City of Toledo
Payroll Tax Revenue

Annual Budget Projections and Long-term Trends

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Executive Summary

Each year the City of Toledo faces problems determining how much money will be available for the next year and when that money will be available. Over the years, revenue projections have provided City Council with the foundation for meeting demands for expenditures within Toledo. The city's stabilization fund serves as an adjustment for overpredictions or underpredictions of revenue from year to year. Perfect predictions of revenue are impossible, but errors can be contained within manageable levels to achieve reasonable budgeting processes for an unknown future environment.

This report highlights long-term forces that influence revenue trends and future prospects. Section 1 compares Toledo's tax revenues to those of other large cities in Ohio and to other areas in Northwest Ohio. The section presents factors that influence long-term prospects for the City of Toledo, including employment and construction trends and the relatively rapid growth of suburbs. Section 2 reviews trends and changes in quarterly tax withholdings from 1986 to 1999 and outlines dynamic procedures for projecting tax revenue for the next calendar year. Section 3 lists recommendations based on analyses of long-term trends and short-run change in the City's tax revenue.

The analysis of **long-term trends** generated the following findings:

- The City of Toledo's tax withholdings grew 3.2% per year from 1986 to 1999, but grew 4.2% per year since 1991. The suburbs surrounding Toledo, especially those with available land for development, experienced more rapid growth of tax revenues -- roughly double the rate of the City of Toledo.

- Toledo has benefited from growth that has outpaced inflation since 1991. The challenge that Toledo faces is how to better deal with the longer term trend that shows growth at more rapid rates in less developed suburban communities while Toledo's population remains constant or declining.

- Toledo is for the most part "built-out," and this has affected residential construction within the City. Residential construction rose during the 1990's, but the City's portion of such construction in the metropolitan region is now just about one-half its 1980 share.

The analysis of **short-run dynamics** generated these findings.

- Forecasting tax revenue is straightforward but complex. The Department of Finance must predict the third and fourth quarters of the current year and then forecast the entire next calendar year.

- Statistical analyses reveal **seasonal, cyclical, and trend** influences on quarterly tax revenue. Our **Dynamic Quarterly Forecast (DQF)** technique accounts for each of these influences on the City's tax revenues.

- The national recession of 1990-1991 was a major external force that pulled revenue below its trend during the 1990's. A key local leading indicator that helps to predict changes in tax revenue is initial claims for unemployment insurance. The DQF uses that indicator to predict cyclical changes in the City's quarterly tax revenue.

- The DQF technique generated quarterly forecasts for the current year with a mean absolute percent error of 1.5% for the ten-year period covering 1989 to 1999. That is a $1.6 million average difference between actual tax withholdings and DQF predictions. Annually, during the 1990's, the forecasting errors averaged 4.2%.

- Forecasting errors from DQF are relatively small and appear manageable for a municipal budgeting process with a stabilization fund (such as Toledo). The dynamics of the DQF can update trend, cyclical, and seasonal estimates with new data available during budget preparation each year.

Based on these findings, we **recommend** the following for the City of Toledo.

- Use DQF for short-term forecasts of tax revenue. Updates of the model with new data will improve forecasting and budgeting each year. These updates include revisions of the seasonal, cyclical, and trend estimates, along with those for the leading Toledo indicators.

- The City needs to monitor trends in employment, firm, and industry shifts for Toledo and Northwest Ohio using ES-202 data.

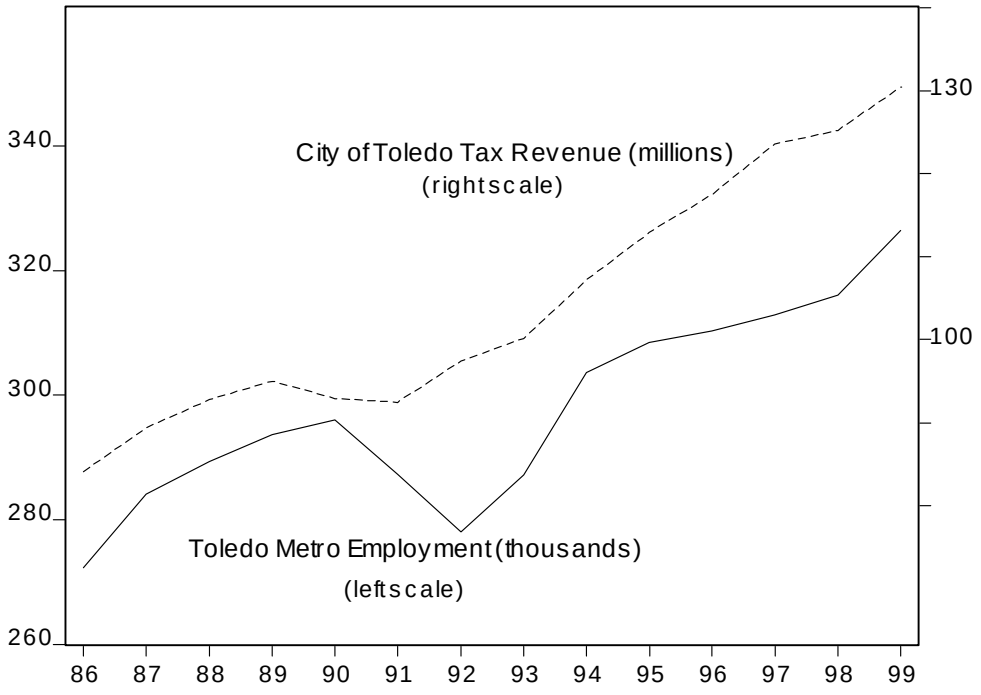
- The City needs to develop a strategy to deal with the long-term factors affecting its tax base. Key issues requiring attention are the employment base, business environment, housing, and new residents.

- The City should explore a political alliance with other central cities in Ohio that are subject to the same long-term forces affecting growth of tax revenue.

Section 1
Long-term Trends

The City of Toledo is located in the center of rapidly growing communities. Growth in the Toledo metropolitan area (MSA) was relatively strong during the 1990's; the large central city grew more slowly. Note the upward trend in the City of Toledo's withholdings of taxes from 1986 to 1999 in Figure 1. The trend in withholdings is similar to that of employment in the three-county (Lucas, Wood, and Fulton) Toledo metro area. The growth rates differ, however. Income tax withholdings grew at 3.2% per year while employment in the Toledo MSA rose at 1.1% per year.

Figure 1
City Tax Revenue Withholdings and Metropolitan Employment



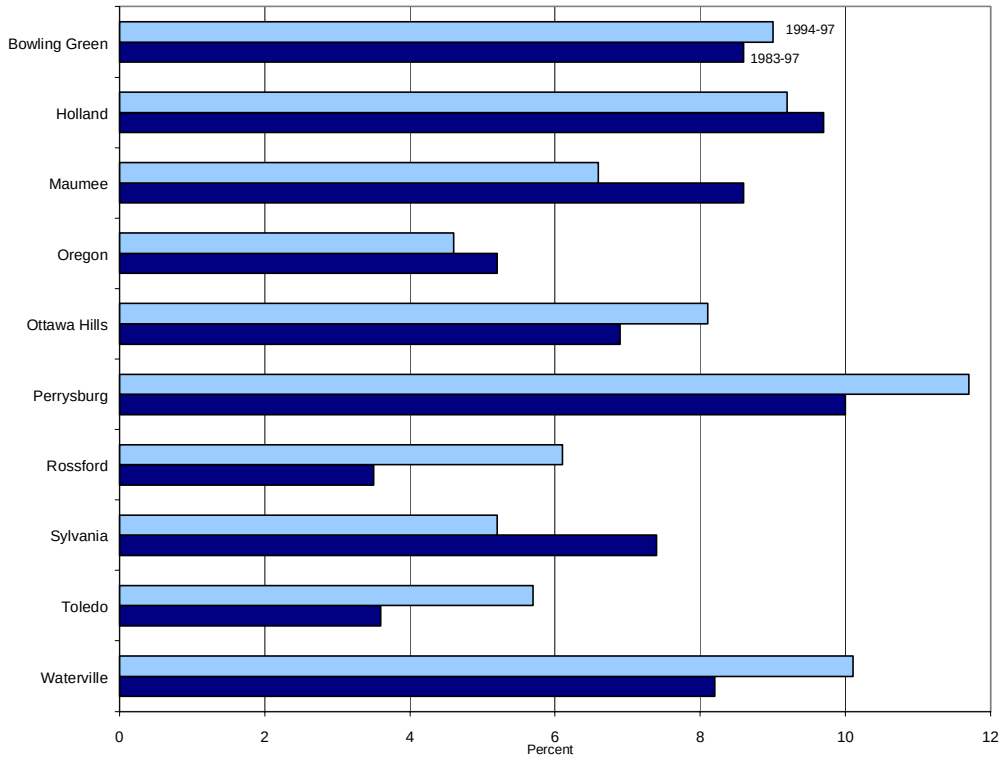
Source: City of Toledo and the Ohio Bureau of Employment Services.

After a significant drop from 1987 to 1991, Figure 2 shows that Toledo turned its revenue picture around and posted reasonable gains through 1999. From 1991 to 1999, the City's current-dollar tax revenue grew 4.2% per year; inflation averaged about 2.5% over that period. In short, it took stronger growth over the last eight years to return the City to its 1987 level of tax revenue when adjusted for inflation. That long recovery reflects the impact that external cyclical factors exert on the local economy and the City's tax revenue.

Figure 2
City of Toledo Deflated Tax Revenue Withholdings

Source: Urban Affairs Center, The University of Toledo.

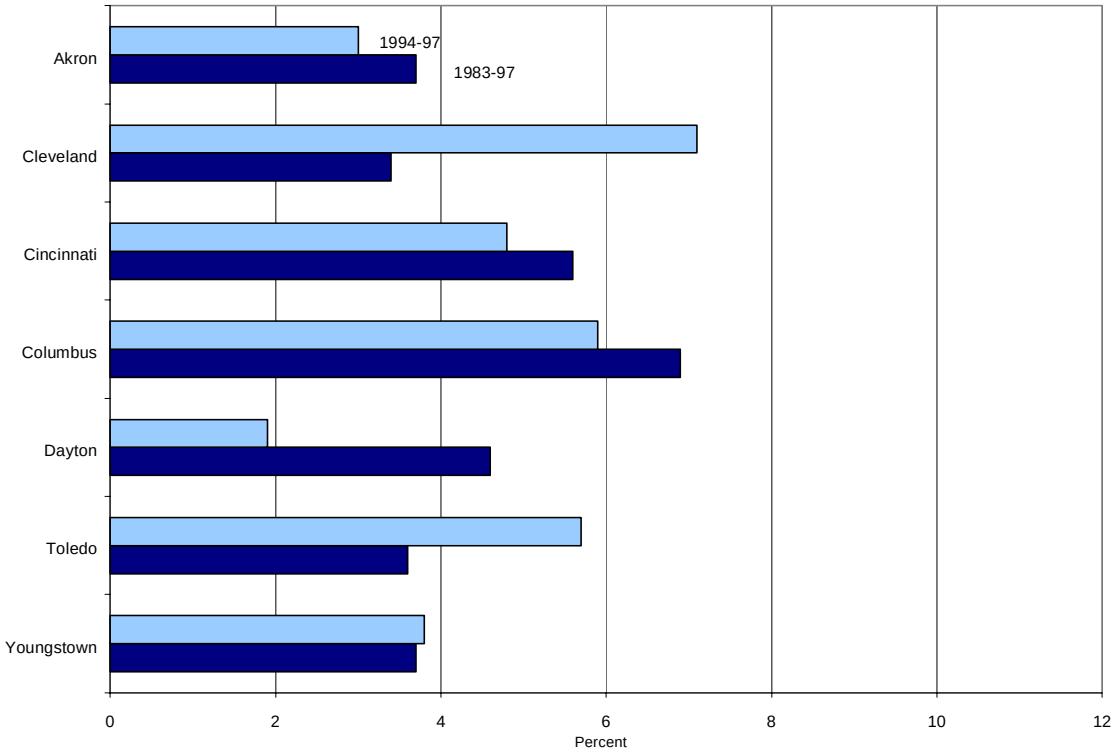
Figure 3
Annual Growth Rate of Tax Revenue, Northwest Ohio Areas



Source: Ohio Department of Taxation, Tax Analysis Division and the Urban Affairs Center.

Figures 3 shows annual growth rates in municipal tax revenue for Toledo and other areas in Northwest Ohio. Comparable data from the Tax Analysis Division of the Ohio Department of Taxation reveal that the City of Toledo grew considerably slower than many of its suburban neighbors. Rapid growth occurred in Bowling Green, Holland, Maumee, Perrysburg, Sylvania, and Waterville. Each of those areas experienced growth in tax revenue greater than 8% per year from 1983 to 1997; that is more than twice the pace in the City of Toledo. The growth rate in the City of Toledo was higher after 1994 but still lagged rates recorded in most suburban municipalities. And, except for Bowling Green and Rossford, none of the other areas increased its municipal tax rate. An expansion of the tax base accounts, therefore, for the rapid growth observed in the suburban areas of Northwest Ohio.

Figure 4
Annual Growth Rate of Tax Revenue, Central Cities



Source: Ohio Department of Taxation, Tax Analysis Division and the Urban Affairs Center.

The City of Toledo's condition with respect to growth in tax revenue is not unique. Figure 4 shows that the cities of Akron, Cleveland, and Youngstown also exhibited relatively slow growth. While growth of tax revenue was somewhat faster in Cincinnati and Columbus, it advanced markedly slower than the municipalities surrounding the City of Toledo. Columbus is a special case among cities in Ohio because of its aggressive annexation policy. That certainly helped Columbus achieve faster growth of tax revenue than other large central cities in the state. Since 1994, only Cleveland and Columbus experienced faster growth than Toledo. It is important to note the stronger growth in Toledo during the second half of the 1990's.

Tax revenue for a municipality depends simply on its tax rate and tax base as follows:

Tax Revenue = Tax Rate x Tax Base.

The tabulation below shows the rates reported by the Ohio Department of Taxation for 1997. The City of Toledo has the highest payroll/income tax rate of the urban areas listed and tied with three other municipalities for the highest rate in Northwest Ohio. Thus, the slower growth in tax revenue in the City of Toledo is combined with a relatively high tax rate. The actual growth in Toledo's revenue results directly from slower growth in the city's tax base. Growth in municipal tax revenues is not directly related to changes in tax rates except in Bowling Green, which increased its tax rate from 1.5% in 1983 to 1.73% in 1997, then to 1.92% in 1998. The full impact of the increases for Bowling Green's increases is not evident in the chart since only one year of the increased tax rate is included in Bowling Green's average growth in tax revenue.

Municipality	1997 Tax Rate (%)
Toledo	**2.25**
Akron	2.0
Cincinnati	2.1
Cleveland	2.0
Columbus	2.0
Dayton	2.25
Youngstown	2.25
Northwest Ohio	
Bowling Green	1.73
Holland	2.25
Maumee	1.5
Oregon	2.25
Ottawa Hills	1.5
Perrysburg	1.5
Rossford	2.25
Sylvania	1.5
Toledo	**2.25**
Waterville	2.0

The tax base depends on employment and income in the city. Employment in the City of Toledo grew during the 1990's, but at a slower rate than many other municipalities in Northwest Ohio. ES-202 data show an employment gain in the City of Toledo of about 7% from 1991 to 1998. These confidential ES-202 data are collected by the Ohio Department of Development and are available to the state's Urban University Program centers for their analytic applications. From 1991 to 1998, Bowling Green experienced an 18%, Perrysburg 46%, and Sylvania City and Township about 28%.

Moreover, Toledo's share of employment in the metropolitan area slipped during the 1990's. In 1991, for example, the city accounted for about 58% of employment in the three-county metropolitan area; by early-1998, that share slipped to 56%. In contrast, the combined City and Township of Sylvania experienced an increase in its employment share from about 13% to nearly 15%.

The City of Toledo, like most of America, is undergoing a shift from a traditional manufacturing base to a more diversified economy. Nevertheless, manufacturing generated relatively high wages for workers in the city. The ES-202 data show manufacturing employment in the City of Toledo at 22,147 for 1991, about 41% of the manufacturing employment in the Toledo metropolitan area. By early-1998, the city's manufacturing employment had dropped almost 2%; its share in the three-county metro Toledo area was down to 35%. The decline in manufacturing in metro Toledo is part of a long-term downward trend. In early-1979, employment in manufacturing was about 80,000; by early-1999, it was about 60,000. Although manufacturing employment did recover in metro Toledo during the 1990's, the City had fewer workers in manufacturing than at the beginning of the decade.

Not all of the smaller municipalities in Northwest Ohio experienced gains in manufacturing employment, but some did. Manufacturing employment jumped 56% in Bowling Green and about 35% in the combined City and Township of Waterville, Springfield Township, and Holland. Employment changes in Northwest Ohio indicate problems in the city's tax base over the last decade. Those trends require attention, otherwise, the tax base can be expected to erode slowly. That possibility reflects a long-term structural problem for the City of Toledo similar to conditions in other large central cities in the state of Ohio and in the United States.

Total Employment in Northwest Ohio Communities

Area	1991	1993	1998*
Bowling Green	17,450	16,946	20,548
Grand Rapids	514	483	488
Holland	5,816	7,743	9,548
Maumee	20,358	20,869	22,447
Monclova	560	560	424
Northwood	2,512	2,994	3,765
Oregon	8,696	8,967	9,558
Perryburg	10,131	12,164	14,777
Rossford	2,183	2,532	3,015
Springfield Township	5,816	7,743	9,548
Sylvania City	10,694	11,565	14,128
Sylvania Township	26,176	28,081	32,898
Toledo	**167,299**	**172,319**	**179,502**
Walbridge	2,766	2,472	2,245
Waterville	1,303	1,416	1,638
Waterville Township	2,842	3,245	3,448
Whitehouse	1,539	1,829	1,810

Manufacturing Employment in Northwest Ohio Communities

Area	1991	1993	1998*
Bowling Green	3,109	3,188	4,856
Grand Rapids	55	76	66
Holland	1,412	1,533	1,913
Maumee	2,995	3,237	2,392
Monclova	8	58	5
Northwood	434	321	348
Oregon	1,599	1,392	1,594
Perryburg	2,430	2,884	2,900
Rossford	1,045	1,096	1,659
Springfield Township	1,412	1,533	1,913
Sylvania City	454	376	365
Sylvania Township	1,369	1,258	1,027
Toledo	**22,147**	**26,077**	**21,752**
Walbridge	1,433	1,242	1,097
Waterville	391	322	465
Waterville Township	634	777	928
Whitehouse	243	455	463

Source: Urban Affairs Center, The University of Toledo, ES-202 data.

We focused on total and manufacturing employment changes in the City of Toledo. ES-202 data permit detailed analyses for other industrial groups; such analyses can identify other industries that are changing the structure of Toledo's tax base.

One aspect of the changing employment and declining revenues not examined herein but in need of careful examination is the wage-related sub-sectors of the economy moving to the suburbs. Are the most skilled and/or highest wage manufacturers moving to the suburbs? Is there a move of high-wage, so-called "white-collar" professionals to suburban locations? Is it the large, so-called "monopoly sector," corporations moving to the suburbs and independent sub-contractor businesses remaining in the City? The latter may be more vulnerable to economic disruption in periods of cyclical downturns.

Trends in residential construction also reflect tax-base erosion in the City of Toledo. Although data collected and reported by the U.S. Bureau of the Census are fragmented and less reliable than employment data from the Ohio Bureau of Employment Services, the information captured from the data for communities in Northwest Ohio leads to the same conclusion drawn from employment data. Over the last two decades, permits issued for residential construction in Toledo exhibited a negative annual growth rate. In the counties of Fulton, Lucas, Ottawa and Wood, growth rates were strongly positive, with the annual pace in Fulton, Ottawa and Wood counties exceeding that of Lucas County. This reflects movement away from the central city and the largest county in Northwest Ohio. In the 1990's, however, growth of construction permits in the City of Toledo was positive at about 2.2% per year. Although positive, the rate is considerably lower than that of Fulton County (9.3%), Ottawa County (6.7%), and Wood County (5.9%). These trends in new residential construction do not reflect favorably on the City of Toledo. Moreover, when actual units authorized by the permits are considered, the City experienced a significant downtrend during the 1990's. In contrast, Fulton, Ottawa and Wood counties experienced positive growth in the number of residential units authorized at close to 6% per year.

Figure 5
Value of New Residential Construction Authorized (millions), Toledo MSA

Source: U.S. Department of Commerce, Bureau of the Census.

The city's share of new residential construction decreased in the last twenty years. In 1980, for example, new residential construction in the City of Toledo accounted for nearly one-third of residential construction in the three-county metro Toledo area. By 1998, the city's share had dropped to 14%. In 1999, the value of residential construction in metro Toledo was reported at $258 million, up 103% from the beginning of the decade. The City of Toledo's share represented a much smaller portion of that total.

Figure 5 displays the value of new residential construction. The upward trend in the metropolitan area is about 3.8% per year from 1986 to 1999. After adjusting for inflation during this period, we observe no growth in the real value. At the end of the 1990's, the City of Toledo possessed a smaller share of residential construction that has not increased in inflation-adjusted value over the last fourteen years.

It should also be noted that this report focuses on total residential construction. The City of Toledo has demolished thousands of homes over the last two decades. Thus, while we note a rebound in new construction, it remains unclear whether there is a net increase in the number of housing units within the City. While one might presume this phenomenon unique to the City, direct examination of it would provide for a more detailed comparative analysis of changes in housing within Toledo.

Declining housing starts, compared to increases in outlying suburban communities, presents a challenge to Toledo, as it does for Ohio's other central cities. Toledo needs to explore potential policy changes to help ensure that there are continued efforts to promote residential development within the City.

The overall environment the city faces is one of relatively rapid growth in the suburbs and slow growth in the central city. For the long run, that is a major economic development problem for the City of Toledo. It requires attention along with aggressive planning and action; otherwise, slow growth in tax revenue will continue into the foreseeable future. This condition sets the stage, moreover, for a continuing struggle by the City's Administration and the City Council to meet demands for municipal services.

Revenues are derived from three sources: payroll taxes on the wages of people working in the City, payroll taxes on the wages of people living in the City and earning their wages elsewhere, and a payroll tax (shared with another municipality) on the wages of employees working in Joint Economic Development zones. This report only examines revenues in general, but a careful analysis of the composition, overlap, and change among these three distinct sources should be undertaken.

A final factor should be noted. The data on employment are aggregate data and do not differentiate between full-time, part-time, temporary, and seasonally employed individuals. Given the varying stability of employment along with susceptibility to unemployment and implications of these different categories on tax revenues, a systematic analysis of employment trends within the City of Toledo compared to other municipalities in Northwest Ohio seems necessary. It is important to understand the nature of urban employment, the possible disadvantages of worker density to economic advancement, and stability of the City's tax revenues in different types of economic conditions. Such considerations were outside the scope of this research, however.

Section 2
Short-term Forecasts of Tax Revenue

Forecasting payroll tax revenue for the next calendar year is the fiscal responsibility of the City of Toledo's Finance Department. City Council prepares a list of expenditures in the city's budget for the next calendar year based on forecasts of tax revenues. Toledo's Municipal Code, Part 19 – Taxation Code, clearly specifies the purpose of the income tax:

> **1905.01 Declaration of Purpose**.
>
> To provide funds for the purposes of general municipal operations, maintenance, new equipment and capital improvements of the City there is hereby levied a tax on salaries, wages, commissions and other compensation, and on net profits as hereinafter provided.
> (1952 Code 33-1-1; Ord. 677-55)

The Finance Department faces two practical forecasting problems:

1. Budget preparation requires a forecast of revenue for the next calendar year.
2. Predicted revenue must be completed by November 15 of the current year when only two quarters of the current year's revenues are known with certainty.

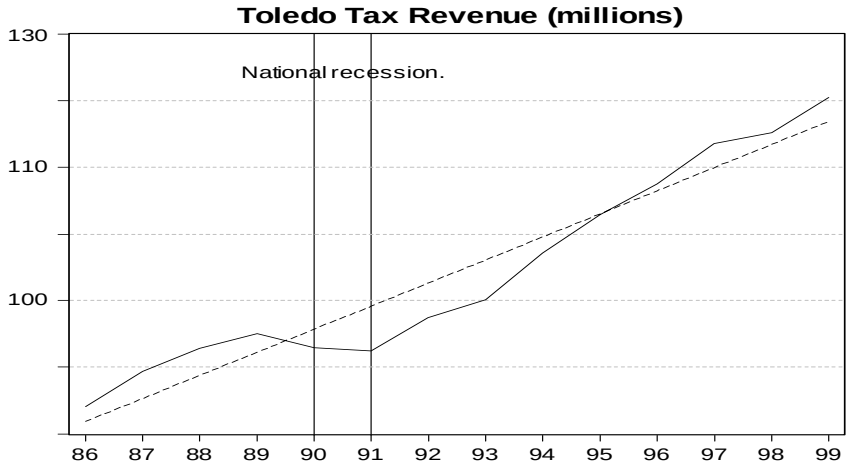
The result is a forecast of tax revenue for eighteen months: two quarters of the current year and the entire next calendar year. Partially mitigating this difficulty, the City's stabilization fund serves as a safeguard, thus allowing for adjustment for overpredictions or underpredictions of revenue from year to year.

Figure 6 shows annual withholdings of tax revenue for the 1986-1999 period. The estimated trend in tax revenue accounts for about 93% of the movement in this series. Extrapolation of the trend each year would generate errors that vary in size as revenues move off the trend line due to economic forces. Most troublesome is the overprediction of revenue during the recession of 1990-91. In 1991, for example, tax revenue withholdings totaled $92,452,379; the trend estimate predicted $99,158,860.

Such overpredictions continue as long as actual tax revenue falls below predictions, leaving City Council to either cut expenditures during the year or try to offset what appears to be lost revenue. Overpredictions present City Council with serious downside problems. In contrast, the trend estimate underpredicts in years of significant economic expansion. For example, in 1999 the trend extrapolation generates a forecast of tax revenue of $126,885,108, with actual tax revenue at $130,461,607. Underprediction is certainly less serious in terms of adjustments for City Council during the year.

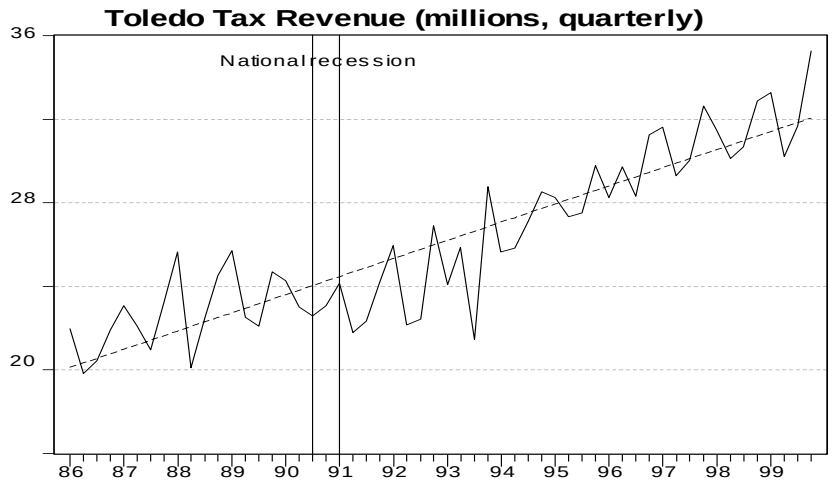
For the fourteen years examined, forecasts from the simple trend generate a mean absolute percent error of 3.3%. This *ex post* (historical) performance is reasonably good, but a trend forecast for the fourteen years would not have been available to the Finance Department. In a practical forecasting situation for 1992, for example, the Finance Department would have data available for only the 1986-1991 years. For those years, the estimated trend is a considerably poorer fit for the City's tax revenue.

Figure 6



Note: Solid line is actual tax revenue; dashed line is estimated trend.
Source: City of Toledo, Division of Taxation and Treasury, and The Urban Affairs Center.

Figure 7



Note: Solid line is actual tax revenue; dashed line is estimated trend.
Source: City of Toledo, Division of Taxation and Treasury, and the Urban Affairs Center.

Annual extrapolation of trend is a simple, reasonably accurate, and low-cost method for forecasting tax revenue. It is not available to the Finance Department because one-year-ahead forecasts are required for preparation of the City's budget before the current year is complete. The Finance Department must prepare a forecast of tax revenue for the next calendar year by November 15. Preparations for City Council occur at a time when tax revenue is available for only two quarters of the current year. Consequently, forecasts are required for two quarters in the current year followed by a forecast for the next calendar year. Figure 7 reveals more variation off trend for quarterly data. Trend is still the dominant movement, but in addition to the cyclic changes noted above, seasonal variation influences tax revenues. **Quarterly forecasts must account for three movements that influence tax revenue throughout the year: trend, cycle, and seasonal.**

We designed forecasting procedures to address the two problems the Finance Department faces in the budget process. Updating all estimates each year as new data become available yields a dynamic forecasting procedure that can be applied each fall during the budgeting process.

Seasonal Variation.

As evident from Figure 7, there are obvious seasonal swings in tax revenue that recur annually. We estimated seasonal variation using methods employed by the U.S. Bureau of the Census. The technique is widely used to seasonally adjust data produced by many federal government agencies and private businesses. For the 1986-1999 period, tax revenues display seasonal highs in the first and fourth quarters. In other words, tax revenue tends to be above the norm at the beginning and end of each year. For the fourteen years examined, estimates reveal seasonal increases of about 3% and 5% for the first and fourth quarters, respectively. The second and third quarters were typically down about 3% and 5%, respectively, relative to the average. Seasonal variation can be estimated each year as new data become available. We recommend estimates for a ten-year period, 1990-1999 for example, which is a standard estimation period used extensively in business and government. For the 1990's, estimated seasonal indexes are given below.

Quarter	Seasonal Index
First	102.4
Second	97.1
Third	95.5
Fourth	105.4

Seasonal indexes do change over time, but our estimates show slowly changing seasonal patterns in tax revenue. There is variation from year to year, but the average seasonal indexes typify the period. We remove seasonal variation from quarterly data and forecast seasonally adjusted tax revenue. This eliminates recurring intra-year movements from the data and improves trend and cyclic estimates and forecasts. Data are re-seasonalized for comparisons with the actual quarterly tax revenues reported by the City's Finance Department.

Trend.

The upward trend in tax revenues, observed in Figures 7 and 8, is the dominating movement in tax revenues during the 1986-1999 period. Our estimate of the quarterly linear trend is based on (1).

(1) $TXSSFF_t = C + BT$, where SSFF refers to the years of seasonal adjustment; T represents the quarter, e.g., T=1 for the first quarter of 1986.

Dependent Variable: TX8699

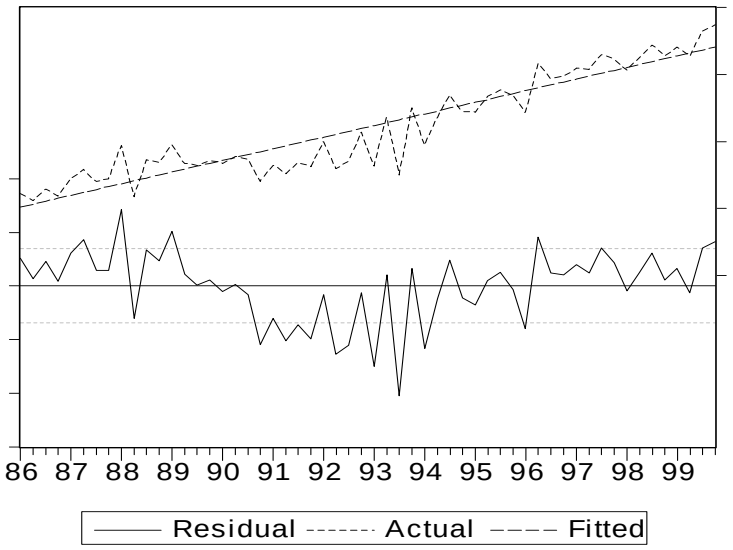
Sample: 1986:1 1999:4
Included observations: 56

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	19879671	374463.3	53.08843	0.0000
T	217063.3	11429.00	18.99233	0.0000

R-squared	0.869788	Mean dependent var	26065975
		S.D. dependent var	3795951.
S.E. of regression	1382390.		
Sum squared resid	1.03E+14		
Log likelihood	-870.2444	F-statistic	360.7084
Durbin-Watson stat	1.535213	Prob(F-statistic)	0.000000

The dashed straight line in Figure 8 is a plot of tax revenues predicted by this equation. This fitted line displays the trend in the current-dollar value of the City's quarterly tax revenue. The results show a significant upward trend in tax revenues (B) that averaged $217,063.30 per quarter for the fourteen-year period. This trend equation accounts for about 87% of the variation in TX8699. Cyclic movements and random, nonsystematic patterns in the data account for the remaining variation. Cyclic movement can be measured off the fitted trend line; it is the residual curve shown in Figure 8.

Figure 8
Quarterly Tax Revenue Trend



Cyclic Movement.

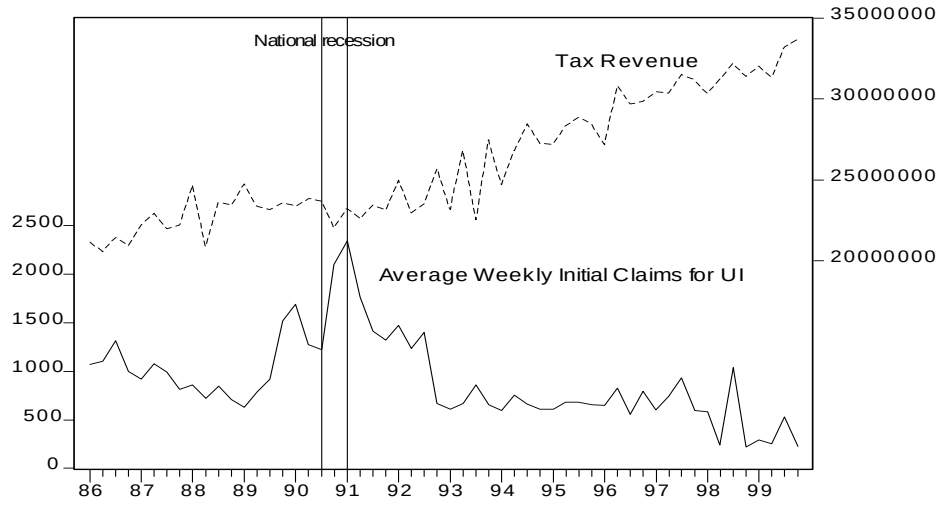
The ratio of the seasonally adjusted tax revenues to trend values measures cyclic movement (CYTRD). In essence, this gives the percent off the trend line in Figure 8. For the fourth quarter of 1999, CYTRD equals 1.051, indicating that tax revenue was about 5% above its estimated trend. CYTRD can be forecast with (2).

(2) $CYTRD_t = A + B_1AWIC_{t-2} + B_2CYTRD_{t-2}$

In this case, AWIC refers to average weekly initial claims for unemployment insurance in the Toledo area. ***Our analysis reveals that initial claims are a reasonably good leading indicator of the cyclic behavior of tax revenues***. We forecast CYTRD with AWIC lagged 2 quarters and with CYTRD itself lagged 2 quarters. The lagged value of CYTRD captures the persistence of cyclic movements in quarterly tax revenues. To forecast CYTRD for the fourth quarter of 1999, for example, we use AWIC and CYTRD from the second quarter of that year. ***This two-quarter lead-time allows us to capture some early warnings on cyclic change in tax revenue.***

Figure 9 illustrates the behavior of AWIC relative to tax revenue. Note that tax revenue tends to decline as initial claims (AWIC) rise; for the fourteen-year period, a two-quarter lead by AWIC is statistically significant. Other indicators for the local economy also show significant lead times compared to quarterly tax revenue, but the leads were less significant in quantitative terms than those of initial claims for unemployment insurance. The latter are linked directly to changing employment conditions in the local economy.

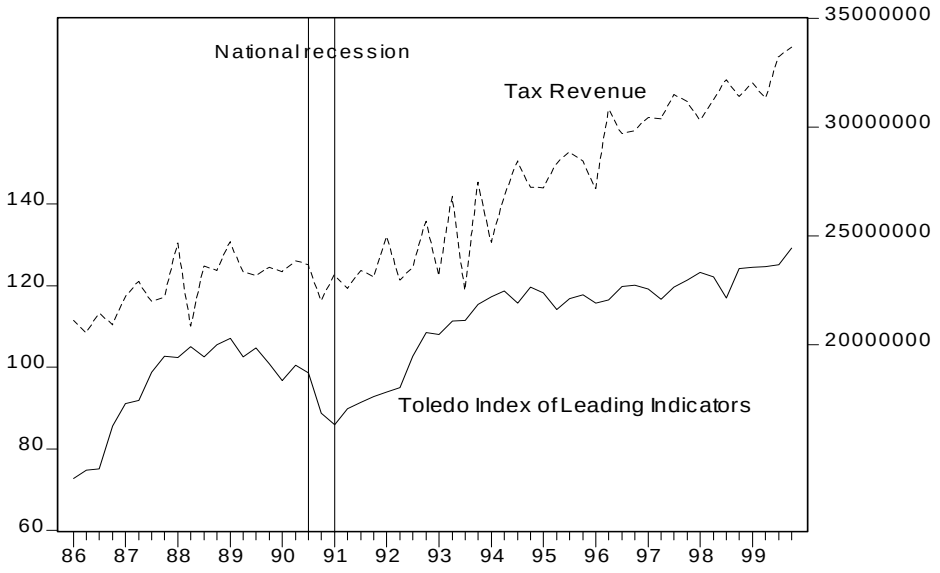
Figure 9
Quarterly Tax Revenue and Initial Claims for Unemployment Insurance



Source: City of Toledo, Division of Taxation and Treasury, and the Ohio Department of Job and Family Services.

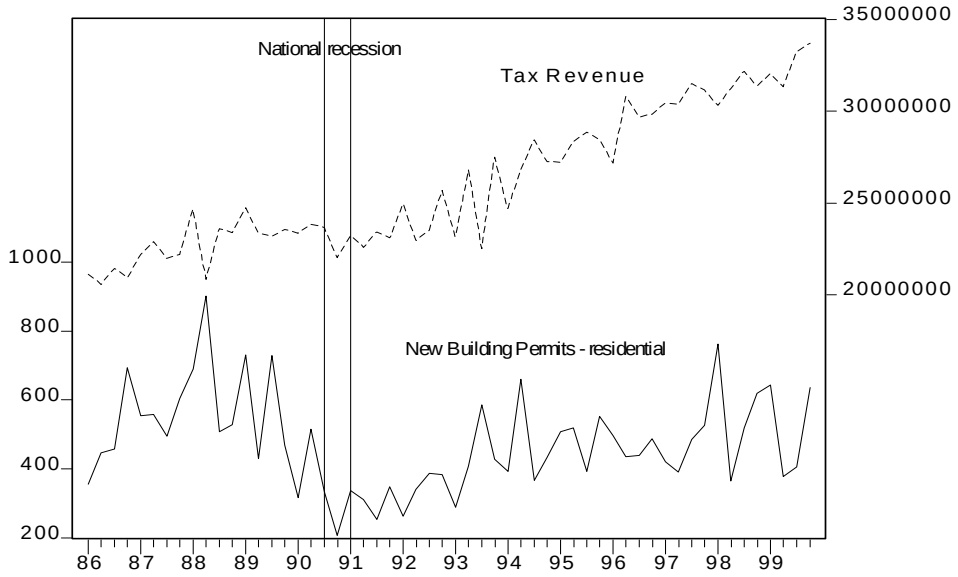
Figures 10 and 11 show the quarterly Toledo metro index of leading indicators and new housing units authorized by building permits within the Toledo metro area. Like initial claims, these indicators are available in a timely manner. The U.S. Bureau of the Census provides new building permits monthly, Dr. Kozlowski updates the Toledo index of leading indicators quarterly at the University of Toledo. Those two indicators can also contribute to a prediction of cyclic change during the budget process each fall.

Figure 10
Quarterly Tax Revenue and Toledo Index of Leading Indicators



Source: City of Toledo, Division of Taxation and Treasury, and Dr. Paul Kozlowski, College of Business Administration, The University of Toledo.

Figure 11
Quarterly Tax Revenue and New Building Permits for Residential Construction



Source: City of Toledo, Division of Taxation and Treasury, and U.S. Department of Commerce, Bureau of the Census.

The following steps present an example of the dynamic quarterly forecast (DQF) for 1998 and the annual forecast for 1999.

A. Dynamic Quarterly Forecast

1) Trend estimate, 1986.1 1998.2

   TX8698 = 20124826 + 203584T

2) Trend Forecast

   1998.3 TX8698 = $30,507,610
   1998.4 TX8698 = $30,711,194

3) Cyclic Forecast (from estimate of equation 2 above)

   1998.3 CYTRD = 1.007
   1998.4 CYTRD = 1.029

4) Seasonally Adjusted Forecasts: Trend and Cycle

   1998.3 $30,507,610 (1.007) = $30,710,913
   1998.4 $31,587,194 (1.029) = $31,587,784

5) Re-seasonalize

   1998.3 $30,710,913 (.950767) = $29,198,922
   1998.4 $31,587,784 (1.04714) = $33,076,895

6) Annual Forecast, 1998

   $31,507,891 (known)
   $30,107,743 (known)
   $29,198,922 (forecast above)
   $33,076,895 (forecast above)
   $123,891,451

7) Forecast Evaluation, 1998

   Actual Tax Revenue $125,178,347
   Forecast $123,891,451
   Error **$ 1,286,896** ***(underprediction = 1%)***

For the eleven years from 1989 to 1999, tax revenue averaged about $108,000,000. In dollars, absolute errors averaged just $1,603,849, which is small relative to the actual size of tax revenue. On a year-by-year basis, absolute percent errors for DQF averaged only 1.5%. Only the third and fourth quarters are predicted each year;

first- and second-quarter revenues are known. The small errors in the current year reflect this fact and the performance of DQF. These current-year forecasts provide a good foundation for predicting annual tax revenue for the next year.

B. Annual Forecast, 1999

1) Annual Trend and Leading Indicator Model (TLI)

$$TX_{99} = 90{,}192{,}810 + 2{,}976{,}538T - 8977.573AWIC_{98} = \$127{,}191{,}512$$

2) Forecast Evaluation, 1999

Actual Tax Revenue	$130,461,607
Forecast	$127,191,512
Error	**$ 3,270,095 (*underprediction = 2.5%)***

The average absolute error is less than 5% for the 1991-1999 period. In dollars, it's about $4.7 million for a city with tax revenues that averaged about $112 million over this period. In 1999, for example, the one-year-ahead projection is $127,191,512, which underpredicts actual tax revenue of $130,461,607 by 2.5%. For the recession year of 1991, the projection is $93,965,949. That is an overprediction of $1,513,570, or 1.6%. With a stabilization fund, that overprediction is manageable.

Forces external to Toledo's economy, a slump in the national economy for example, do influence cyclical movement locally. The national recession of 1990-1991 is the cyclic force that pulled revenue below trend during the 1986-1999 period. Such episodes recur but are not periodic; they are difficult to predict.

Key leading indicators are used to account for cyclical forces. Our procedures estimate and integrate recurring, intra-year seasonal patterns into the one-year-ahead projection of tax revenue. Random, non-recurring, non-systematic movements also occur; they manifest themselves in strikes or through construction projects (Lucas County Library, Jeep, and the Toledo Prison, for example). Such non-systematic movements contribute to errors in projecting revenues into the next calendar year.

Good judgment by City officials plays a key role in adapting projections to account for these economic impacts. Our forecasting procedure incorporates the systematic patterns from trend, cycle, and seasonal movements that are estimated and

updated dynamically to predict tax revenue. The forecasting process is not mechanical, however. Analysis of the economic outlook for the local area is a key input to forecasts of the City's tax revenue that allows adaptation of forecasts to account for non-recurring, but potentially significant, economic factors.

Using updated estimates for each year in the 1990's for DQF and TLI results in a mean absolute percent error of 4.2%. This is reasonably good given the loss in observations as estimates are moved back in time. For example, in 1991 there are only five annual observations to work with (1986 to 1990) and only 18 quarterly observations (1986.1 to 1990.2). If the TLI model is not used and forecasts rely simply on an estimate of the annual growth in tax revenue following DQF as the base, then this reduces the mean absolute percent error to 3.6%. Although that appears to be better performance, it ignores potential cyclic movement that influences annual tax revenue. In a period like the 1990's, which is characterized by a long, vigorous economic expansion, ignoring cyclic activity does not generate larger errors. During a classical economic slump like the recession episode of 1990-1991, failing to account for cyclic activity will inevitably result in larger errors. This showed up in the large differences between the estimated trend in tax revenue and actual tax revenue in 1990 through 1992, a period when trend predictions resulted in large overpredictions of the City's revenue for the next year. Overpredictions associated with slumps may require significant budget cuts and/or program reductions at a time when they are likely to be counterproductive. This may exacerbate a local recession. The impact on employees, capital expenditures, leases, and other contracts may be severe and take years to overcome. The TLI model is preferable, therefore, to a simple extrapolation of recent growth rates one-year ahead, but it can only partially explain revenue changes. The DQF, which includes TLI as a component, has greater explanatory ability than either simple extrapolation or TLI alone.

The Finance Department can apply DQF each year with updated data. During the budget process, seasonal indexes, trend estimates, and cyclic estimates can be re-calculated. ***We believe it is essential to apply the Dynamic Quarterly Forecast (DQF) model each year, instead of attempting to predict revenue with a static model that fails to account for new information.*** Updating estimates and forecasting quarterly and annual tax revenues can be completed during the budget process starting in September.

Section 3
Recommendations

The long-term trends and short-run movements in the City's tax revenue present the City of Toledo with economic conditions requiring attention. The long-term challenge facing the City is to identify policies that will continue the upward momentum observed the tax revenue since 1992. The short-run movements in tax revenue require a systematic approach to forecasting revenue for the next calendar year. The Dynamic Quarterly Forecasting procedure addresses directly the short-run issues surrounding budget preparation.

For short-run forecasting of the City's tax revenue, we strongly recommend the use of the Dynamic Quarterly Forecast (DQF) procedures. In budget preparation, DQF considers factors that influence tax revenue from year to year. Its dynamic characteristics reflect new information that can be integrated into the budget process each Fall. Updates on leading indicators for the local economy can improve forecasting, and those updates should be part of the process each year. DQF can be put in operation in Fall 2000.

The City's major problem with tax revenue is long-run growth, not short-term fluctuations. Faced with long-term trends identified in this report, the City needs to:

- Develop a strategy to deal with the long-term factors affecting its tax base. Key issues that require attention include the employment base, business environment, housing, and new residents; these are not new issues for urban areas. Analyses of these issues should include the following:

    1. Consideration of the impacts and effects of joint economic development zones.
    2. Composition and distribution of full-time, part-time, temporary, and seasonal employees.
    3. Analysis of the relationship between the relocation of jobs from Toledo to the suburbs and the residential location of workers in subsequent years.

- Track industry trends and shifts within the City and region. The economic base of the City requires attention. Detailed assessment of industrial trends for various economic sectors can be derived from ES-202 data available at the Urban Affairs Center. The City needs to track these trends in the Northwest Ohio region to get a clearer picture of possible impacts on the City. We recommend such tracking as part of an ongoing evaluation of the City's economic prospects.
- Develop a strategy for economic revitalization that recognizes the impact of sprawl on the City's tax base. The City needs to encourage coordinated responses and efforts among departments and agencies seeking to address these problems and opportunities.
- Re-examine the City's role as the economic, business, social, and cultural center of an area in Northwest Ohio with rapidly growing suburbs. Despite the long-term trends that affect Toledo and most other Ohio and U.S. cities, the City must identify and take actions to address effectively the implications of such trends. A long-term strategy must be developed to determine what advantages and disadvantages the City can actually influence. Such a strategy must:
    1. Identify actions that can benefit the creation and retention of high levels of employment and full-time, high-paying jobs (and/or residences attractive to people with such) within the City. Maintenance of the status quo will not result in improvement; in fact, slow erosion of the tax base can be expected to continue.
    2. Develop a plan for attracting new and/or renewed residents based on the creation of a higher-valued housing stock with amenities and options commonly desired by individuals with higher incomes.

- Create a political alliance among the governments of the large central cities in Ohio that is based on their common conditions. The Ohio Urban University Program (UUP) members, including the University of Toledo's Urban Affairs Center, at the request of Governor Robert Taft, prepared reports detailing the nature and breadth of a common plight relative to tax base, sprawl, construction starts, service availability, etc. Copies of the Executive Summary of that multi-volume study are currently available and they lay the basis for comparison and collaboration among the governments of Ohio cities seeking to address similar revenue problems.