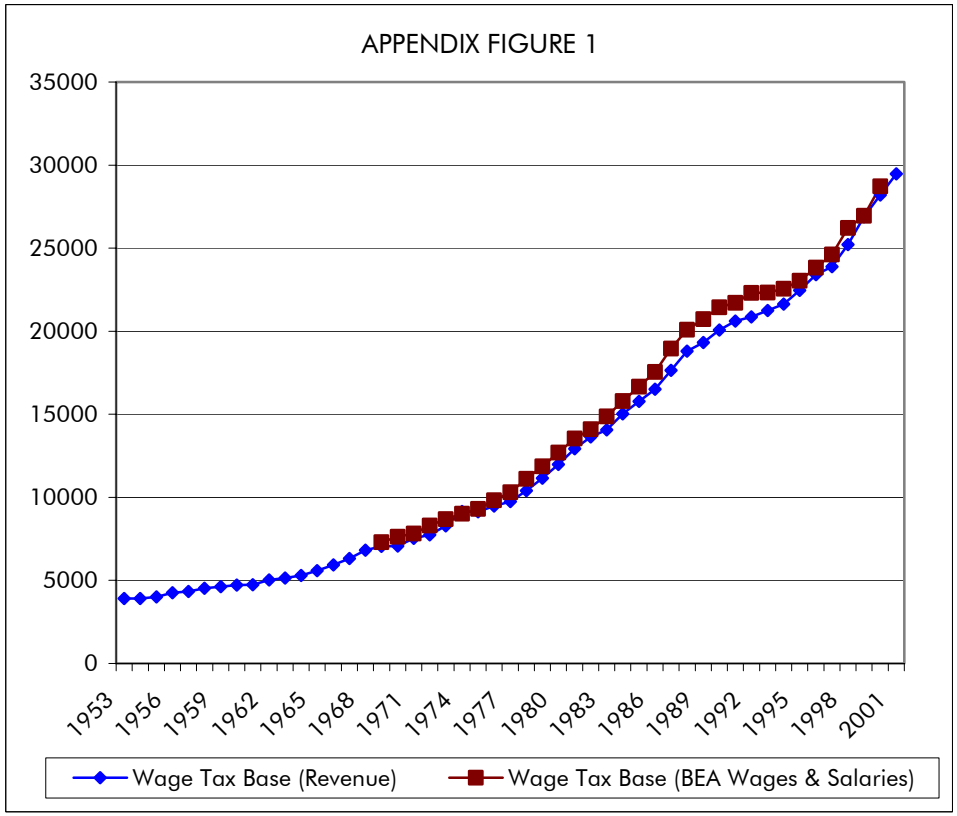
APPENDIX A. TAX BASE DATA

This appendix contains technical information regarding the tax base data used in our study.

A.1. Wage Tax Base

In our analysis, we use two sources to estimate the Philadelphia wage tax base. One measure of the wage tax base is computed using the annual wage tax revenue collected for the city. These data span the period from 1953 to 2002. The wage tax base is equal wage tax revenue divided by the wage tax rate in the same period. An alternative source for wage tax base is the BEA data on wages and salaries for the city of Philadelphia. This series includes only wages and salaries earned in the city of Philadelphia and therefore does not include the earnings of residents of the city who work outside the city. These data also cover a shorter period, starting in 1969 as opposed to 1953 for the revenue-based series and ending in 2001. The wage tax base derived from Philadelphia tax revenue as well as the BEA wages and salaries for Philadelphia (in first differences) are shown in Appendix Figure 1. Note that the two series are fairly closely related, with a correlation of 0.69 (in first differences).

APPENDIX FIGURE 1

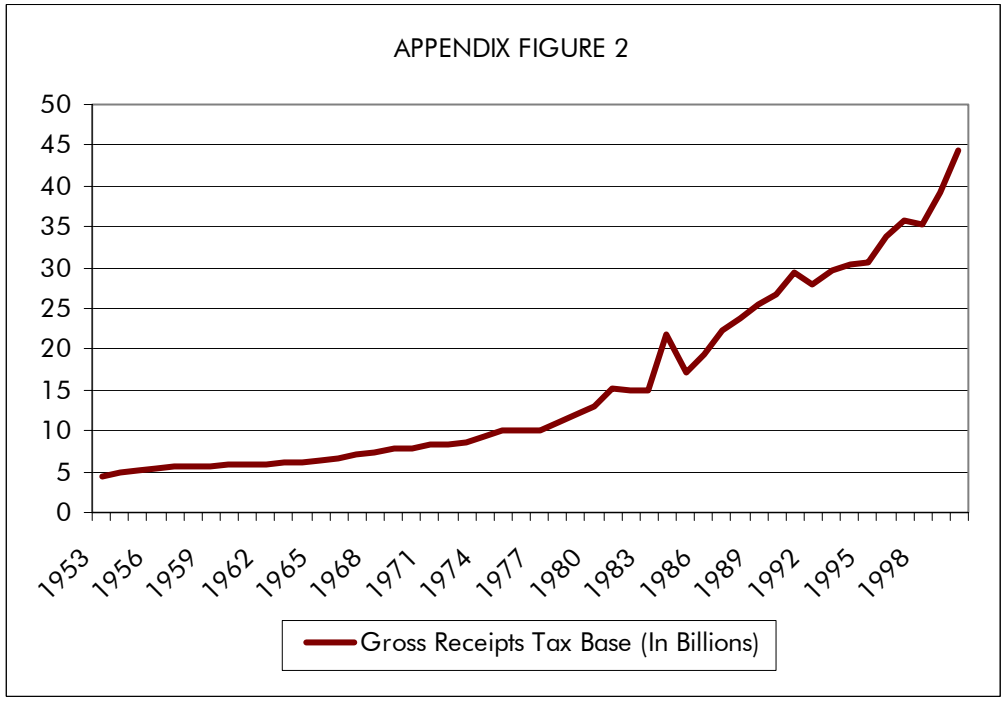


We have no strong theoretical grounds for choosing between estimates based on the revenue-derived series and those derived from the BEA data; each series has weaknesses. The revenue-derived series may reflect delayed payments, differential tax enforcement strategies, and negotiated tax settlements. For example, at the same time that wage taxes were lowered during the Rendell Administration, an aggressive effort was made to increase collections, especially from city residents working outside the city. The BEA series does not reflect wages of city residents who work outside the city, and the sample period covered is shorter. Note, however, that for much of the sample, collection of wage taxes of residents working outside the city was very lax, so that the series may not differ so much from the revenue-derived series in this regard. The BEA series also have the added advantage of being measured on a consistent basis through time.

A.2. Gross receipts tax base

The gross receipts tax base can be straightforwardly calculated using the revenues from the Mercantile License and gross receipts portion of the Business Privilege Taxes by dividing the revenues by the tax rates. Appendix Figure 2 shows the gross receipts tax base.

APPENDIX FIGURE 2



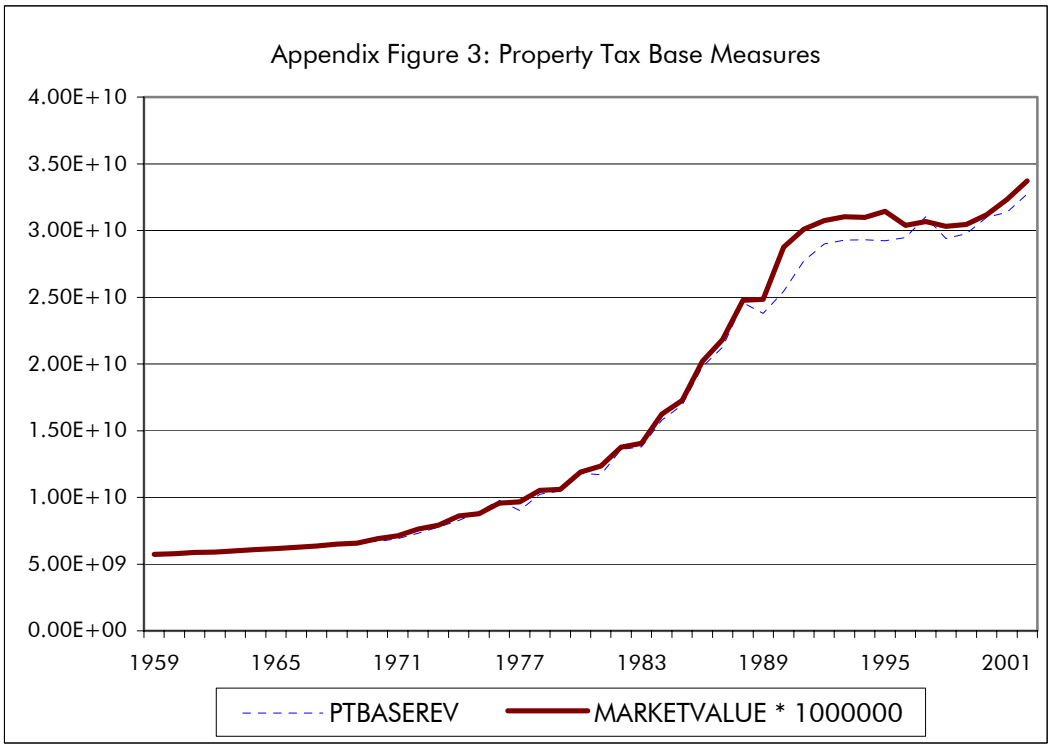
A.3. Net Income Tax Base

Unfortunately, it is not possible to compute a tax base using the data from the General Business Tax because we cannot directly link General Business Tax revenues to total net income in the city (returns reflect some component of gross receipts). Thus we can only construct a Net Income Tax Base for 1985 forward. Moreover, since there have been only a couple of changes in the rate (1986 and 1987) since its inception, there simply is not enough data to generate a statistical relationship between the tax and its base.

A.4. Property Tax Base

As with the wage tax base, we investigated two alternative ways of computing the property tax base. One measure of the property tax base is the assessed value of taxable properties in Philadelphia divided by the ratio of assessment to market value—which yields the market value of taxable properties. Another measure is based on actual property tax revenues divided by the effective property tax rate. The primary differences between this series and the assessment based series result from (1) failure of some owners to pay taxes and (2) delinquent payments by property owners. These base estimates, in first differences, are shown in Appendix Figure 3. The simple correlation between the two series is 0.77.

Appendix Figure 3: Property Tax Base Measures



APPENDIX B. MODEL SPECIFICATION

The basic structure of the City tax base and employment equations are as follows:

$$\Delta^k b_{j,t} = \alpha_{j,0} + \sum_0^M \alpha_{j,m} \Delta^k \tau_{w,t-m} + \sum_0^M \alpha_{j,M+m} \Delta^k \tau_{p,t-m} + \sum_0^M \alpha_{j,2M+m} \Delta^k \tau_{g,t-m} + \mu_t^j$$

where: $b_{j,t}$ is the base, expressed as a share of the national base of tax j at time t.

$j = (w, g, p, e)$

$\tau_{j,t-m}$ is the tax rate of tax j at time t-m

M is the number of lagged tax rates

Δ^k is the difference operator and k is the order of the difference.

$\alpha_{j,m}$ are the parameters of the effect of tax rates on tax base share.

$\mu_t^w, \mu_t^g, \mu_t^p, \mu_t^e$ are error terms for the wage, gross receipts, property base share and employment share equations, respectively.

There is a common structure across estimation models: each equation is normalized as a share of the national base or national employment; each equation is estimated in differences; and current and lagged values of own and other tax rates are included in each equation.

The relationships are estimated in either "first differences"or "second differences" (k=1 or 2) as is appropriate to ensure that the estimates do not reflect "spurious" correlation caused by "unit roots" in the data. A unit root process refers to a highly persistent time series process where the current value equals last period's value plus a disturbance. Inferences drawn about relationships among data series with unit roots are frequently misleading. In particular, data series with unit roots are

often correlated even if there is no underlying causal relationship between the variables. The degree of differencing that was used is that which was required to eliminate the unit roots in the variables.

An optimization routine was employed to determine the exact model specifications.[28] That is, the tax rate variables included in the base and employment equations, the lag structures and the error structures were determined through a specification search based on "goodness of fit"as measured by the adjusted R^2 and the lack of serial correlation as measured by the Breusch-Godfrey LM test statistic. The selected specifications for the different tax bases differ in lengths of lags, and inclusion of tax rates other than own rates depending on the information contained in the time series data.

[28] Because this process involved searching over many model specifications to achieve the "best" model, it could be argued that the traditional Ordinary Least Squares (OLS) measures of statistical significance are overstated. This concern, however, is partially mitigated in that the criteria for choosing models was unrelated to the statistical significance of the variables chosen.

APPENDIX C. ESTIMATION RESULTS

In this appendix we present the preferred statistical models used to generate the forecast simulations for the wage, property and gross receipts tax base shares and for the employment share.

C.1. Wage Tax Base Share

The wage tax base equation is based on the BEA's series on Philadelphia's wages and salaries.[29] The equation is estimated in second differences because the ADF test cannot reject the presence of a unit root in the first difference of the BEA-derived series. (See Appendix Table 1.) The estimation results which are presented in Appendix Table 2, reveal the following statistical relationships: (1) significant impacts of wage tax changes that take three years to be fully realized; (2) finds significant impacts of lagged property and gross receipts tax rates; (3) finds no evidence of a time trend. The constant in the second difference equation measures the rate of change in secular growth or decline. The coefficient on the intercept term is insignificant which indicates that the rate of decline is neither accelerating nor decelerating. We can compute the rate of secular decline implied by the first difference estimates by estimating a model in first differences, constraining all of the parameters of the estimation except the intercept to be equal to the those estimated in the second difference equation. That constrained estimation implies that the rate of secular share decline is –0.000208 each year.

The relationship between the BEA measure of tax base share and the tax rates indicate that the impact of a change in wage taxes has a statistically significant initial impact with a coefficient of -0.000307, as well as a statistically significant three period lag with a coefficient of -.000437.[30] The total impact of current and lagged changes is statistically significant. A 1.0 percentage point wage tax reduction would result in economic expansion that would increase base share 0.000744 or 12.8

[29] As we note in Appendix Section A.1., we have no strong theoretical grounds for choosing between estimates based on the revenue-derived series and those derived from the BEA data, and each series has its weaknesses. We have chosen to focus on the results obtained with the BEA data because they are bit more conservative in terms of the estimated sizes of the effects of changes in the wage tax and effective property tax rates.
[30] For all of the models, we experimented with inclusion of own and other tax rates, various lag lengths, and linear and non-linear time trends. The rule we followed in choosing models was to select the model with the highest adjusted R^2.

percent over four years. This is an increase in base of $3.8 billion. About 59 percent of that growth occurs after the first year.

In addition to wage tax rates, the gross receipts tax rate (with a lag of two years) and the property tax rate (with a lag of one year) significantly affects the wage tax base. The magnitude of the impact of a change in the gross receipts tax rate is such that reducing the gross receipts tax by 0.1 percentage points (a 37.7 percent reduction) results in an expansion of the wage tax base share of .0001109; this increases the wage tax base by 1.9 percent or $0.57 billion. Recall that the gross receipts tax is a much smaller tax, so that it is not surprising that a relatively large cut in this tax has a relatively modest impact on the extremely large wage tax base. A 1.0 percentage point reduction in the effective property tax rate (a 40 percent reduction in the 2003 rate) results in an expansion of the wage tax base of 5.4 percent or $1.6 billion.

C.2. Gross Receipts Tax Base Share

We provide estimates of the relationship between the gross receipts tax base share and tax rates for the period 1961 to 2001 in Appendix Table 3. In this regression only the gross receipts tax rate has a significant effect on the gross receipts tax base. Here, the coefficients on the current value and second lag of the gross receipts tax rate are jointly significant with a p-value of .018489. The effective property tax is also included in the equation but it is positive and insignificant. The negative and significant intercept term indicates that there is a secular downward trend in Philadelphia's share of national wages and salaries. The positive and significant trend term, however, indicates that the pace of the decline is decreasing. There are also dummy variables included for the years 1984, 1985 and 1986 to remove the substantial fluctuations in gross receipts revenues associated with the transition to the business privilege tax.

C.3. Property Tax Base Share

The property tax base share equations were based on the assessment measure of the property tax base. With this series, one cannot reject the hypothesis of a unit root in first differences but can reject unit roots in second differences. Appendix Table 4 displays the property tax base share equation.

In this model property tax rates, wage tax rates, and gross receipt tax rates all have significant, negative impacts on property value. In general, we expect relatively rapid capitalization of property tax changes. Contrary to expectation, the first lag of property tax changes has a positive coefficient, which while not significant, nearly offsets the initial impact. Subsequent lags have negative signs, with the second lag having a negative impact of greater magnitude than the current impact. Still, only the current and second lags are significant. The sum of current and lagged impacts is –000297 but are not statistically significant at the 5 percent level. This total impact implies that a 1.0 percentage point reduction in the effective property tax would raise property values by 16.97 percent or $5.58 billion. [31] Additionally, a one period lag of wage taxes has a negative and significant effect on property tax base shares, as does the first and third lag of the gross receipts tax. The coefficient on the first lag of wage tax rates of -.000178 implies that a 1.0 percentage point reduction in the wage taxes would increase property values by 10.2 percent or 3.3 billion after two years. The sum of the coefficients on the gross receipts tax is -0.1199. This summation implies that a 0.1 percent change in the gross receipts tax rate will increase property values by 6.85 percent or $2.25 billion over four years.

We use the estimates associated with assessment-derived property base, which generally display smaller base responses than those using a revenue-derived property tax base. As was the case with the revenue-derived wage tax base, the pattern of revenue collection reflects delinquent payments and missed property tax payments. The assessment-based measure does not have these problems. On the other hand, the pattern of capitalization shown in the revenue base share is more consistent with the commonly held notion that taxes are rapidly capitalized into value.

C.4. Summary of the Effects of Tax Rates on Tax Bases

Taken together, the wage base, gross receipts base, and property base equations provide strong evidence of significant, negative own base effects of tax rate changes. They also provide evidence of statistically and economically significant cross base effects, at least with respect to wage tax rates and gross receipts tax rates. Additionally, the models suggest a continuing downward trend in Philadelphia's share of the nation for each of its tax bases. These findings strongly suggest that there are large private gains associated with tax reductions in Philadelphia, which findings have important implications for the revenue gained or lost when the City changes tax rates.

[31] In 2003 the market value of Philadelphia property was $32.9 billion or 0.175 percent of the national total.

C.5. Effects of Tax Rates on City Employment Share

City tax rates have significant impacts on city employment. Appendix Table 5 presents the equation results showing the effect of tax rates on Philadelphia employment utilizing the BEA series on total full and part time employment. ADF unit root tests indicate that the hypothesis of a unit root cannot be rejected, even at the 10 percent confidence level for the first difference of this series. Therefore, the estimations are based on second differences. The results show that the wage tax rates have negative and statistically significant effects on Philadelphia's share of the nations jobs. Further, the effect of a change in wage tax rates persists for 4 or 5 years. The sum of the wage tax rate coefficients, -0.00049 implies that a 1.0 percentage point reduction in taxes would increase employment by 10.5 percent or 81.7 thousand jobs.[32] Also, the second and third lags of the gross receipts tax rate have negative and significant impacts on employment. The sum of the coefficients is -.06986, which implies that a 0.1 percentage point reduction in the gross receipt tax rate would result in an increase in employment of 1.5 percent or 11,655 jobs. The coefficients on the effective property tax rate are negative but not statistically significant at the 5 percent level. The coefficient indicates that a 1.0 percentage point decrease in the effective property tax rate would result in an increase in employment of 4 percent or 31,194 jobs over a two to three year period.

C.6. Conclusion

In this appendix we have presented estimates of the impacts of Philadelphia's tax structure as reflected in the composition and rates of taxes on the city's tax bases, tax revenues, and employment. We find consistent evidence that (1) reductions in tax rates expand the base of the particular tax being reduced; (2) changes in wage, property and gross receipts tax rates have cross-base effects; (3) loss in tax revenues are partially offset by growth in base resulting from tax reductions; and, (4) reductions in wage taxes significantly increase employment in Philadelphia.

[32] In 2000, Philadelphia had 777,001 jobs, which was 0.46 percent of national employment.

Table 1
Unit Root Tests: Augmented Dickey-Fuller

Variable	Levels	First Difference	Second Difference
Wage Tax Base Shares (BEA)	-2.705	-2.835	-5.474***
Property Tax Base Shares (Assessment Based)	-1.454	-1.849	-5.610***
Gross Receipts Tax Base Shares (Revenue Based)	-0.089	-6.838***	-11.413***
Employment Shares City (BEA)	-2.998	-2.383	-5.466***
Tax Rates			
Wage Tax	-0.266	-4.905***	-7.555***
Property Tax	-2.443	-4.361***	-6.521***
Gross Receipts Tax	-1.621	-6.443***	-8.946***

**Significant at the 10% level.*
*** Significant at the 5% level.*
**** Significant at the 1% level.*

Table 2
Wage Tax Base Equation
Dependent Variable – Base Share (BEA) 2nd Differences

Independent Variables	Coefficients	t - statistics	P - values
Intercept	-.00000391	0.424	.6755
Wage tax rate	-.000307	-3.12	.0050
Wage tax rate$_{t-3}$	-.000437	-4.54	.0002
Property tax rate$_{t-2}$	-.000313	-2.79	.0107
Gross receipts tax rate$_{t-2}$	-.110922	-3.16	.0003
AR(1)	-1.219230	-7.11	.0000
AR(2)	-0.513021	-3.16	.0046
Adjusted R^2	.349		
Included Observations	29		

Table 3
Gross Receipts Tax Base Equation
Dependent Variable – Base Share 1st Differences

Independent Variables	Coefficients	t - statistics	P - values
Intercept	-.000583	-5.74	.0000
Gross receipts tax rate	-.211767	-1.77	.0862
Gross receipts tax rate$_{t-2}$	-.123825	-1.99	.0551
Property tax rate$_{t-1}$	.000057	0.33	.7457
Time50	-.000013	-4.37	.0001
D84	.001169	4.77	.0000
D85	-.001839	-4.27	.0002
D86	.000449	1.85	.0740
Adjusted R^2	.745		
Included Observations	41		

Table 4
Property Tax Base Equation
Dependent Variable – Base Share (Assessment Value) 2nd Differences

Independent Variables	Coefficients	t - statistics	P - values
Intercept	.000004	0.36	.7208
Wage tax $rate_{t-1}$	-.000178	-4.15	.0003
Property tax rate	-.000202	-2.84	.0085
Property tax $rate_{t-1}$	.000146	1.39	.1770
Property tax $rate_{t-2}$	-.000231	-2.33	.0271
Property tax $rate_{t-3}$	-.000098	-1.33	.1921
Gross receipts tax $rate_{t-1}$	-0.05975	-3.32	.0024
Gross receipts tax $rate_{t-3}$	-.060186	-3.43	.0019
AR(2)	-.372154	-2.32	.0280
Adjusted R^2	.751		
Included Observations	36		

Table 5
Philadelphia Employment Equation
Dependent Variable – Employment Share (BEA) 2nd Differences

Independent Variables	Coefficients	t - statistics	P - values
Intercept	.000011	1.29	.2116
Wage tax rate	-.000141	-2.66	.0148
Wage tax $rate_{t-3}$	-.000167	-3.89	.0008
Wage tax $rate_{t-4}$	-.000180	-4.33	.0003
Property tax $rate_{t-1}$	-.000106	-1.79	.0887
Property tax $rate_{t-2}$	-.000080	-1.34	.1938
Gross receipts tax $rate_{t-2}$	-.049546	-4.14	.0005
Gross receipts tax $rate_{t-3}$	-.020313	-2.79	.0110
AR(1)	-0.16305	-1.03	.3126
Adjusted R^2	.565		
Included Observations	30		

APPENDIX D. SEPARATING IMPACTS OF RESIDENT AND NON-RESIDENT WAGE TAX RATES

We were unsuccessful in our attempt to determine whether the resident and non-resident wage tax rate affected the wage tax base differentially. The econometric models we tried to use in this analysis related Philadelphia's tax rates including the resident and non-resident wage tax to the wage tax base. The basic structure of the relationship was similar to that of the other tax base equations. That is:

$$\Delta^k b_{w,t} = \alpha_{j,0} + \sum_0^M \alpha_{j,m}\Delta^k \tau_{g,t-m} + \sum_0^M \alpha_{j,M+m}\Delta^k \tau_{p,t-m} + \sum_0^M \alpha_{j,2M+m}\Delta^k \tau_{wr,t-m} + \sum_0^M \alpha_{j,3M+m}\Delta^k \tau_{wn,t-m} + \mu_t^j$$

where: $b_{w,t}$ is the base, expressed as a share of the national base of tax j at time t.

$\tau_{j,t-m}$ is the tax rate of tax j at time t-m $j = (g, p, wr, wn)$

M is the number of lagged tax rates

Δ^k is the difference operator and k is the order of the difference.

$\alpha_{j,m}$ are the parameters of the effect of tax rates on tax base share.

μ_t^w are error terms for the wage base share equation.

As in the other base equations, the tax base is normalized as a share of the national base, the model is estimated in differences, and current and lagged values of the tax rates are included in the equation. As before, the local share of the nation's tax base was employed because Philadelphia is effectively competing nationally, and its share of the nation is an appropriate indicator of its relative growth and success. This specification also controls for national trends in growth and inflation. It should be noted that the wage tax base includes the wages of residents and non-residents.

The Commission attempted to collect data on tax revenues from residents and non-residents, but these data were only available from 1993 to 2001, which is insufficient to estimate a separate regression. Thus, while we believe that this issue is of considerable importance, it is not currently possible to separately estimate the differential impacts of a change in the

two rates on the two bases. We did try, however to measure separate impacts of the resident and non-resident wage tax rates on the aggregate wage tax base using the same methods we applied to the other tax base models in the report.

Our estimation results were nearly impossible to interpret because of a statistical problem known as multicollinearity. Multicollinearity arises when two or more variables, in this case the resident and non-resident wage tax rates, are highly but not perfectly correlated with each other. If two variables are related in this manner, then it will be possible to obtain least squares estimates of the regression coefficients, but the interpretation will be difficult because the coefficient is interpreted to mean the change in the base given a change in the one wage tax rate assuming that the other tax rate is unchanged. However, except for one occurrence, any time the resident wage tax rate changes, the non-resident wage tax rate changes in the same direction as well. Thus, there is very little evidence in the sample to give one confidence about the interpretation of the resident or non-resident wage tax rate coefficients.

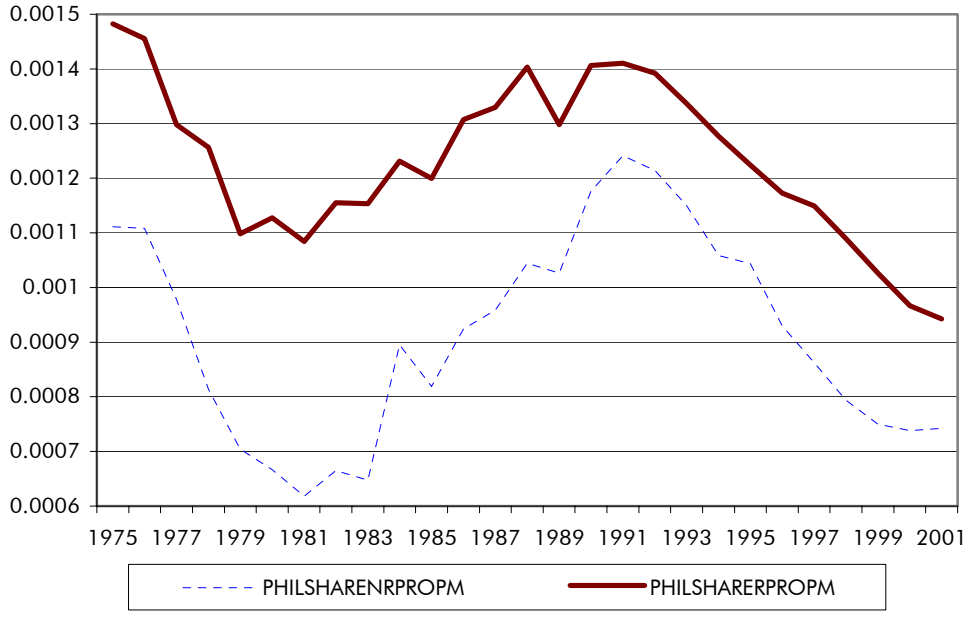
APPENDIX E. IMPACTS ON THE RESIDENTIAL AND NONRESIDENTIAL PROPERTY TAX BASES

The purpose of this section is to extend the analysis regarding the impact of Philadelphia's tax rates on the property tax base by investigating how changes in the city's tax structure have impacted property values for commercial and residential property. We want to see whether a change in taxes has a differential impact across land use categories. In particular, this analysis is centered on estimating the statistical relationship between changes in the City's wage, gross receipts, and property tax rates on the value of residential and nonresidential property relative to the value of U.S. residential and commercial structures.

E.1. Trends in Real Property Values

Residential and nonresidential property values in Philadelphia have had a similar pattern of change over the last three decades. Both series fell substantially in the mid to late 1970s, rose through the 1980s and fell through most of the 1990s. Appendix Figure 4 displays Philadelphia's share of national real estate value for residential properties (PhilshareRpropm) and nonresidential property values (PhilshareNRpropm) since 1975.

Appendix Figure 4: Philadelphia Share of National Real Estate: Residential and Nonresidential



E.2. Approach and Methodology

The econometric models used in this analysis were similar to that of the aggregate property tax base analysis. The basic structure of the City residential and commercial tax base equations are as follows:

$$\Delta^k b_{j,t} = \alpha_{j,0} + \sum_0^M \alpha_{j,m}\Delta^k \tau_{w,t-m} + \sum_0^M \alpha_{j,M+m}\Delta^k \tau_{p,t-m} + \sum_0^M \alpha_{j,2M+m}\Delta^k \tau_{g,t-m} + \mu_t^j$$

where: $b_{j,t}$ is the base, expressed as a share of the national base of tax j at time t.

$j = (r,c)$; r and c denote residential and non-residential

$\tau_{j,t-m}$ is the tax rate of tax j at time t-m

M is the number of lagged tax rates

Δ^k is the difference operator and k is the order of the difference.

$\alpha_{j,m}$ are the parameters of the effect of tax rates on tax base share.

μ_t^r, μ_t^c are error terms for the residential and commercial property base share equations, respectively.

As with the aggregate property equations, each tax base is normalized as a share of the national base; each equation is estimated in differences; and current and lagged values of own and other tax rates are included in each equation. The models are estimated in second differences to ensure that the estimates do not reflect "spurious" correlation caused by unit roots in the data. An optimization routine was employed to determine the exact model specifications.[33] That is, the tax rate variables included in the base and employment equations as well as the "optimal" lag and error structures were determined through a specification search based on "goodness of fit" as measured by the adjusted R^2 and the lack of serial correlation

[33] Because this process involved searching over many model specifications to achieve the "best" model, it could be argued that the traditional Ordinary Least Squares (OLS) measures of statistical significance are overstated. This concern, however, is partially mitigated in that the criteria for choosing models was unrelated to the statistical significance of the variables chosen.

as measured by the Breusch-Godfrey LM test statistic.[34] As with our previous analysis, this approach was employed to minimize the effect of political beliefs or preconceptions about the structure of the regional economy and the impact of taxes. This model specification process means that the actual estimations differ in lengths of lags, and inclusion of tax rates other than own rates depending on the information contained in the time series data.

In conducting our analysis, we employed annual data for the period 1975-2001 obtained from the City Department of Revenue It should be noted that the State Tax Equalization Board's annual series relating assessed value to market value (the STEB rate) was the same for commercial and residential property.

E.3. Results

The results of the estimation are reported in Appendix Table 6 below. The second column describes the ARIMA process that was used to make the data stationary and properly account for serial correlation. The adjusted R^2 for the selected model is reported in column 3. The data in columns 4 indicate whether or not the relationship between changes in the wage tax were positively or negatively related to the city's share of US employment. In accord with the model specification, tests were run on the joint significance of two or more lags on the Wage, Property, and gross receipts portion of the Business Privilege Tax. The p-value, or the probability that the coefficient(s) on the Wage Tax variable is zero, is reported in column 5.[35] The remaining columns show similar test statistics for the Property and Gross Receipts taxes, respectively.

[34] Serial correlation occurs when the error term is correlated with its own past. If serial correlation is detected, the usual measures of the statistical significance of OLS estimates are no longer valid. In addition, serial correlation often indicates serious misspecification of the econometric model.
[35] In the event that model 2 was selected we used the Wald Test to assign a p-value to the combination of the first and second lag on the wage tax variable.

Appendix Table 6: Estimation Results for Residential and Commercial Property								
Dependent Variable	ARIMA process	Adjusted R^2	Wage Tax		Property Tax		Gross Receipts Tax	
			Sign	p-value	Sign	p-value	Sign	p-value
Residential Value	(0,2,0)	0.83	-	<.001	+	0.29	-	<.001
Commercial Value	(2,2,0)	0.75	-	<.001	-	.004	-	.0043

The data suggest that the Wage Tax and Gross Receipts Tax had a negative and highly significant impact on the real residential property values in Philadelphia over the last three decades. Changes in the Property Tax displayed a positive relationship with residential values; however, with a p-value of 0.29, this was not statistically significant. On balance, the model's goodness of fit, as measured by the adjusted R^2 performed quite well. Nearly 83 percent of the variance in residential property value share was explained by the variance in the independent variables.

The situation was similar for commercial property values, except that property tax rates negatively affected nonresidential values. In the commercial property model, the wage property and gross receipts tax rates all had a negative and statistically significant impact on commercial property share.

The results of the residential and commercial property tax analysis indicate that the effect of a change in the wage tax is larger for the commercial property share whereas it is somewhat smaller for the gross receipts tax. In fact our estimates suggest that the impact of wage tax changes on nonresidential property is more than double the impacts on residential property. The differential effect of the property tax rate suggests that an increase in the property tax rate may be amortized into commercial property values more quickly than into residential property values. Gross receipts tax rates, on the other hand, have slightly larger impacts on residential property values than on non-residential values.

The differences in the measured impacts of taxes on residential and commercial values could alternatively be related to the assessment process. If the assessment practices vary for residential and non-residential property, these practices will impact the effective property tax rate, which is used in the analysis. This in turn could affect the magnitude of our estimated relationships.

E.4. Summary

Wage tax and gross receipts tax rates are both negatively and significantly related to Philadelphia's residential and commercial property markets. While the estimated impacts of gross receipts is roughly similar in magnitude for residential and commercial property, the impacts of wage tax rates appear to have significantly larger effects on non-residential values.

APPENDIX F. EVALUATING THE IMPACT OF THE CITY'S TAX STRUCTURE ON EMPLOYMENT: AN INDUSTRIAL VIEW

Earlier sections of this report provided an investigation of the statistical relationship between Philadelphia City's tax structure and the associated tax bases and revenue collections. Through various simulations it was found that reducing the City's wage and gross receipts taxes would have a positive and statistically significant impact on economic activity in the City of Philadelphia. The purpose of this appendix is to extend this analysis by investigating how changes in the City's tax structure have impacted different industry segments. In particular, this analysis is centered on estimating the statistical relationship between changes in the City's wage, gross receipts, and property tax rates on the City's share of US employment for the six major private sector industry divisions. Emphasis was placed on identifying local industry segments that lost ground as a result of the City's tax structure.

F.1. Philadelphia City Industrial Employment

To put this analysis in context it is instructive to understand how industrial employment is distributed in the City of Philadelphia and how it has changed over time. Appendix Table 7 shows how City employment is distributed across the major industrial sectors. Services is by far the largest industrial sector, accounting for nearly 45 percent of total City employment. The data also show that the City is heavily concentrated in government and retail trade.

Appendix Table 7. 2001 Philadelphia City Employment Distribution

Total Nonfarm employment	784,448	100.0%
Construction	18,130	2.3%
Manufacturing	57,614	7.3%
Transportation & public utilities	38,050	4.9%
Trade	131,061	16.7%
Finance, insurance, and real estate	60,902	7.8%
Services	352,353	44.9%
Government	124,486	15.9%

Appendix Table 8 highlights the longstanding and broad based decline in city employment relative to the US as a whole over the last few decades. The data show precipitous drops in the City's share of US employment between 1970 and 2000 in each of the 8 major non-farm industrial sectors. For example, more than 1 out of every 83 (1.2 percent) US manufacturing jobs was located in the City of Philadelphia in 1970. By, 2000 the City had only 1 out of every 333 (0.3 percent) US manufacturing jobs. The remainder of this appendix focuses on understanding whether or not the City's tax structure contributed to this decline.

Appendix Table 8. Philadelphia City's Share of US Employment by Industry

Industry	1970 Share	2000 Share
Construction	0.91%	0.19%
Manufacturing	1.2%	0.30%
Transportation & Public Utilities	1.4%	0.46%
Trade	1.2%	0.38%
Finance, Insurance, & Real Estate	1.4%	0.46%
Services	1.4%	0.66%
Government	1.2%	0.47%

F.2. Estimation Methodology

We made use of ordinary least squares regression techniques to estimate the statistical relationship between the City's share of US employment and changes in the local tax structure. Each industry was evaluated in a two-step process.

Before any modeling was initiated, we conducted unit root tests for each of the variables used in the models. A unit root process refers to a highly persistent time series process where the current value equals last period's value plus a disturbance. Inferences drawn about relationships among data series with unit roots are frequently misleading. In

particular, data series with unit roots are often correlated even if there is no underlying causal relationship between the variables. The degree of differencing that was used is that which eliminated the unit roots in the variables. This determined the order of integration, or the degree of differencing that was necessary to make the data stationary before estimation.

We used the model selection criteria described in Appendix B to select preferred statistical models for our estimates of tax impacts by sector. In particular, we made use of annual employment data for the period 1969-2001 obtained from the Bureau of Economic Analysis to estimate models of the form:

$$\Delta^k e_{j,t} = \alpha_{j,0} + \sum_0^M \alpha_{j,m} \Delta^k \tau_{w,t-m} + \sum_0^M \alpha_{j,M+m} \Delta^k \tau_{p,t-m} + \sum_0^M \alpha_{j,2M+m} \Delta^k \tau_{g,t-m} + \mu_t^i$$

where: $e_{i,t}$ is employment of industry i, expressed as a share of national employment at time t.

j denotes the tax rate where j = (w, g, p)

$\tau_{j,t-m}$ is the tax rate of tax j at time t-m

M is the number of lagged tax rates

Δ^k is the difference operator and k is the order of the difference.

$\alpha_{j,m}$ are the parameters of the effect of tax rates on tax base share.

μ_t^i is the error term for industry i.

The optimal degree of differencing was determined through unit root testing as described above. The choice of included current and lagged tax rate changes was based on the following selection criteria: maximize the model fit as reflected in the Rbar^2 subject to the constraint that the error term was effectively white noise.

The outcome variable used in the analysis, JOBSHARE, reflects the Philadelphia's share of US employment for the *i*th industry at time *t*. It is important to note that City employment is expressed as a share of national employment to control for any broad-based structural change that has taken place in the industry. The list of independent variables included the

Wage, Property, and Gross Receipts tax. To allow for a reasonable period of time for the labor market to adjust to changes in the tax rates all independent variables have been entered with up to three lags.

F.3. Regression Results

The results of the estimation are reported in Appendix Table 9 below. The first column shows the industry under consideration. Column 2 presents the adjusted R^2 for the selected model. The data in columns 3 indicate whether or not the relationship between changes in the wage tax were positively or negatively related to the city's share of US employment. The p-value, or the probability that the coefficient(s) on the Wage Tax variable is zero, is reported in column 4. The remaining columns show similar test statistics for the Property and Gross Receipts taxes, respectively.

Appendix Table 9. Industry Model Specification and Regression Results

Industry	Adjusted R^2	Wage Tax		Property Tax		Gross Receipts Tax	
		Sign	p-value	Sign	p-value	Sign	p-value
Construction	.45	+	.007	-	.51	+	.001
Manufacturing	.17	-	.001	+	.30	-	.006
TPU	.81	-	.001	+	.001	-	.001
Trade	.30	+	.08	-	.001	+	.01
FIRE	.72	-	.83	-	.45	-	.001
Services	.42	-	.007	+	.04	-	.002

On balance the results are consistent with findings presented in earlier work completed by Econsult. In many cases, changes in the Wage and Gross Receipts Tax generally were inversely related to changes in the city's share of employment. These sectors accounted for over 75 percent of the city's private employment.[36] Somewhat surprisingly, for three sectors changes in the property tax rate were positively related to changes in the share of the sector's employment. Two of three of those cases were statistically significant. A summary of findings are presented below:

- The city's share of U.S. employment in four of the six industry divisions displayed an inverse relationship to changes in the wage and gross receipts tax rate. In three of the four cases this relationship was statistically significant for the impact of the wage tax rate. The relationship between gross receipts tax rates and tax bases is always significant for these sectors.

- The largest sector, services, was significantly and negatively affected by both the Wage Tax and Gross Receipts Tax.

- Trade, a distant second in terms of size, yields results contrary to expectation with regard to Wage Tax and Gross Receipts Tax. One explanation is that these jobs are relatively lower wage and the increase in jobs in these sectors is arising from a shift to services from jobs in other sectors.

- The sign on the Property Tax coefficient was negative in only 3 of 6 cases. For those sectors with a positive relationship, the coefficient was statistically significant for two of the industries: Transportation and Public Utilities and Services. The only other significant coefficient on property taxes was a negative and significant coefficient for the Trade sector. This might reflect the fact that trade sector is land intensive and real estate related.

- The overall fit of the models, as measured by the adjusted R^2, varied considerably, from a low of 0.17 in the Manufacturing sector to a high of 0.81 in the Transportation and Public Utilities sector. Low adjusted R^2 implies that there is a lot of variation in employment that is unrelated to tax changes.

- Arguably, the FIRE sector is among the most mobile. The high adjusted R^2 in the FIRE sector is consistent with the expectation that taxes should matter in highly mobile sectors.

[36] We did not estimate an equation for the effects of taxation on government employment.

F.4. Summary

The findings of the industry level employment analysis are broadly consistent with the findings for the relationship between employment and city tax rates. For sectors containing over 75 percent of the city's private employment, wage and gross receipts tax rates are found to have negative impacts on jobs.

APPENDIX G. INCORPORATING CHANGES IN CITY SERVICES AND CRIME

One concern that has been expressed in response to earlier versions of this report is that we had failed to account for the possible impacts of changes in City services that might be associated with changes in tax rates. The dominant view among policy analysts regarding the effect of inter-jurisdictional differences in taxes and services is that business, population and property values decline in areas offering an unattractive mix of taxes and services. Most studies, which attempt to relate investment or location behavior to taxation, neglect the benefits derived from the services provided via city expenditures. In this appendix we discuss our attempts to address this issue by incorporating measures of the level and quality of city services into the estimated tax base models discussed in the earlier sections of this report. Our goal is twofold: to determine whether such factors have statistically significant impacts and to see if their inclusion alters the estimated relationships among the city tax rates and the levels of economic activity.

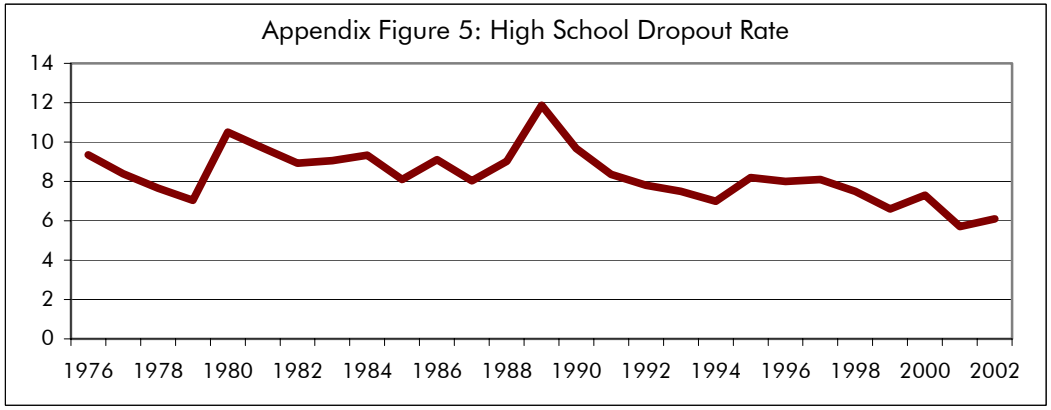
It should be noted that our data and methodology may be inadequate to accurately capture the impact of an increase in the level or quality of City services. First, the relevant service data are measures of services as they are valued by city residents and businesses. Most service level measures are actually service input measures—how much is spent on services or how many people are employed delivering services. Input measures of services neglect the fundamental importance of how efficiently the inputs are used and how the services are valued by residents. In addition, while the framework that Econsult has employed is good for capturing impacts of discrete changes such as changes in tax rates, it may be inadequate for capturing the impacts of long run trend changes in factors such as school quality. Thus, even though our statistical results, which are described below, do not indicate clear impacts of services on tax bases, it is highly likely that public services are important for the economic health of the city as well as the health of its tax bases.

G.1. City Services Data

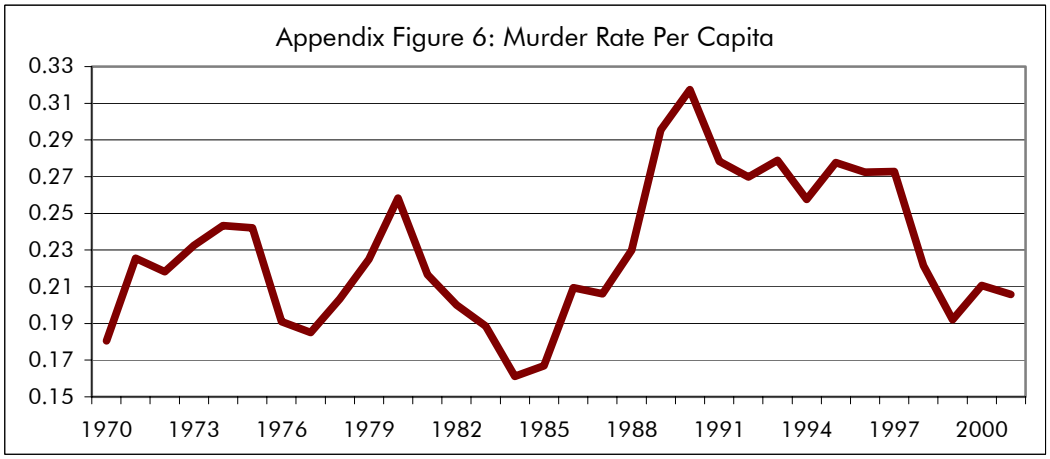
The data available for use in this analysis include the high school dropout rate, the number of murders per capita and the share of city employees providing non-dependent services. In theory, the inclusion of these measures into our analysis could result in more accurate estimates of the impacts of changes in tax rates on tax bases. This analysis could add to our understanding of the economic impact of public services and safety in the location of economic activity. It should be noted that it is not clear that the data and the modeling strategy are of sufficient quality to achieve this goal. For example,

increases in city employment in non-dependent services such as police, fire and recreation may, or may not indicate improvements in service levels since it depends upon productivity.

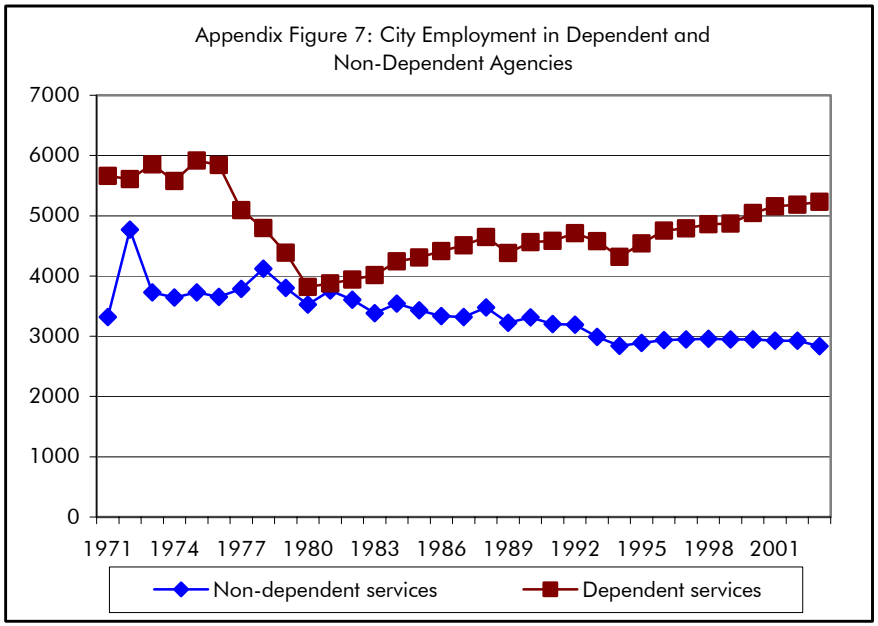
The high school dropout rate is a measure of the success of the public school system. We would expect that reductions in the high school dropout rate should imply improving schools. Thus we would expect the changes in the high school dropout rate to be negatively related to changes in Philadelphia's tax bases. This variable is displayed in Appendix Figure 5.



Another variable that we examined was crime. Because of the inadequacy of crime data in the city, we relied on the murder rate per capita, since murders are accurately counted. As is the case with the high school dropout rate, we expect higher crime (which we assumed to be correlated with murders) to impose higher costs on businesses and lower the quality of life of residents. We expect, therefore, that changes in the murder rate would be negatively related to Philadelphia's tax bases. The murder rate per capita is shown in Appendix Figure 6.



Appendix Figure 7 shows the number of workers employed by the city who work for dependent and non-dependent agencies. The city functions included in dependent employment are: Health, Philadelphia General Hospital, Welfare, Riverview, Youth Study Center, Prisons and the Office of the Homeless. Non-dependent employment includes such functions as police, fire, recreation and the library. The graph also shows that over the last two decades employment in dependent services has been rising whereas employment in non-dependent services has been slowly decreasing at the rate of 0.3 percent per year, which results in the number of jobs falling from 23,155 in 1980 to 21,537 jobs in 2003. Employment in non-dependent services is considered a proxy for the level of services, which are being provided to city residents and businesses that affect location decisions.



G.2. Approach and Methodology

This analysis of the impact of changes in the level and quality of city services was conducted by including each of the three measures of services into the optimal tax base equations. We examined the impacts of one and two period lags for each variable. That is we allowed the changes in services to take up to two years to have an impact on the tax bases. Each of the factors was included sequentially to avoid problems related to multicollinearity. As with the other relationships, regression analysis was used to estimate the statistical relationship between the city's wage, property and gross receipts tax base and tax rates and services.

G.3. Regression Results

In general, inclusion of the service variables into our equations did not yield statistically significant impacts of the services. Frequently, the sign of measured impact was not the expected sign. It is our belief that the lack of significance of service variables, and the fact that the estimations often yielded signs that were not consistent with businesses and residents valuing education and public safety reflects inadequacy of the data more than anything else.

The results of the estimation are summarized in Appendix Table 10 below. The estimates shown are for models with only a single lag—two lags did not improve the results. The first column shows the variable included in the equation. Column 2 and 3 then show the sign and p-value for the variables included in the gross receipts tax base equation. The sign shows the direction of the relationship. That is a positive relationship indicates that the tax base share increases if the variable in question increases. To recap, we expect a negative sign for both the dropout rate and murder rate and a positive sign on the fraction of city employees delivering nondependent services. The p-value indicates whether the relationship is statistically significant (p-value < .05). Column 4 and 5 show the results for the property tax base and Columns 6 and 7 for the wage tax base.

Appendix Table 10: Estimation Results for Services Variables in the Tax Base Equations

Variable	Gross Receipts Tax		Property Tax		Wage Tax	
Dropout Rate	+	.63	+	.19	-	.58
Murders per Capita	+	.14	+	.34	-	.79
Share Non-dependent Employment	+	.10	+	.27	-	.37

The table shows that none of the variables were statistically significant in any of the tax base equations. Further, the sign of the estimated relationship was wrong for 5 of the nine estimations. The sign of share of employment in nondependent services was as expected in the gross receipts and property base estimations while the sign on the murder rate per capita was correct in the wage equation. In general, the addition of these service variables does not help explain the movements in Philadelphia's tax base. These results do not imply, however, that services are unimportant since it could be due to a variety of causes as discussed above.

One key finding of our services analysis is that their inclusion into our models do not qualitatively alter the estimated impacts of changes in tax rates. While we do not believe that this particular set of service data improves the estimations, for information purposes, we report the range of differences in the measured impacts of changes in wage and gross receipts taxes on tax bases. For the impacts of changes in wage tax rates, the equations that include service variables results in own base impacts of wage tax changes that are between 5 and 18 percent smaller than those of our optimal equation. The impacts of wage tax rate changes on property are considerably larger---more than double—those of our optimal equations.

For gross receipts tax changes, the own-base measured impacts range from 20 percent lower to 35 percent higher than our preferred equations. The effect of gross-receipts tax changes on the wage base ranges from 21 percent lower to 4 percent lower than our preferred equations. Finally, the effects of the gross receipts tax on the property base range from 20 percent lower to 20 percent higher than the preferred equations. In general, the coefficients change little from the estimates without services. We prefer, however, the estimates without services included, because the service variables are generally insignificant and often inconsistent with economic theory.

G.4. Summary

The services variables included in the tax base shares equations were not found to be statistically significant. Further, their inclusion did not change the results of our analysis of tax impacts. Even though our statistical results do not indicate clear impacts of services on tax bases, it is highly likely that public services are important for the economic health of the city as well as the health of its tax bases. We do not view these results as conclusive regarding the impact of city services but rather as indicative of the need to collect additional data and possibly to consider alternative methodologies that may be more appropriate for determining the impact of city services.

APPENDIX X. BIBLIOGRAPHY

Adams, Charles, H. Fleeter, Y. Kim, M. Freeman, and I. Cho. (1996) "Flight from Blight and Metropolitan Suburbanization Revisited," Urban Affairs Review, Vol. 31, March, pp. 529-543.

Haughwout, Andrew F. (1997) "Central City Infrastructure Investment and Suburban House Values," *Regional Science and Urban Economics*, Vol. 27, No. 2, pp. 199-216.

Haughwout, Andrew F. (2002) "Should Suburbs Help Their Central City?," *Brookings-Wharton Papers on Urban Affairs 2002*, William G. Gale and Janet Rothenberg Pack, Eds., Washington D.C: Brookings Institution Press.

Haughwout, Andrew F., Robert P. Inman (2001) "Fiscal Policies in Open Cities with Firms and Households," *Regional Science and Urban Economics*, Vol. 31, pp. 147-80.

Haughwout, Andrew F. Robert P. Inman, Steven Craig, Thomas Luce (2000) "Local Revenue Hills: A General Equilibrium Specification with Evidence from Four U.S. Cities," National Bureau of Economic Research Working Paper #7603.

Ihlanfeldt, Keith R. (1995) "The Importance of the Central City to the Regional and National Economy: A Review of the Arguments and Empirical Evidence," *Cityscape: A Journal of Policy Development and Research*, 1(2), pp. 125-150

Inman, Robert P. (1992) "Can Philadelphia Escape Its Fiscal Crisis with Another Tax Increase?" *Business Review*, Federal Reserve Bank of Philadelphia, September/October, 1992.

Inman, Robert P. (1998) "Local Taxes and the Economic Future of Philadelphia: 1998 Report," Testimony prepared for the City of Philadelphia.

Inman, Robert P. (2002) "Local Taxes and the Economic Future of Philadelphia: 2002 Report," Testimony prepared for the City of Philadelphia.

McGuire, Therese, Mark, Steven T., Papke, Leslie E. (2000) "The Influence of Taxes on Employment and Population Growth: Evidence from the Washington D.C. Metropolitan Area," *National Tax Journal*, Vol. LIII, No. 1, March.

Voith, Richard P. (1999) "The Suburban Housing Market: Effects of City and Suburban Employment Growth," *Real Estate Economics*, Vol. 27. pp. 621-648.

Voith, Richard P. (1998) "Do Suburbs Need Cities?" *Journal of Regional Science*, Vol. 38, pp. 445-64.

Voith, Richard P. (1993) "Changing Capitalization of CBD-Oriented Transportation Systems: Evidence from Philadelphia," *Journal of Urban Economics*, Vol. 33, pp. 361-76.

Voith, Richard P. (1992) "City and Suburban Growth: Substitutes or Complements?" *Business Review*, Federal Reserve Bank of Philadelphia, September/October.

Wasylenko, Michael. (1997) "Taxation and Economic Development: The State of the Economic Literature," *New England Economic Review*, March/April, pp. 37-52.