CASE STUDIES OF THE ECONOMIC IMPACT OF HIGHWAY BYPASSES IN KANSAS

Report Number: K-TRAN: KSU-02-1
By
Michael W. Babcock and Jose Davalos, Kansas State University

RESEARCH

Introduction

The construction of highway bypasses in Kansas has resulted in important economic benefits. Perhaps the most significant benefit is the travel time savings of through motorists who avoid the slower speeds, stops, and congestion associated with driving through downtowns.

Project Objective

The five objectives were: (1) assess the impact of the bypass on the towns' total employment, (2) measure the impact on retail sales of the towns' travel-related businesses, (3) measure the impact on employment of the towns' travel-related businesses, (4) measure the impact on labor cost per employee of the towns' travel-related businesses, and for the Kansas counties that contain the sample of small Kansas towns that have bypasses, (5) assess the incremental impact on the county's road maintenance expenditures of assuming maintenance responsibility for the previous road alignment.

Project Description

The impact of the bypasses on total employment of the bypass towns was analyzed using regression analysis. Total average annual employment in each bypass town was regressed on total average annual employment of each of its control towns and a dummy variable that measured the impact of the bypass on total employment of the bypass towns. The regression equations were estimated by ordinary least squares (OLS) regression for the 1988 to 2001 period. Objectives 2, 3 and 4 were achieved by interviewing 54 travel-related business owners and managers in the nine bypass towns regarding how the retail sales, employment, and labor cost of their firms were affected by the highway bypass. Objective 5 was achieved through personal interviews of road supervisors and county engineers in the eight counties containing the nine sample bypass towns.

Project Results

The principal conclusions of the study are as follows: (1) the statistical results are consistent with the conclusion that the bypasses did not have a statistically significant effect on total employment in the bypass towns, (2) a majority of the owners and the managers of the travel-related business firms interviewed felt that the bypass had a major effect on retail sales of their firm in the 1999 to 2001 period. However, they felt it did not have any effect on their employment during the same time period. (3) There was substantial variation in the opinions and perceptions of the respondents concerning the impact of the bypass on retail sales and employment of the four industry groups in the sample. (4) Total road and bridge maintenance expenditures of the seven counties increased an average of 2.3 percent per year (not inflation adjusted) over the five year period. To finance road and bridge maintenance, all seven counties employed the property tax.

Report Information

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Report No. K-TRAN: KSU-02-1
FINAL REPORT

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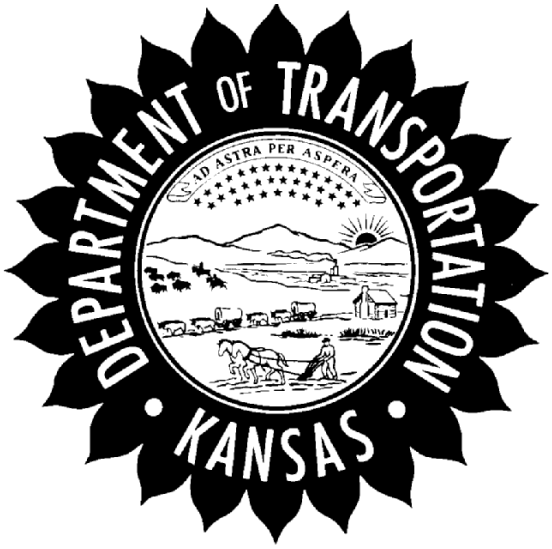

JANUARY 2004

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16 Abstract

The construction of highway bypasses in Kansas has resulted in important economic benefits. Perhaps the most significant benefit is the travel time savings of through motorists who avoid the slower speeds, stops and congestion associated with driving through downtowns.

Despite the benefits of highway bypasses, they remain controversial. Some local business owners in the town being bypassed may be concerned that the reduction of traffic passing through the town will adversely affect their sales. In addition, when a bypass or a new highway alignment is constructed, the old alignment is refurbished (if needed) by the state and then given back to the local unit of government (city and/or county) which contains the old route. The added expenditure to the local government of an additional road may result in a reduction of maintenance on other city/county roads.

Case studies of the economic impacts of highway bypasses on individual towns are needed since the effects of bypasses may vary a great deal from place to place. The objectives of this report were for a sample of small Kansas towns that have highway bypasses, (1) assess the impact of the bypass on the towns' total employment, (2) measure the impact on retail sales of the towns' travel-related businesses, (3) measure the impact on employment of the towns' travel-related businesses, (4) measure the impact on labor cost per employee of the towns' travel-related businesses, and for the Kansas counties that contain the sample of small Kansas towns that have bypasses, (5) assess the incremental impact on the county's road maintenance expenditures of assuming maintenance responsibility for the previous road alignment.

The principal conclusions of the study are as follows: (1) the statistical results are consistent with the conclusion that the bypasses did not have a statistically significant effect on total employment in the bypass towns, (2) a majority of the owners and the managers of the travel-related business firms interviewed felt that the bypass had a major effect on retail sales of their firm in the 1999 to 2001 period. However, they felt it did not have any effect on their employment during the same time period. (3) There was substantial variation in the opinions and perceptions of the respondents concerning the impact of the bypass on retail sales and employment of the four industry groups in the sample. (4) Total road and bridge maintenance expenditures of the seven counties increased an average of 2.3 percent per year (not inflation adjusted) over the five year period. To finance road and bridge maintenance, all seven counties employed the property tax.

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Final Report

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A Report on Research Sponsored By

THE KANSAS DEPARTMENT OF TRANSPORTATION
TOPEKA, KANSAS

KANSAS STATE UNIVERSITY
MANHATTAN, KANSAS

JANUARY 2004

PREFACE

The Kansas Department of Transportation's (KDOT) Kansas Transportation Research and New-Developments (K-TRAN) Research Program funded this research project. It is an ongoing, cooperative and comprehensive research program addressing transportation needs of the state of Kansas utilizing academic and research resources from KDOT, Kansas State University and the University of Kansas. Transportation professionals in KDOT and the universities jointly develop the projects included in the research program.

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ABSTRACT

The construction of highway bypasses in Kansas has resulted in important economic benefits. Perhaps the most significant benefit is the travel time savings of through motorists who avoid the slower speeds, stops, and congestion associated with driving through downtowns.

Highway bypasses also result in benefits for residents of towns with bypasses. For example, by diverting trucks and other through traffic away from downtown, traffic congestion and noise is reduced. Also traffic safety is enhanced due to reduced pedestrian-vehicle conflicts, and the local population is less exposed to health-threatening vehicle emissions and hazardous materials. In addition, highway bypasses enable local motorists to realize travel time savings when driving from one end of the town to the other.

Highway bypasses promote economic development of industries whose sales are primarily to customers located outside the town or county. These industries are referred to as basic industries. Since bypasses reduce transportation costs, they help local basic industries to lower their costs and increase their sales. The increased buying power will have a favorable multiplier effect on non-basic industries (i.e., retail trade and consumer services) in the town and county. Local economic development may also be enhanced by new firms that locate at highway bypass interchange or intersection locations.

Despite the benefits of highway bypasses, they remain controversial. Some local business owners in the town being bypassed may be concerned that the reduction of traffic passing through the town will adversely affect their sales. This is especially the case for travel-related firms such as auto and truck repair shops, hotels-motels, restaurants, bars, and convenience stores. In addition, when a bypass or new highway alignment is constructed, the old

alignment is refurbished (if needed) by the state and then given back to the local unit of government (city and/or county) which contains the old route. Eventually the old road will require maintenance expenditures by the city and/or county. The added expenditure to the local government of an additional road may result in a reduction of maintenance on other city/county roads. Also in order to fund the additional maintenance costs it might be necessary to increase taxes. However, it should be noted that the old route will have reduced maintenance needs relative to when it was a state highway due to reduced truck traffic.

Case studies of the economic impacts of highway bypasses on individual towns are needed since the effects of bypasses may vary a great deal from place to place. Also it is important to discover which types of businesses are impacted by Kansas highway bypasses, and the quantitative magnitude of the impact. Accordingly, the objectives of this research project are as follows:

Objective 1 - For a sample of small Kansas towns that have highway bypasses, assess the impact of the bypass on of the towns' total employment.

Objective 2 - For a sample of small Kansas towns that have highway bypasses, measure the impact of the bypass on retail sales of the towns' travel-related businesses.

Objective 3 - For a sample of small Kansas towns that have highway bypasses, measure the impact of the bypass on employment of the towns' travel-related businesses.

Objective 4 - For a sample of small Kansas towns that have highway bypasses, measure the impact of the bypass on labor cost per employee of the towns' travel-related businesses.

Objective 5 - For the Kansas counties that contain the sample of small Kansas towns that have bypasses, assess the incremental impact on the county's road maintenance expenditures of assuming maintenance responsibility for the previous road alignment.

The impact of the bypasses on total employment of the bypass towns was analyzed using regression analysis. Total average annual employment in each bypass town was regressed on total average annual employment of each of its control towns and a dummy variable that measured the impact of the bypass on total employment of the bypass towns. The regression equations were estimated by ordinary least squares (OLS) regression for the 1988-2001 period.

Objectives 2, 3, and 4 were achieved by interviewing 54 travel-related business owners and managers in the nine bypass towns regarding how the retail sales, employment, and labor cost of their firms were affected by the highway bypass. To confirm information obtained in the interviews a questionnaire was also distributed to these business representatives and 65% of them were returned.

Objective 5 was achieved through personal interviews of road supervisors and county engineers in the eight counties containing the nine sample bypass towns. Six of the eight county representatives completed questionnaires as well.

The principal conclusions (results) of the study are as follows:

1. The statistical results are consistent with the conclusion that the bypasses did not have a statistically significant effect on total employment in the bypass towns. In eight of the nine bypass towns the bypass dummy variable (measures employment change caused by the bypass) was not statistically significant. The sole exception was Fredonia as the bypass dummy variable was negative and statistically significant at the .05 probability level.

   As is generally the case with dummy variables it can't be claimed with certainty that the variable measures what it is hypothesized to measure. It is possible that the dummy variable reflects other events that occurred in the bypass towns after completion of the bypass. However, employing the best available statistical techniques it does not appear that

the bypasses had a significant impact on total employment in most of the bypass towns.

2. A majority (55%) of the owners and managers of the 54 travel-related business firms were of the opinion that the bypass had a major effect on retail sales of their firm in the 1999 to 2001 period. However, a majority (54%) of the survey respondents thought that the bypass had no effect on their firm's employment in the 1999 to 2001 period. A majority of the firm representatives (76%) had the perception that sales of their company would have been higher in the 1999 to 2001 period if the bypass had never been built. Almost half (49%) of the business owners and managers thought employment in their company would have been higher in the 1999 to 2001 era in the absence of the bypass.

The business owners and managers were asked their opinions regarding the impact of the bypass on labor cost per employee in the 1999 to 2001 period. The alternative responses were major, minor, or no effect. The three alternatives are not defined in specific monetary amounts or percentages, but rather in terms of the perception of the individual respondents. A large majority (77%) of the firm representatives thought that the bypass had no effect on labor cost per employee.

Two-thirds (67%) of the representatives of the travel-related businesses had the perception that the bypass had a negative effect on their town, while 23% of the business owners and managers thought the bypass had a positive effect or both positive and negative effects.

The business owners and managers who thought the bypass had a negative effect on the town stressed the reduction in the demand for travel-related business, and the closure of local businesses. They noted the difficulty of attracting intercity traffic from the bypass due to the lack of signs on the bypass to inform motorists of the businesses located in the bypass town, and the placement of the bypass several miles from the bypass town. Those business owners and managers who stressed the positive impacts of the bypass on the town cited the reduction in noise and

traffic congestion, improved traffic safety, development of new businesses, and improved accessibility to other cities in the region.

3. There was substantial variation in the opinions and perceptions of the respondents concerning the impact of the bypass on retail sales and employment of the four industry groups (restaurants, convenience stores, auto and truck repair firms, and motels) in the sample. A relatively high percentage (compared to that of all 54 firms in the sample) of the firm representatives of the convenience stores and motels had the opinion that the bypass had a major impact on their firm, and that their sales and employment would have been higher if the bypass had never been built. In contrast, a relatively low percentage of the owners of the auto and truck repair firms thought the bypass had a major impact on their sales and employment. Also, a relatively low percentage of the auto and truck repair firm owners thought their sales would have been higher in the absence of the bypass.

   Unlike retail sales and employment there was little industry group variation in opinions regarding the impact of the bypass on labor cost per employee. A large majority (67% to 86%) of the firm representatives in all the industry groups thought the bypass had no effect on labor cost per employee.

   A relatively high percentage (compared to that of all 54 firms in the sample) of the owners and managers of the convenience stores and restaurants thought the bypass had a negative effect on the town as a whole, while the owners of the auto and truck repair firms were more likely to view the impact of the bypass as positive.

4. County engineers and road supervisors in seven of the eight counties that contained the nine bypass towns provided data on their road conditions and road and bridge maintenance expenditures. In general, the bypass counties are responsible for an average of almost 1000 miles of road and hundreds of bridges. While over one-half (57%) of the asphalt roads are in good to very good condition, only 24% of the collective seven county

road mileage is paved. The other 76% are unpaved gravel roads.

In the 1997-2001 period, total road and bridge maintenance expenditures of the seven counties increased from $15,563,209 to $17,383,325, an average increase of 2.3% per year (not inflation adjusted) over the five year period. The average annual expenditure for road and bridge maintenance of the seven counties rose from $2,223,316 (1997) to $2,483,322 (2001). To finance road and bridge maintenance, all seven counties employed the property tax. Other revenue sources cited by the county representatives included federal-aid for bridge repair, state fuel tax transfers, and other local taxes. A majority of the county engineers or road supervisors of the seven counties said that their current road and bridge maintenance budgets are insufficient to provide adequate transport service on the county's roads, and that the budget shortfall is substantial (10 to 30%).

5. KDOT performed significant maintenance on five of eight previous road alignments prior to transferring them to county maintenance responsibility. Typically, KDOT applied a one to two inch asphalt overlay on these old alignments. Four of the seven participating counties spent $3,500 to $15,000 on normal annual maintenance of the roads they inherited from the state. The city of Pleasanton in Linn County spent $25,000 to resurface the old U.S. 69 alignment.

   Based on data supplied by KDOT it is possible to estimate how much a county would have to spend, over the 20-year life of the road, to maintain roads they inherited from the state as a result of the bypasses. The per mile cost of three asphalt overlays during the 20-year life of the road is estimated to be $155,000. The total per mile cost of routine annual maintenance over the 20-year life of the road is estimated to be $54,240 (i.e., an average of $2,712 per year). Thus total per mile maintenance costs are $209,240.

   It is possible to estimate the total 20-year maintenance cost of each of the old alignments by multiplying the $209,240, 20-year maintenance

cost per mile by the number of miles of road inherited by the county as a result of the bypass. The counties containing the sample bypass towns inherited 26.935 miles of road from the state, resulting in a total estimated 20-year county maintenance cost of $5,635,879 or $281,794 per year. The latter figure amounts to 1.6 percent of the 2001 seven county total road and bridge maintenance budget. There was wide county variation in the number of miles of road inherited from the state, and the resulting total 20-year maintenance cost.

ACKNOWLEDGMENTS

This research project could not have been completed without the assistance and cooperation of many people. James Tobaben and James Brewer of the Kansas Department of Transportation (KDOT) were helpful in obtaining funding for the research project, and the KDOT monitor, Todd Kindred managed the project in a professional manner. Steve Brunkan of the Kansas Department of Revenue provided state sales tax collection data for the bypass and control towns, and John Leatherman of the Agricultural Economics Department at Kansas State University (KSU) retrieved the total employment data for the bypass and control towns from the ES-202 database. Prasad Bidarkota and David Darling of KSU provided helpful professional advice to the authors. Kristi Smith typed the final report.

Special thanks go to the owners and managers of the travel-related firms in the bypass towns, and the county engineers and road supervisors of the counties in which the bypass towns are located. Without their cooperation, this study would not have been possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

Introduction

1.1 Research Problem and Objectives

The construction of highway bypasses in Kansas has resulted in many important economic benefits. Perhaps the most significant benefit is the travel time savings of through motorists who avoid the slower speeds, stops, and congestion associated with driving through downtowns.

Highway bypasses also result in many benefits for residents of towns with bypasses. For example, by diverting trucks and other through traffic away from downtown, traffic congestion and noise is reduced. Also traffic safety is enhanced due to reduced pedestrian-vehicle conflicts, and the local population is less exposed to health-threatening vehicle emissions and hazardous materials. In addition, highway bypasses enable local motorists to realize travel time savings when driving from one end of the town to the other.

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Despite the benefits of highway bypasses, they remain controversial. Some local business owners in the town being bypassed may be concerned that the reduction of traffic passing through the town will adversely affect their sales. This is especially the case for travel-

related firms such as car and truck repair shops, hotels-motels, restaurants, bars, and convenience stores. In addition, when a bypass or new highway alignment is constructed, the old road is refurbished (if needed) by the state and then given to the local unit of government (city and/or county) which contains the old route. Eventually the old road will require maintenance expenditures by the city and/or county. The added expenditure to the local government of an additional road may result in a reduction of maintenance on other city/county roads. Also in order to fund the additional maintenance costs it might be necessary to increase taxes. However, it should be noted that the old route will have reduced maintenance needs relative to when it was a state highway due to reduced truck traffic.

Previous Kansas Department of Transportation (KDOT) funded research has developed predictive models of the average response of retail sales, employment, and payroll in Kansas towns that have been bypassed (Burress, 1996). However, KDOT needs "after-the-fact" case studies of the economic impacts of highway bypasses on individual towns, since the impacts of bypasses may vary a great deal from place to place. Also, KDOT needs to know which types of businesses are impacted by Kansas highway bypasses, and the quantitative magnitude of the impact. This research will enable KDOT to provide small towns that are affected by future bypasses with information on the impacts of bypasses on other Kansas small towns in the past. This will reduce uncertainty of local residents and business owners and perhaps mitigate local opposition to future Kansas highway bypasses. Accordingly, the objectives of this research project are as follows:

Objective 1 - For a sample of small Kansas towns that have highway bypasses, measure the impact of the bypass on the towns' total employment.

Objective 2 – For a sample of small Kansas towns that have bypasses, measure the impact of the bypass on retail sales of the towns' travel-related businesses.

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Objective 5 - For the Kansas counties that contain the sample of small Kansas towns that have bypasses, measure the incremental impact on the county's road maintenance expenditures of assuming maintenance responsibility for the previous road alignment.

1.2 Characteristics of the Sample of Kansas Bypass Towns and Sample Highway Bypasses

Table 1 contains the sample of Kansas towns with highway bypasses which are the subjects of this research. The sample was selected jointly by the authors and the KDOT monitor for this research project. All of the sample towns, referred to hereafter as bypass towns, are located in the eastern half of Kansas, and are small towns with year 2000 populations ranging from a low of 723 (Cedar Vale) to a high of 2600 (Fredonia). For seven of the nine towns the bypass was built on a U.S. highway with the other two constructed on state of Kansas highways.

A bypass on US-166 was completed north of the town of Cedar Vale, Kansas, in Chautauqua County in October 1997. Before the bypass was built, US-166 passed through the center and northern sections of Cedar Vale (see Figure 1).

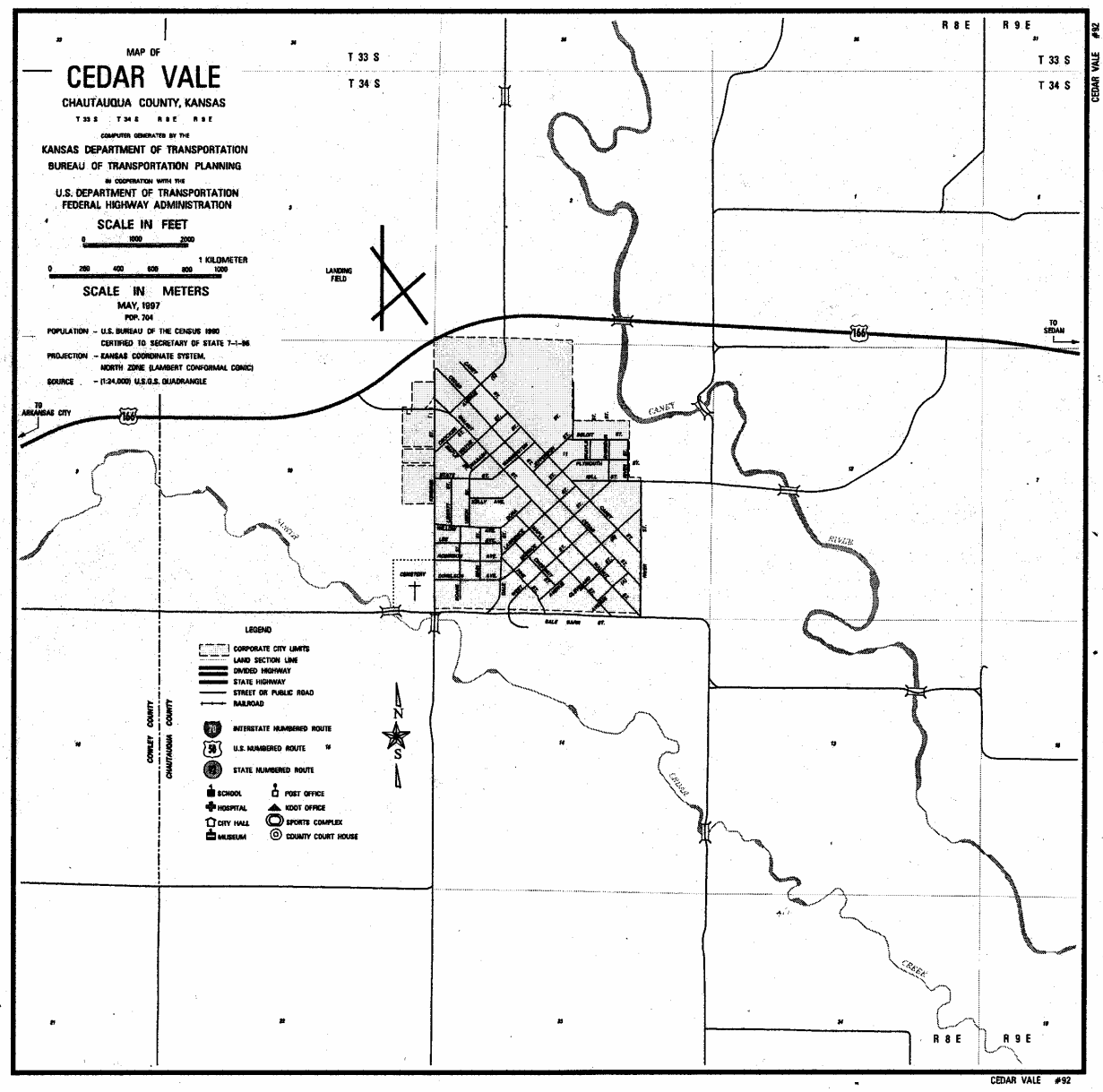


FIGURE 1: CEDAR VALE, KANSAS AND US-166 BYPASS

TABLE 1: Sample of Kansas Towns with Bypasses

Town	County	2000 Population	Bypass Route	Year Opened
Cedar Vale	Chautauqua	723	U.S. 166	1997
Cherryvale	Montgomery	2386	U.S. 169/160	1998
Fredonia	Wilson	2600	U.S. 400	1998
Haven	Reno	1175	Kansas 96	1998
Peabody	Marion	1384	U.S. 50	1998
Pleasanton	Linn	1387	U.S. 69	1990
Sedan	Chautauqua	1342	U.S. 166	1997
Towanda	Butler	1338	Kansas 254	1998
Troy	Doniphan	1054	U.S. 36	1991

Source: (2000 Population) Policy Research Institute, The University of Kansas, *Kansas Statistical Abstract 2000* (September 2001) pp. 2-70 to 2-88.

In August 1998, a bypass was completed west of Cherryvale, Kansas, in Montgomery County on US-160/169. Prior to construction of the bypass, the route passed through the center of Cherryvale (see Figure 2).

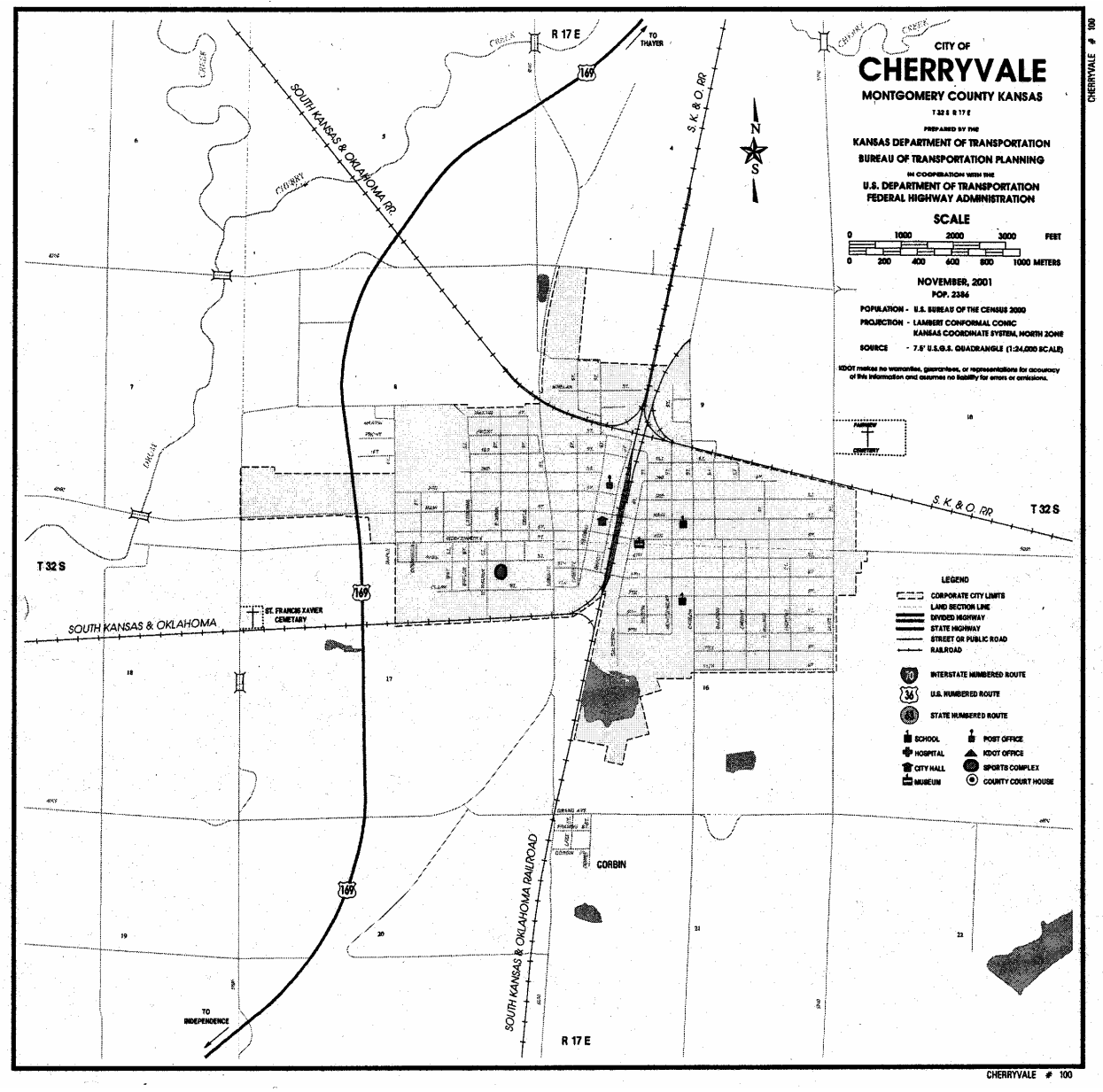


FIGURE 2: CHERRYVALE, KANSAS AND US-169/160 BYPASS

Prior to the 1998 completion of the US-400 bypass around Fredonia, Kansas, Kansas Highway 96 (K-96) was a north-south road located on the eastern edge of Fredonia, which intersected with Kansas Highway 47, (K-47) an east-west route, on the southern and western edge of Fredonia. After completion of the US-400 bypass, K-96 became a county road with greatly reduced traffic passing through Fredonia compared to when the road was a state highway.

The US-400 bypass runs north and east of Fredonia, intersecting with K-47 on the east edge of town (see Figure 3).

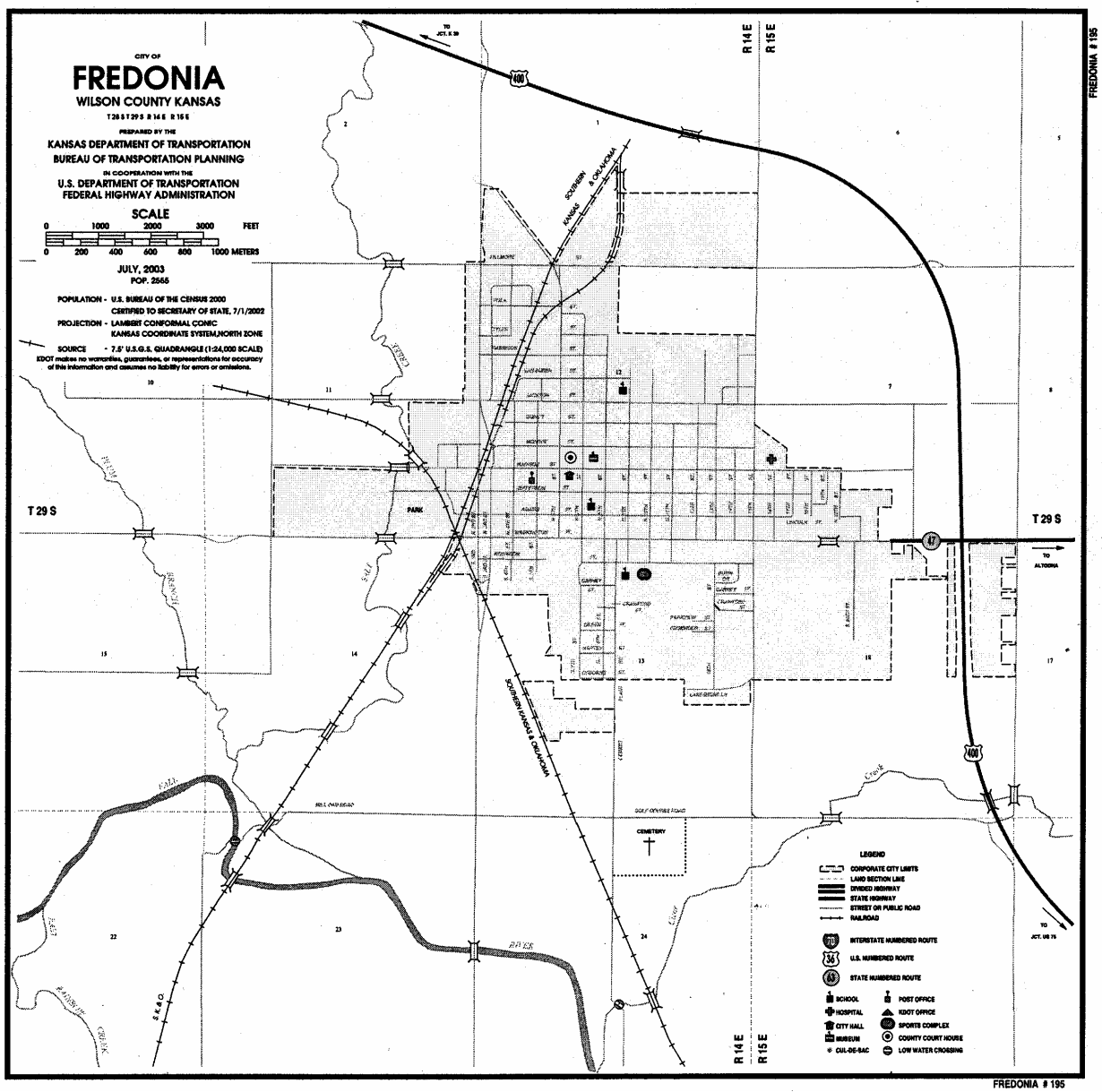


FIGURE 3: FREDONIA, KANSAS AND US-400 BYPASS

In October 1998, the K-96 bypass was completed south of Haven, Kansas, in Reno County. This bypass project involved widening K-96 to a four lane divided highway from the K-

17 and K-96 junction to south of Haven. Prior to construction of the bypass, K-96 passed through the southern part of Haven (see Figure 4).

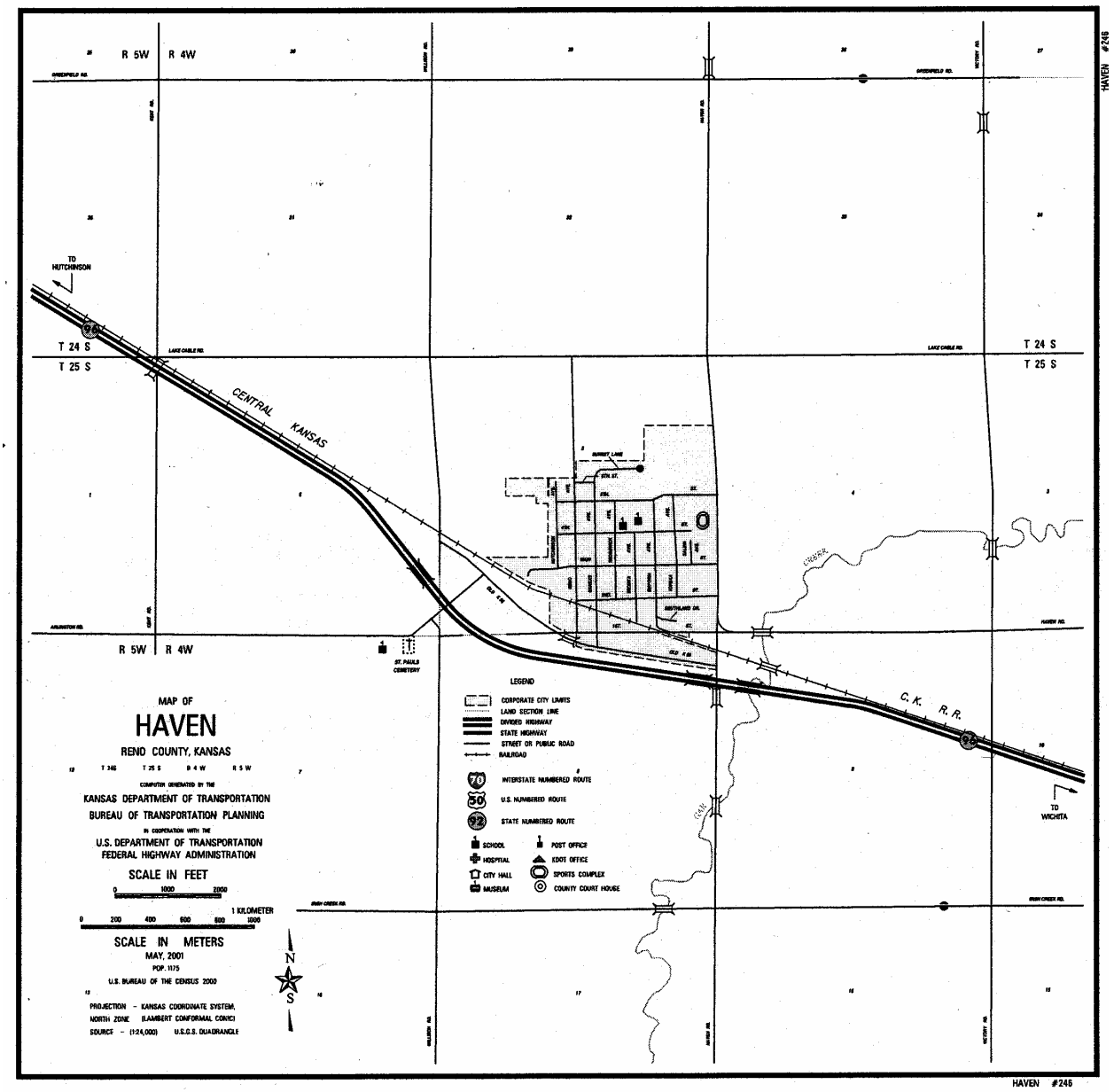


FIGURE 4: HAVEN, KANSAS AND K-96 BYPASS

A bypass on US-50 was completed in August 1998, north of Peabody, Kansas in Marion County. Before the bypass was built, US-50 passed through the northern edge of Peabody. The US-50 bypass was built north of the former route (see Figure 5).

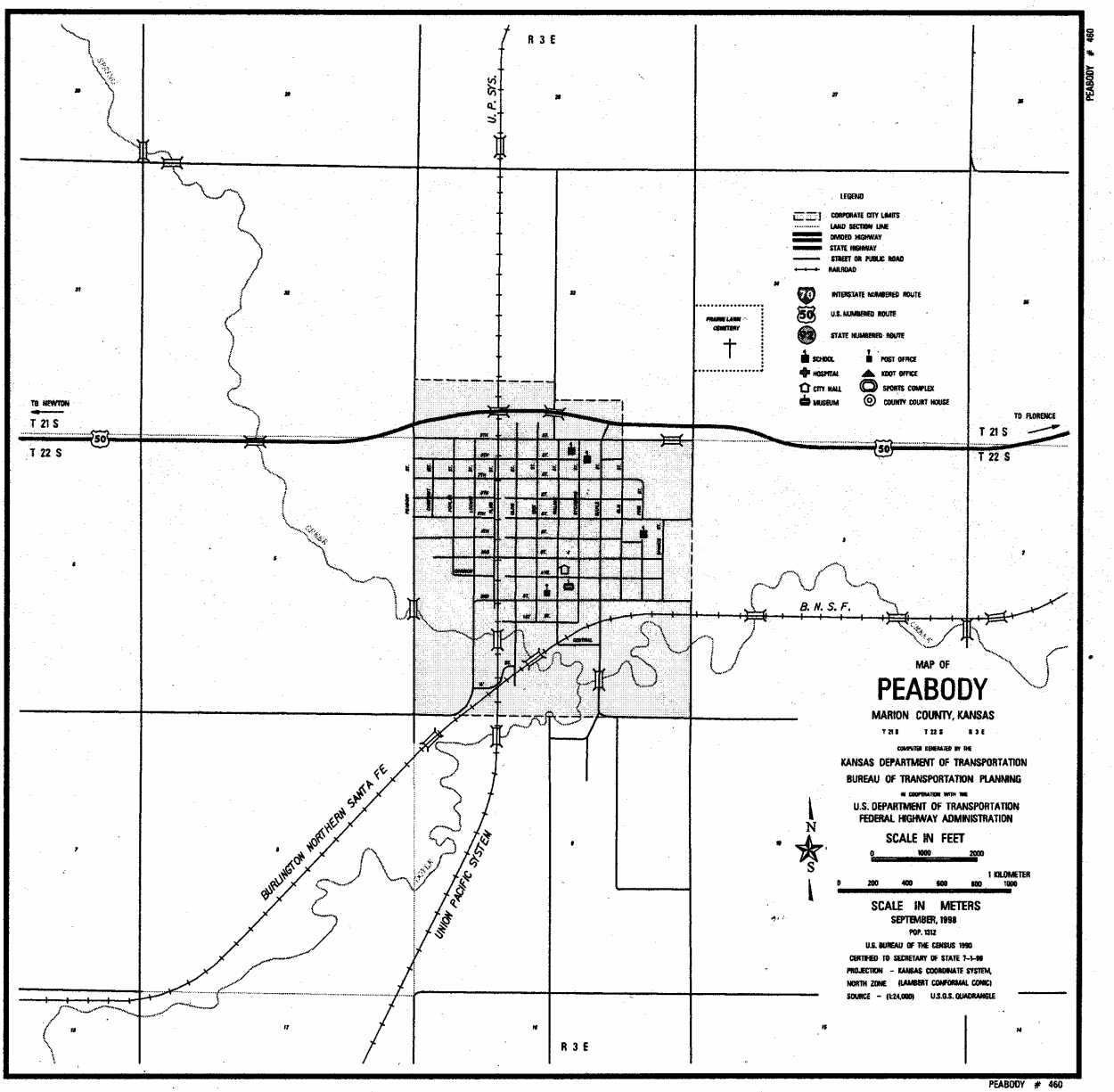


FIGURE 5: PEABODY, KANSAS AND US-50 BYPASS

The oldest bypass in the sample is the US-69 bypass, built around the east side of Pleasanton, Kansas, in Linn County, and completed in December 1990. The old US-69 Highway was a north-south road passing through the center of Pleasanton (see Figure 6).

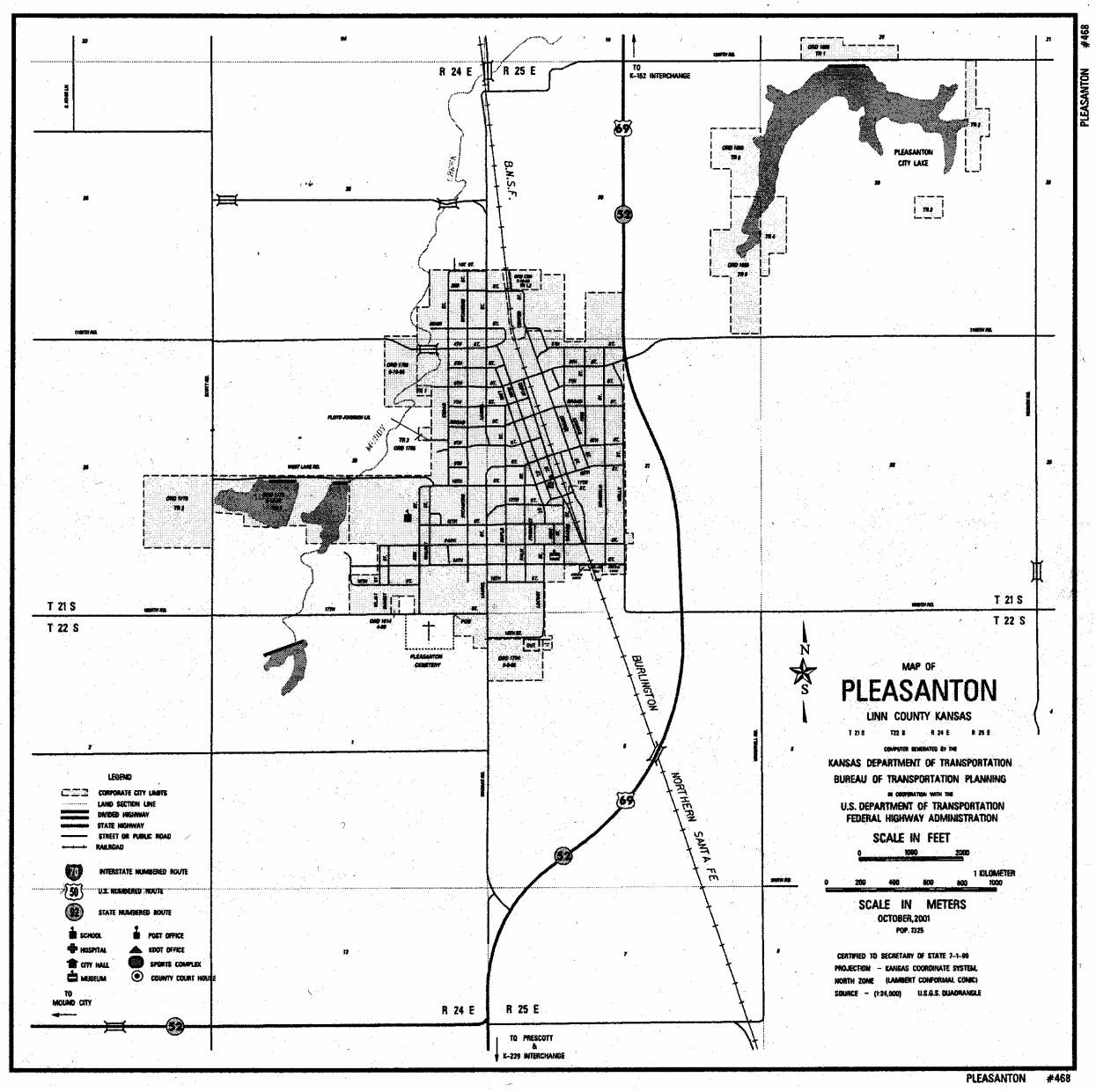


FIGURE 6: PLEASANTON, KANSAS AND US-69 BYPASS

Prior to the opening of the US-166 bypass in August 1997, south and west of Sedan, Kansas in Chautauqua County, US-166 had passed through Sedan. It is an east-west road and when the motorist was traveling west, US-166 turned north into Sedan prior to the opening of the bypass. The new bypass alignment does not turn north and passes several miles south of Sedan, connecting with US-166 Business several miles west of Sedan (see Figure 7).

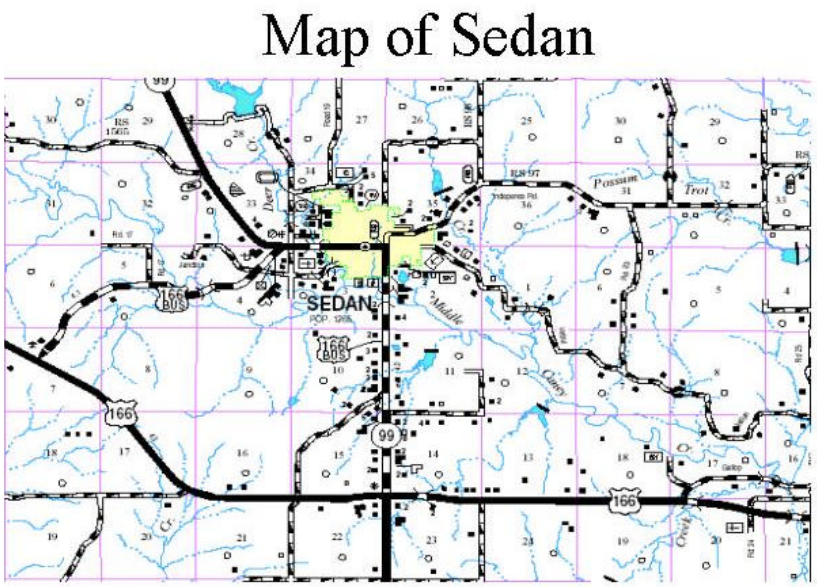


FIGURE 7: SEDAN, KASNAS AND US-166 BYPASS

A bypass on Kansas Highway 254 (K-254) was completed in November 1998, north of Towanda, Kansas, in Butler County. It is a four lane divided highway and prior to construction, the old alignment passed through the center of Towanda (see Figure 8).

The second oldest bypass in the sample is the U.S. Highway 36 bypass built north of Troy, Kansas, in Doniphan County, and completed in April 1991. The old alignment of US-36 passed east to west through the northern edge of Troy (see Figure 9).

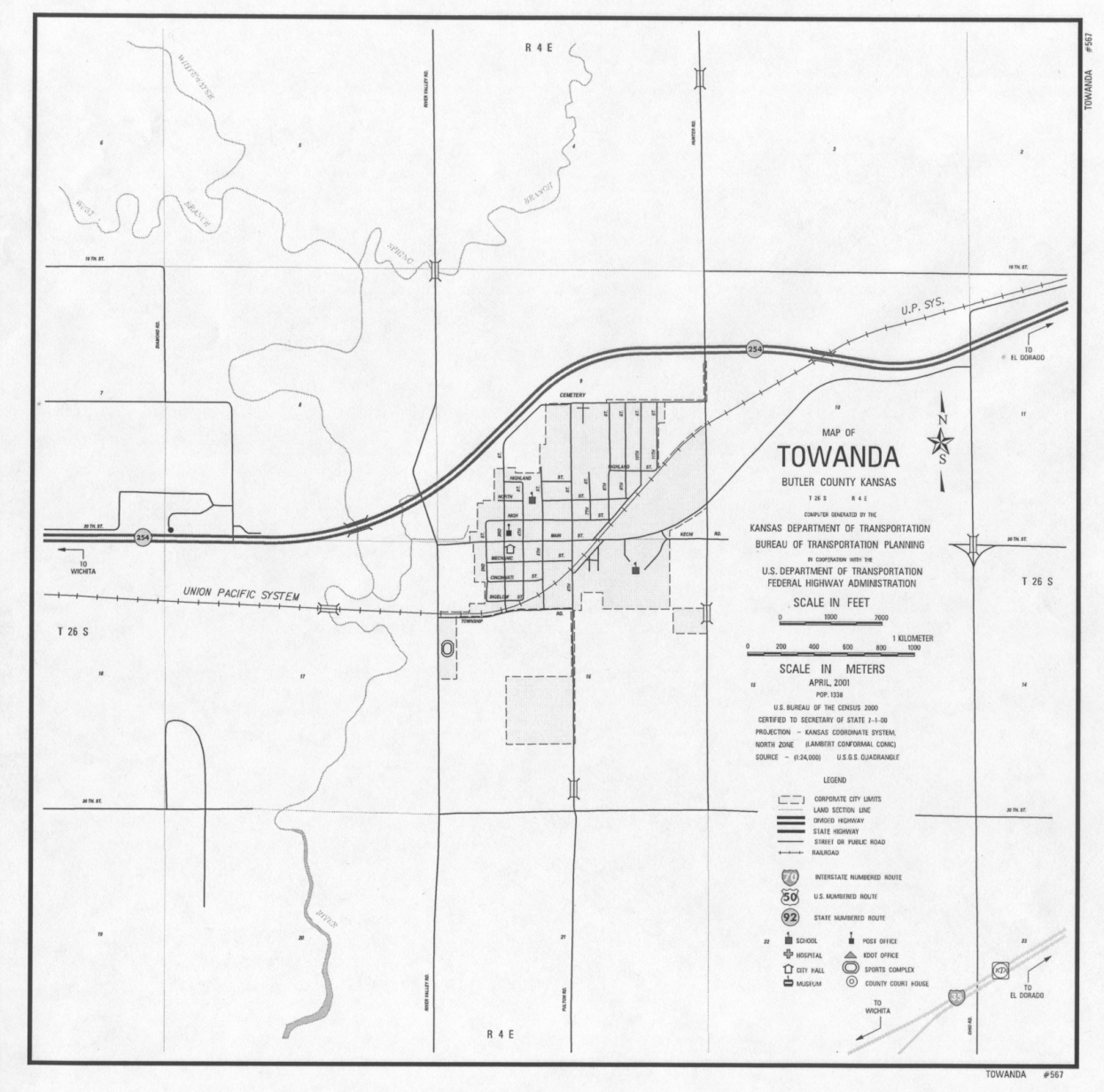


FIGURE 8: TOWANDA, KANSAS AND K-254 BYPASS

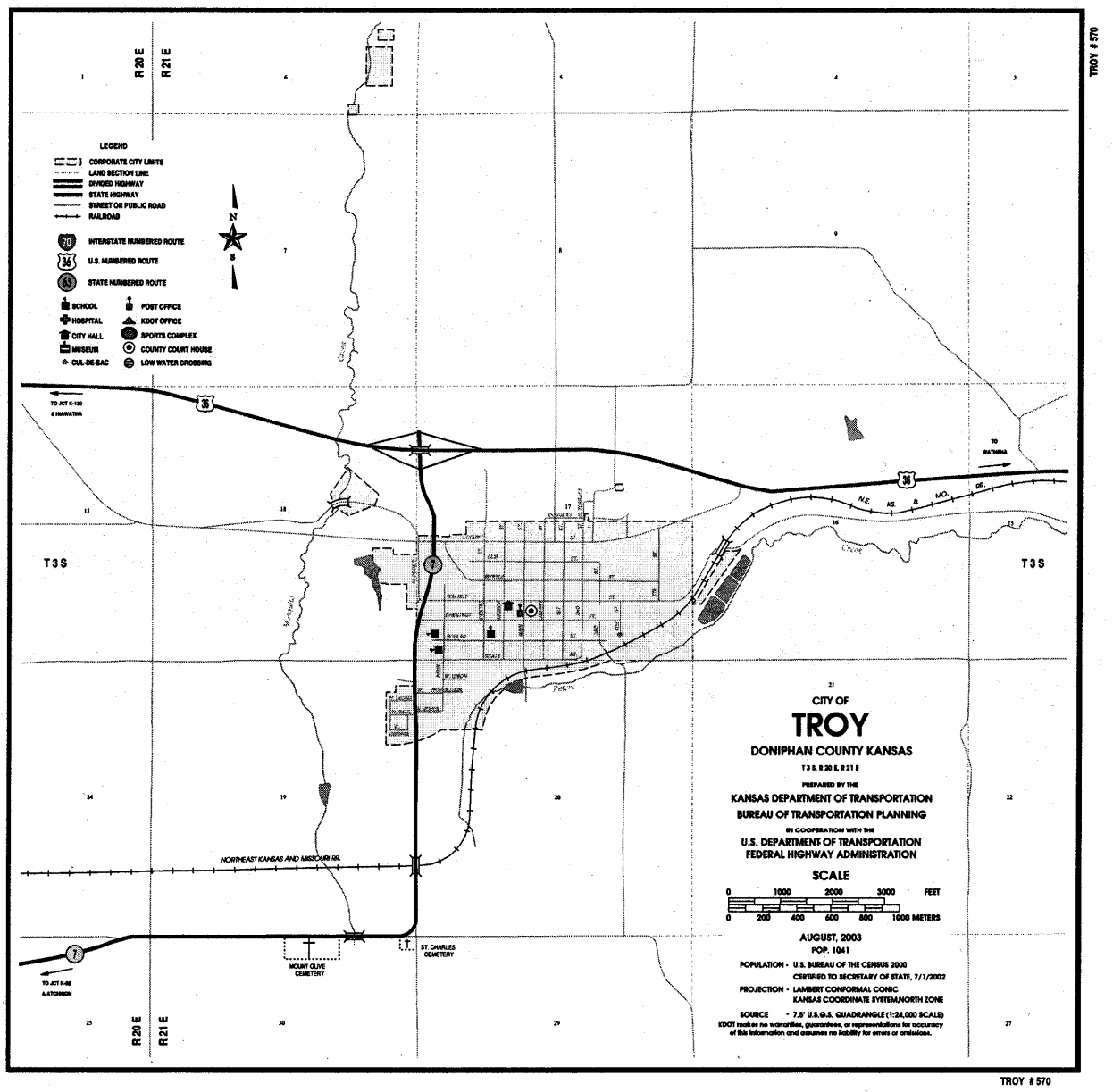


FIGURE 9: TROY, KANSAS AND US-36 BYPASS

1.3 Selection of Control Towns

Objective 1 is to measure the impact of the highway bypass on the total employment of the bypass town. To accomplish this objective each of the sample bypass towns was matched with a group of control towns. The objective was to select control towns that are as similar as possible to the bypass town, with the major difference being the absence of a bypass in the control towns.

It was assumed that economic factors affect total employment in the bypass and control towns in a similar manner. Thus any difference in total employment between the sample bypass town and the control towns is attributable to the bypass.

Potential control towns were those located in the same region of Kansas as the bypass town. Thus if the bypass town was located in southeast Kansas, the control towns had to be in southeast Kansas as well. None of the bypass or control towns is located on an interstate highway or near a large metropolitan area. Although socioeconomic data for small towns is limited; population, employment, and state retail sales tax collection data is available for all Kansas towns. The Labor Market Information Service of the Kansas Department of Human Resources (KDHR) collects employment and payroll data which can be grouped by zip codes and thus related to each town in Kansas. The Kansas Department of Revenue (KDOR) has state sales tax collection data for each Kansas town, starting in November 1999. Decennial population data is available from the U.S. Bureau of the Census for every incorporated town in the United States.

Table 2 contains year 2000 population, employment, and state sales tax collection data for each sample bypass town and their associated control towns. The control towns for Cedar Vale are Burden and Udall in Cowley County, Howard in Elk County and Thayer in Neosho County. The year 2000 population of Cedar Vale was 723, and the population of the control towns ranged from a low of 500 (Thayer) to a high of 808 (Howard). Cedar Vale 2000 total employment was 338, while the total employment of the control towns ranged from a low of 75 (Thayer) to a high of 440 (Howard). Year 2000 state sales tax collections were about $80,000 for Cedar Vale in 2000 compared to a range of about $95,000 (Burden) to $130,000 (Udall) for the control towns.

The control towns for Cherryvale are Caney in Montgomery County, Oswego in Labette County, Yates Center in Woodson County and Neodesha in Wilson County. The year 2000 population of Cherryvale was 2,386 compared to a range of 1,599 (Yates Center) to 2,848 (Neodesha) for the control towns. Cherryvale year 2000 total employment was 744 while the total employment of the control towns ranged from a low of 601 (Yates Center) to a high of 2,500 (Neodesha). State sales tax collections for Cherryvale in 2000 were about $580,000 while the range for the control towns was from about $462,000 (Caney) to $789,000 (Neodesha).

Eureka in Greenwood County, Burlington and Girard in Crawford County, and Baxter Springs in Cherokee County are the control towns for Fredonia. The largest bypass town in the sample, Fredonia had a year 2000 population of 2,600, while the populations of the control towns ranged from a low of 2,773 (Girard) to a high of 4,602 (Baxter Springs). Since the employment and population data are collected by different government agencies, occasional anomalies occur in the population and employment data. Such a situation occurs in the case of two of the Fredonia control towns as the reported total employment in Burlington and Girard exceeds the reported population of these towns. Year 2000 total employment for Fredonia was 1,331 compared to a range of 1,258 (Eureka) to 3,524 (Girard) for the control towns. Year 2000 state sales tax collections for Fredonia were $1,254,533 while the corresponding figure for the control towns ranged from a low of $965,439 for Eureka to $1,464,441 for Baxter Springs.

There are six control towns for Haven including Ellinwood in Barton County, Halstead in Harvey County, Sterling in Rice County, and Andale, Clearwater and Colwich in Sedgwick County. Haven had a year 2000 population of 1,175 compared to a range of 766 (Andale) to 2,642 (Sterling) for the control towns. Haven total employment was 629 in year 2000 while that of the control towns ranged from a low of 540 (Andale) to a high of 1,916 (Clearwater). State

sales tax collections in year 2000 were about $440,000 for Haven compared to a range of about $382,000 (Andale and Halstead) to $492,000 (Clearwater).

The control towns for Peabody are Burrton and Sedgwick in Harvey County, Cottonwood Falls in Chase County, and Inman and Moundridge in McPherson County. The year 2000 population of the control towns ranged from a low of 966 (Cottonwood Falls) to a high of 1,593 (Moundridge) as opposed to the Peabody population of 1,384. Total employment in Peabody was 435 compared to a range of 324 (Burrton) to 1,725 (Moundridge) for the control towns. Data anomalies occurred for Moundridge as reported total employment of 1,725 exceeds the reported population of 1,593. Year 2000 state sales tax collections for Peabody were about $246,000 while that of the control towns ranged from a low of about $175,000 (Sedgwick) to a high of about $278,000 (Moundridge).

Neodesha in Wilson County, Yates Center in Woodson County, Galena in Cherokee County, Oswego in Labette County, and Wellsville in Franklin County are the control towns for Pleasanton. The year 2000 population of Pleasanton was 1,387 compared to a range of 1,599 (Yates Center) to 3,287 (Galena) for the control towns. Total employment of the control towns ranged from a low of 601 (Yates Center) to a high of 2,500 (Neodesha) as opposed to 427 for Pleasanton. Year 2000 state sales tax collections for Pleasanton were about $644,000 while the corresponding figure for the control towns ranged from a low of $466,000 (Wellsville) to a high of $789,000 (Neodesha).

The control towns for Sedan are Caney in Montgomery County, Yates Center in Woodson County, and Chetopa and Oswego in Labette County. The year 2000 population of Sedan was 1,342 while that of the control towns ranged from 1,281 (Chetopa) to 2,092 (Caney). Total employment of the control towns was lowest in Chetopa (334) and highest in Caney

(1,089) compared to 556 in Sedan. Year 2000 state sales tax collections in Sedan were $381,000 compared to a range of about $304,000 (Chetopa) to about $565,000 (Yates Center).

Burrton and Sedgwick in Harvey County, Conway Springs and Oxford in Sumner County, Madison in Greenwood County, Cottonwood Falls and Strong City in Chase County, and Florence in Marion County are the control towns for Towanda. The year 2000 population of Towanda was 1,338 compared to that of the control towns that ranged from a low of 584 (Strong City) to a high of 1,537 (Sedgwick). Total employment of the control towns varied from 180 (Strong City) to 466 (Cottonwood Falls) while the corresponding figure for Towanda was 577. Year 2000 state sales tax collections for Towanda were about $227,000 dollars whereas the control towns ranged from about $175,000 (Sedgwick) to about $301,000 (Oxford).

The control towns for Troy are Effingham in Atchison County, Meriden in Jefferson County, and Westmoreland and Onaga in Pottawatomie County. The population of Troy in year 2000 was 1,054 while the population of the control towns varied from 588 (Effingham) to 706 (Meriden). Troy total employment was 399 compared to that of the control towns that ranged from 287 (Effingham) to 1,125 (Onaga). However, data anomalies exist for both Meriden and Onaga as reported employment exceeds reported population for both towns. Troy state sales tax collections in year 2000 were about $151,000 compared to the corresponding figure for the control towns that varied from a low of about $114,000 (Effingham) to a high of about $164,000 (Onaga).

TABLE 2: Comparison of Bypass Town and Control Town Population, Employment and State Sales Tax Collections Year 2000

CEDAR VALE

Bypass Town – Cedar Vale

Population	723
Employment	338
State Sales Tax Collections	$79,964

Control Towns for Cedar Vale

Town (County)	Population	Employment	State Sales Tax Collections
Burden (Cowley)	564	169	$94,968
Udall (Cowley)	794	233	129,875
Howard (Elk)	808	440	123,533
Thayer (Neosho)	500	75	105,578

CHERRYVALE

Bypass Town – Cherryvale

Population	2386
Employment	744
State Sales Tax Collections	$580,413

Control Towns for Cherryvale

Town (County)	Population	Employment	State Sales Tax Collections
Caney (Montgomery)	2092	1089	$461,738
Oswego (Labette)	2046	846	477,773
Yates Center (Woodson)	1599	601	565,465
Neodesha (Wilson)	2848	2500	789,202

FREDONIA

Bypass Town – Fredonia

Population	2600
Employment	1331
State Sales Tax Collections	$1,254,533

Control Towns for Fredonia

Town (County)	Population	Employment	State Sales Tax Collections
Eureka (Greenwood)	2914	1258	$965,439
Burlington (Crawford)	2790	2843	1,035,205
Girard (Crawford)	2773	3524	1,189,988
Baxter Springs (Cherokee)	4602	2165	1,464,441

HAVEN

Bypass Town – Haven

Population	1175
Employment	629
State Sales Tax Collections	$439,761

Control Towns for Haven

Town (County)	Population	Employment	State Sales Tax Collections
Ellinwood (Barton)	2164	678	$480,280
Halstead (Harvey)	1873	1156	381,889
Sterling (Rice)	2642	1024	418,728
Andale (Sedgwick)	766	540	382,529
Clearwater (Sedgwick)	2178	1916	492,178
Colwich (Sedgwick)	1229	816	440,731

PEABODY

Bypass Town – Peabody

Population	1384
Employment	435
State Sales Tax Collections	$245,767

Control Towns for Peabody

Town (County)	Population	Employment	State Sales Tax Collections
Burrton (Harvey)	932	324	$262,678
Cottonwood Falls (Chase)	966	466	211,513
Inman (McPherson)	1142	513	255,909
Moundridge (McPherson)	1593	1725	277,729
Sedgwick (Harvey)	1537	342	174,681

PLEASANTON

Bypass Town – Pleasanton

Population	1387
Employment	427
State Sales Tax Collections	$644,265

Control Towns for Pleasanton

Town (County)	Population	Employment	State Sales Tax Collections
Neodesha (Wilson)	2848	2500	$789,202
Yates Center (Woodson)	1599	601	565,465
Galena (Cherokee)	3287	1279	550,293
Oswego (Labette)	2046	846	477,773
Wellsville (Franklin)	1606	666	466,418

SEDAN

Bypass Town – Sedan

Population	1342
Employment	556
State Sales Tax Collections	$381,005

Control Towns for Sedan

Town (County)	Population	Employment	State Sales Tax Collections
Caney (Montgomery)	2092	1089	$461,738
Yates Center (Woodson)	1599	601	565,465
Chetopa (Labette)	1281	334	304,231
Oswego (Labette)	2046	846	477,773

TOWANDA

Bypass Town – Towanda

Population	1338
Employment	577
State Sales Tax Collections	$227,466

Control Towns for Towanda

Town (County)	Population	Employment	State Sales Tax Collections
Burrton (Harvey)	932	324	$262,678
Sedwick (Harvey)	1537	342	174,681
Conway Springs (Sumner)	1322	414	233,346
Oxford (Sumner)	1173	306	300,955
Madison (Greenwood)	857	350	194,430
Cottonwood Falls (Chase)	966	466	211,513
Strong City (Chase)	584	180	197,654
Florence (Marion)	671	341	190,578

TROY

Bypass Town – Troy

Population	1054
Employment	399
State Sales Tax Collections	$150,650

Control Towns for Troy

Town (County)	Population	Employment	State Sales Tax Collections
Effingham (Atchison)	588	287	$113,796
Meriden (Jefferson)	706	829	154,136
Onaga (Pottawatomie)	704	1125	163,643
Westmoreland (Pottawatomie)	631	501	123,471

Sources: (Population) Policy Research Institute, The University of Kansas, *Kansas Statistical Abstract 2000* (September 2001), pp. 2-70 to 2-88. (Employment) Labor Market Information Service, Kansas Department of Human Resources, ES-202 employment data collected from Employer's Quarterly Wage Reports and Contribution Returns. (State Sales Tax Collections) Kansas Department of Revenue.

1.4 Methodology

Objective 1 was achieved with regression analysis. KDHR provided annual average total employment data for the bypass and control towns for the 1988 to 2001 period. Total employment in each bypass town was regressed on total employment of each of its control towns. The impact of the bypass on total employment in the bypass town was measured by a bypass dummy variable which was equal to zero for the years before the bypass was completed and equal to 1.0 for each year following the opening of the bypass.

One way of achieving Objectives 2, 3 and 4 of the study is to ask business owners and managers in bypass towns how the retail sales, employment, and labor cost of their firms were affected by the highway bypass. Since it was impractical to interview every business in the

bypass towns, only the owners and managers of firms that were most likely to have been impacted by the bypass were interviewed. Thus, we interviewed the owners and managers of the following travel-related businesses: restaurants; convenience stores; motels; and auto and truck repair shops

A total of 54 business owners and managers in the nine bypass towns were interviewed by the research team. To confirm information obtained in the interviews a questionnaire (see Appendix A) was also distributed to these business representatives and 35 of them were returned for a response rate of 65 percent.

Objective 5 was achieved through personal interviews of road supervisors and county engineers in the eight counties containing the nine sample bypass towns. Seven of the eight county engineers or road supervisors completed questionnaires as well (see Appendix B).

Chapter 2

Literature Review

The literature review was conducted in order to better understand methods and concepts used by other researchers in the field of transportation economics, and to give insights as to new methods that might be used to better examine the effects of highway bypasses on rural economies.

The method most often used by transportation economists in measuring the impact of highway bypasses on rural communities was regression analysis in a quasi-experimental framework that compares economic effects in communities with bypasses to those without bypasses. Most researchers used regression to get an understanding of the effects of bypass construction over time.

The conclusion of most of the studies indicated that the effects of highway bypasses on rural communities were, for the most part, undetermined. The results of the regression analyses were not able to give any clear indication as to the positive or negative effects on communities due to highway bypasses. In the literature review, all of the researchers concluded that any effects on the local economy were mainly due to factors unrelated to the construction of bypasses.

2.1 Anderson, S.J., H.S. Mahmassani, R. Helaakoski, M.A. Euritt, C.M. Walton and R. Harrison (1993) Economic Impact of Highway Bypasses. *Transportation Research Record* 1395: 144-152.

The goal of this study was to measure the economic impact of highway bypasses constructed around small rural communities in Texas. The results were made available to rural business owners who voiced concerns about the possibility of declining economic activity caused by the construction of highway bypasses around their communities.

In identifying communities that would be studied, the researchers identified experimental cities (those with bypasses) with similar characteristics such as accessibility to a highway, proximity to large urban centers, economic base, size of retail market, and population and growth trends. Once the researchers had identified the experimental cities (23 in total), each of the cities was then matched with a control group city (non-highway bypass cities) that had the same characteristics as the experimental city.

In order to measure the economic effects on the various industries of cities with highway bypasses, the researchers used econometric modeling that would provide information as to the expected changes the would occur in industries affected by highway bypasses. The researchers also chose to use two other models; cluster analysis which improves the specification of the econometric model, and a multivariate statistical procedure, which measures any underlying economic structure of the bypass city.

The data collected for this study was divided into two categories: dependent and explanatory variables. Dependent variables measure business activity and the researchers used total retail sales as an indicator of short-run economic activity in the city. Explanatory variables reflect changes in the demographic, geographic, and economic characteristics of the cities selected for this study.

In devising a method of studying the effects of highway bypasses in rural communities, the researchers divided the econometric model into four dependent variable sub-categories: total retail sales, highway oriented business sales, restaurants sales, and service-oriented business sales. By dividing the study into these four parts, it became possible to determine which industries were most affected (positively or negatively) by construction of highway bypasses. Although the models measured the effects of bypasses on different types of industries found

within the communities, the models contain certain explanatory variables that were standard to all of the models including population, income, proximity to metropolitan areas, traffic volume, and number of highways entering the community. Once the data for these variables had been collected for a particular community, the researchers incorporated variables into their model that would measure the economic impact of bypasses on different industries.

The econometric model indicated that there was a small decrease in economic activity due to highway bypasses. However, when the researchers combined the cluster analysis with the econometric model, the overall economic condition in the region improved. **Therefore, the researchers concluded that highway bypasses do not have a negative impact on economic growth**. This is because the decrease in some types of industry sales in the community was counteracted by changes in the way business managers and owners operated their firms i.e., that they might have relocated to areas with heavier traffic volume.

2.2 Broder, J.D., T.D. Taylor, and K.T. McNamara (1992) Quasi-Experimental Designs for Measuring Impacts of Developmental Highways in Rural Areas. *Southern Journal of Agricultural Economics*: 24, 1:199-207.

The focus of this study was to document the economic impact of developmental highways in Georgia rural areas. The study was intended to determine the economic impact of highways on rural communities. Another objective of the researchers was to estimate the change in economic activity associated with highway development. On completion of the study, local decision-makers would be able to use the techniques developed on "site-specific or case-study levels" to determine the economic impact of developmental highways on their communities.

The researchers determined that a quasi-experimental method would provide the most effective technique for finding a relationship between highways and economic activity. The data for the study covered a period of 17 years. The objective of the first part of the research was to

establish a plausible causality to support the claim that economic impacts were due to highways. Tractable causality also had to be controlled, which measures the "effects of non-highway factors on the control counties." By focusing on tractable causality, the researchers were better able to measure spatial independence, which is "when highway related impacts affect not only the experimental county but also the adjacent counties." The experiment used a time series analysis with non-equivalent non-treatment control group, more commonly referred to as regression discontinuity analysis (RDA). The model is as follows:

$$Y_i = B_o + B_iC_i + B_2E_i + e_i \qquad \text{(Equation 2.1)}$$

Where Y_i is the i^{th} economic variable in the county with the highway, C_i is the i^{th} economic variable in the control counties without the highway, E_i is the intercept binary set at 0 before the highway was opened and 1.0 after the highway was opened for traffic, and e_i is the error term.

Since this study was primary concerned with controlling for non-highway related factors in the development process, the economic impact on highway-related activity was for the most part estimated with other counties that shared the same attributes as the experimental counties. Hence, once the control counties were identified, an average was taken of the control counties and used in the computations. Second, in order to prevent any type of urban influence on study results, the inquiry was limited to rural areas with developmental highway construction. The main problem facing the researchers was that by using adjacent counties to reduce the tractable causality, they coincidentally jeopardized spatial independence, which causes the RDA model to either over or under estimate the economic impact that highway development might have on rural communities. As a result, the RDA model was readjusted to include non-adjacent counties, which led to an increase in the number of control counties in the study.

The researchers could not find enough evidence to conclusively determine the

relationship between highway development and economic activity. They were able to conclude that increases in economic activity were attributable to non-highway development activity in the counties. They noted that highway developmental activity might increase economic activity (i.e. highway construction) in a region for a short period of time. Continuous growth in a particular county might also be attributed to the geographical location of the rural community relative to an urban center, and the general economic conditions that might be affecting the community before and after the completion of the highway.

2.3 Burress, David (1996) *Impact of Highway Bypasses on Kansas Towns*. Kansas Department of Transportation Final Report No. K-TRAN: KU 95-5

The goal of this study was to determine if construction of highway bypasses in Kansas caused any changes in the economic activity of local communities. The results of the study were used by KDOT to determine if construction of new highway bypasses was cost effective, i.e., the economic gain of the community and intercity drivers would be greater than the cost of bypass construction.

Burress obtained county data from KDOR and the Kansas Department of Human Resources (KDHR). This secondary data was then used to conduct a regression analysis that would explain any changes in the economic activity of a particular county, resulting from a bypass.

In determining the effects that were caused by the construction of highway bypasses, Burress divided the study into two categories, short-term and long-term effects of highway bypass construction. In both cases a regression analysis (time series and cross-sectional) was conducted to determine the effect of a bypass on economic activity. Using a time series analysis the long-term effect was measured using data covering a 21 year period, while the short-term effect focused on the time period just before construction, the construction period, and a very

short period after construction of the bypasses. Cross-sectional analysis compared experimental communities with control communities, in order to determine the effects of highway bypasses. Once the data was collected, Burress examined the effects that highway bypasses have on local employment and on local retail sales in the communities that were included in the study.

Burress concluded that in the long run, the local economies were not significantly affected by the construction of highway bypasses. He concluded that although some businesses might experience a negative effect due to the bypass, most travel-related businesses would move to a location that was closer to the bypass. Also, the effect that a highway bypass might have on one community is not transmitted to all of the rural communities within Kansas. Other factors not related to the construction of the bypasses might affect the economic activity in a particular community.

In the short run, Burress concluded that the effects of bypasses on rural Kansas economies were not significant. He hypothesized that the impact of the construction of highway bypasses in the short run, is only temporary, and the effects on the economy would not be apparent until the long run. However, after estimating the regression for the short run, the results revealed that the short run effects were so insignificant that they could be ignored. Burress asserted that these results are for the entire sample, which means that there may have been individual communities that might have experienced other results that are not consistent with the overall results of the study.

2.4 **Engle,D. and Y.J. Stephanedes (1987) Dynamic Highway Impact on Economic Development. *Transportation Research Record 1116*, Transportation Research Board, Washington, D.C.**

The goal of this research was to explore how highway construction projects impact employment in communities that are in close proximity to the project. The results of the study were used by

the Minnesota Department of Transportation and other government agencies in determining whether or not to increase highway funding in order to stimulate local economies in Minnesota.

Data for this study included annual expenditures for highway construction projects, and employment for all counties in the state. The data was obtained from the Minnesota DOT, covering a period of 26 years from 1957 to 1982. Employment data were also collected from *County Business Patterns* covering a period of 19 years (1964 to 1981). The *County Business Patterns* data did not include workers that were self-employed, railroad, and government employees.

In order to understand the effects of highway construction on the economic development of a community, the researchers employed two methods. The first method used was the Granger-causality test, which establishes a null hypothesis that X does not cause Y. Once this is established, X is then regressed on past, present and the future values of Y. The second method was a structural time series plot of highway construction and employment. The time series plots were divided into subcategories that would better identify the relationships between highway construction and employment in regional centers. These sub-categories are: urban cities, towns next to urban centers, regional centers, towns next to regional centers, percent change in employment level statewide, and percent change in highway expenditure.

The results of this study indicated that highway construction does not increase employment in a particular area, although the study found that employment levels did increase during the period of highway construction. However, once the project was completed employment in the region fell. The researchers also mentioned that if employment in the economic center of a county increased, it had the effect of decreasing employment in the small communities that surround the economic center. Hence, the construction of new highways

in the economic center caused increased migration of workers and customers towards the economic center. This migration towards the economic center reduced economic activity in the outlining areas causing an increase in unemployment in those regions.

2.5 Forkenbrock, D.J., T. Pogue, N. Foster and D. Finnegan (1990) *Road Investment to Foster Local Economic Development*. Public Policy Center, University of Iowa.

The purpose of this study was to find the correlation between highway expenditure and economic activity in Iowa counties. State planners used the results from the study to determine if highway-induced increases in economic activity are greater than the cost of funding new highway projects.

The focus of this study was an economic development project instituted by the state of Iowa called RISE (Revitalize Iowa's Sound Economy). The goal of the program was to build new roads throughout Iowa, in the hopes of increasing state net wealth, especially in low growth areas. Funding for the project would mainly come from increases in gasoline taxes. Thus the problem facing the state was determining if the RISE program would be an economic stimulus that would provide economic growth throughout Iowa.

The researchers in this study examined the conditions that had to occur in order to conclude that highway expenditure affects income. The first condition was that a firm's location would be influenced by the highway project; therefore, state planners must take into consideration the effects on county income generated by a firm's relocation due to highway access. The second condition was to determine if the road project was cost effective. This condition determines what the benefit would be if the firm's location were not affected by the RISE project. In other words, if there were no RISE project would the location of a firm near a non- RISE road increase the income level of the community? The last condition required by the

researchers is to determine if the overall benefits of the RISE projects are positive. This condition can be expressed in mathematical terms as follows:

$$(Br - B) = (Wr - W) + (Pr - P) - C \qquad \text{(Equation 2.2)}$$

Where (Br-B) is the net benefit of the RISE project, and (Wr – W) is the wealth gain to others (communities) with the RISE project, minus the gains to others without the RISE project. (Pr – P) is the firms' profits with the RISE road minus the profit of the firms without the road, and C is the cost of the road. Thus Br > B must be true in order to insure that the RISE project will increase the income level in the local community.

The researchers found that the best measure of economic development of a city and county was total income. **They also found that given the current level of economic activity in Iowa, a clear understanding of how the RISE program has impacted Iowa communities could not be determined**. However, the researchers stated that the RISE program could prove to be an effective tool in determining whether road investment will increase income in local Iowa communities if more data was available to use in the screening process.

2.6 Helaakoski, R., H.S. Mahmassani, C.M. Walton, M.A. Euritt, R. Harrison and S.J. Anderson (1992) Economic Effects of Highway Bypasses on Business Activities in Small Cities. *CTR Research Report 1247-7*. Center for Transportation Research, University of Texas at Austin.

The goal of this study was to measure the effects of highway bypasses on small cities in Texas. On completion of the study, the Texas Transportation Planning Board used the results from the study to determine which communities would benefit the most from highway bypass construction. The results from the study were also used to explain to local business owners how bypass construction would impact business activities.

In order for the researchers to achieve their objectives, they used an econometric model and plot analysis. The researchers elected to divide the econometric model into four industry

components: total retail sales, gas station sales, restaurant sales, and service sales. In addition to dividing the model into four parts, the researchers hypothesized that population plays an important role in economic development. Therefore the researchers divided all cities included in the study into two categories, one for cities with a population less than 6,000, and cities with a population greater than 6,000. Hence, the re-classification of cities increased the number of econometric models to eight, which were then used to determine the economic impact (by industry) due to bypass construction. Plot analysis was used to examine trends from a time-series that covered 45 years (1945 to 1990). The use of plot analysis helped the researchers determine how economic activity changed on a per year basis. Hence, by studying trend lines the researchers were able to obtain a visual correlation between highway bypasses and the economic impact on the bypassed city.

In examining the bypass impact results of the econometric models, the researchers observed that there was a significant yet small decrease in the amount of economic activity experienced by businesses in small cities. However, other models that included economic factors that were non-highway related revealed an indeterminate conclusion because the results of these models indicated that while some cities were experiencing an increase in economic activity, others were experiencing the opposite effects on their economies. The researchers concluded that factors that are not related to highway bypass construction are the cause of these results. The researchers also acknowledged that future economic activity could be somewhat predicted by observing the pre-bypass economic environment of each city. Given this hindsight into the pre-bypass economic condition of a city, the researchers concluded that cities that were growing prior to bypass construction would be significantly helped by the bypass. On the other hand, cities that had low or declining economic growth would not benefit

from the construction of a bypass. In fact, construction of bypasses will depress economic activity in these cities.

2.7 Jesse E. Buffington and Dock Burke, Jr. (1991) Employment and Income Impact of Expenditures for Bypass, Loop and Radial Highway Improvements. *Transportation Research Record* 1305: *225-253.*

The goal of this study was to determine if a relationship exists between local community economic activity and road construction. The state of Texas Highway Planning Board used the results obtained in this study to determine which type of community will receive the most benefit from road construction.

The objective of this study was to discover if increases in road improvement would cause an increase in employment and income in the local community. To achieve the objective, Buffington and Burke used data that encompassed most of the major radial highways, bypasses, and loops found in Texas. The cities selected for this study had a population of approximately 4,000 with an analysis period from 1955 to 1984.

In order to determine the employment and income effects of construction on the local level, Buffington and Burke estimated two sets of equations using single equation linear regression analysis. One of the equations was a cross sectional model, which measures the micro level relationship between economic dependent variables and explanatory variables. The second model was a combination of the cross sectional model and time series model. This model was intended to measure the macro and micro level relationships between the economic dependent variables and explanatory variables.

Buffington and Burke concluded that there was a statistically significant positive impact on local economic activity that resulted from the construction of radial highways, bypasses and loops.

2.8 Kuehn J.A., and J.G. West (1971) Highways and Regional Development. *Growth and Change* 2: 23-28

This study was conducted to determine the economic effect of highways in the rural mountainous area known as the Ozarks.

The objective of this project was to determine if there was a relationship between highways and the economic development of the Ozark region. Since the Ozark is a rural and mountainous area characterized by low per capita income and low growth in employment opportunities, government planners were searching for policies to stimulate the economy of the region. Hence Kuehn and West wanted to determine if a network of highways in the region would increase economic development of the area, and to determine the direction of causation between highway investment and increases in the levels of income and employment in the region. They were also intent on finding the most suitable types of highways that would be most beneficial to the region.

The method used in determining the relationship between highways and economic development was a correlation analysis between roads and income type. Roads were classified as all roads and highways within the jurisdictions of state, county and turnpike authorities. The data for the study was obtained for a three year model, which used 1954, 1959 and 1963 highway types, which were then related to 1959 income or 1960 employment figures. Data on highway volume and income were collected from the governments of the states comprising the Ozark (Arkansas, Missouri and Oklahoma) region. The result of the analysis was a matrix that contained the correlation coefficients between types of roads in the region, and total income per square mile, per capita income, and family median income.

A second correlation analysis was conducted to study the relationship between roads and employment in manufacturing industries. Road classification remained the same. Employment

data was collected for the manufacturing industries that were located in the region. Industry categories were food, apparel and textiles, wood production, printing, chemicals, metal manufacturing, machinery, and transportation equipment. A third correlation study was performed to determine the correlation between employment in the trade and service industries (wholesale trade, retail trade, financial services and recreation related services) and road types.

The study concluded that there is no indication that a highway network within the Ozark Region has made any significant contribution to economic development in the area. Kuehn and West also concluded that highway development probably increased income and employment in the short run as result of the economic activity related to the construction of highways in the region. **The researchers also found that "Others who study the role of transportation…see…the probability of success is dependent on the existence of prior dynamism. Therefore, the investment in highways must be part of a cluster of change**."

2.9 Rephann, T.J. and A.M. Isserman (1994) New Highways as Economic Development Tools: An Evaluation Using Quasi-Experimental Matching Method. *Regional Science and Urban Economics.* 24: 723-751.

The purpose of this paper was to document the impact of highway development projects on local economies. The results of the study were used by the federal government in determining if highway expenditures can be used as a stimulus tool to increase economic activity within local communities.

Rephann and Isserman used a quasi-experimental method in order to determine how the cities in this study were affected by the construction of highways. They also incorporated the use of a non-equivalent control group with an interrupted time-series method. Data collected for the study was obtained from the Virginia Department of Transportation and local government agencies, and covered both the pre-and-post highway construction periods.

In order to determine the correct matching of experimental and control groups, Rephann and Isserman used a three-step method. The first step is a sequential caliper, a global constraint that allowed the researchers to exclude all cities that were on an interstate highway. The results of this step enabled the researchers to remove all counties with interstate highways from being matched with counties that were to have interstate highway construction begin at a later date. The second step was a statistical analysis (the Mahalanobis distance) to determine a measurement for similarity between counties. Third, once the counties were ranked according to the results of the Mahalanobis metric, they were matched (untreated to treated counties). Optimal matching was used that employs an optimization algorithm, which minimizes the sum of the Mahalanobis distance of the matching counties.

Once the counties had been matched, Rephann and Isserman estimated an econometric model that enabled them to determine which counties had positive and which had negative correlations between economic impact and highway construction. The counties in this study were placed into five county classifications. The first group of counties measured the contemporaneous relationship between economic growth and highway construction activity. The rest of the counties were used to study the post construction effects. The second group of counties were urban spillover counties. Urban spillover measures the effects of highways on decentralization of residents from large urban areas (treated counties), and how this spillover causes substantial population spread effects. The third classification included counties that are uncompetitive. These are rural counties whose economies are not affected by highway construction. The fourth group was competitive counties, in which highway construction was expected to show positive economic stimulus to "tertiary and manufacturing industry." The fifth group, adjacent counties were those counties that were close to treated counties, but were not in

close proximity to a highway.

The results of the study indicate that communities do not seem to benefit equally from freeway construction projects. Isolated rural areas and rural areas in close proximity to a freeway failed to show any significant signs of increased economic activity. However, Rephann and Isserman found that cities with large populations greater than or equal to 25,000 and cities that were experiencing urbanization before highway construction began had a positive correlation between highway development and economic growth. Also, the researchers concluded that if there was some economic growth in communities with population just below 25,000, a freeway construction project would stimulate the local economy. However, the economic stimulus would be small compared to the economic growth of communities on the surrounding fringe of a large growing urban area.

2.10 Rogers, C.L., and R.S. Marshment (2001) Methodology for Determining the Impact of Highway Bypasses in Oklahoma, Oklahoma Department of Transportation.

The goal of this paper was to assess the impact of bypasses on small Oklahoma towns located along U.S. Highway 70. The study provided the Oklahoma Department of Transportation (ODOT) with a methodology which could be used by the Highway Bypass Planning Board to determine the economic effects of bypasses on small communities.

One of the objectives of this project was to collect data from small towns in Oklahoma in order to develop an analytical model that could be used in determining the impact of bypasses on small communities with population at or near 1,500. These models would be used by ODOT in determining whether or not construction of a bypass around a particular small town will cause an increasing or decreasing effect on the economy and infrastructure of the town. The model also aided ODOT in addressing issues that local communities might have about the post- construction effect of the new bypass, and future growth of the town.

In order to obtain the results needed for this study, Rogers and Marshment used three methods including; (1) The Quasi–Experimental Control Group (QECG); (2) Difference-in-Difference (DD), and (3) Anecdotal methods.

In selecting the towns that were to be used as the control group, they had to identify the experimental and control towns that were similar to each other. These towns were selected according to the following criteria; adequate sales tax records for the designated time period of this study, population of town, and towns with general proximity to a major highway. They also collected data on traffic volume, highway bypass information, general city information and underground storage tank information. Once Rogers and Marshment had obtained their data, they used the follow equation to determine the impact of the bypass.

$$Y_T - \Sigma Y_C/N = B + e,\ e \sim N(0,\sigma^2) \qquad \text{(Equation 2.3)}$$

Where Y is the log of the growth rate in sales tax base in bypassed towns (T) and control towns (C). B measures the impact of the bypass on city T, and N is the number of places in the control group.

An equivalent model is the cross-section regression specification:

$$Y_{Ti} = \text{Constant} + B_1 Y_{Ci} + B_2 BYPASSi + e_i,\ e \sim N(0,\sigma^2) \qquad \text{(Equation 2.4)}$$

Here Y_{Ti} and Y_{Ci} are the values of the economic outcome variable of the experimental and control group, respectively. $BYPASS_i$ is a dummy variable, which is equal to 1.0 after the bypass has been constructed and zero for other years. The impact of the bypass is measured by B_2, and e_i is the error term.

The second method involved estimating an econometric model to determine the effects of the bypass. These results were studied to determine the economic impact that might have occurred from the construction of the bypass.

The Difference-in-Difference (DD) model was the following regression equation:

$$Y_{it} = B_1 BYPASS_{it} + B_2 R_t + B_3 C_i + B_4 X_{It} + e_{it} \qquad \text{(Equation 2.5)}$$

Y_{it} is a measure of economic activity for town i in year t. $BYPASS_{it}$ is a dummy variable that is equal to 1.0 if the observation is for the bypass town in a year after the completion of the bypass. X_{it} are other explanatory variables, R_t is a vector of time dummies and C_i is a vector of city dummies. The coefficient B_1 measures the impact of the bypass.

The third method of the study dealt with the authors' visit to the bypass towns. They discussed with local business owners any changes in economic activity before and after construction of the bypass. Rogers and Marshment also examined the photo archives of the towns during the time period of the study.

Rogers and Marshment did not find statistically significant correlations of sales tax base between the control group and the experimental group. However, the researchers also noted that Stonewall was the only site for which they could apply their methodology, since the other two sites had limited post-bypass data. However, the results of the studies done in Rush Spring and Snyder were consistent with those of Stonewall.

Rogers and Marshment recommended conducting an anecdotal investigation in order to understand why changes in the community take place. They also stated that by visiting sites that have been identified as a possible site of bypass construction the Bypass Planning Board will be better able to get an understanding of the effect that a bypass might have on a community. Another observation of Rogers and Marshment was that some towns have a tendency to expand their boundaries to a point which encompasses the areas in which the bypass will be constructed in order to capture some of the economic benefits of locating near a bypass.

2.11 Liff, Sally D. (1996) Effects of Highway Bypass on Rural Communities in Small Urban Areas. *Researcher Results Digest. # 212*

The goal of the paper was to determine the overall effects of highway and bypass construction in rural areas in the U.S. and Canada. Liff wanted to provide a viable method that could be used by all transportation planning boards in North America as a means for determining the effects that a new highway and bypass would have on rural communities.

The data for this study was gathered from state economic development agencies and the U.S. census. Another aspect of the study dealt with examining and analyzing transportation studies that were performed by state agencies including state academic institutions. The third aspect of the study used primary data taken from the areas that were under investigation. The method used in obtaining the primary data was mail survey, in which out of the 60 governments that were surveyed, 47 states and six Canadian provinces responded to the mailer. The information that was gathered came mainly from communities that had a population level below 20,000. Liff examined changes in employment, population, retail sales, and growth of businesses within the communities being bypassed, and business that operated close to the newly constructed highway and/or bypass. Once the data was collected from the different state and local government agencies, the information was analyzed and a mean for each variable was determined. Thus the final results that were obtained only indicated the average of all of the areas studied.

Liff concluded that highway and bypass construction does have an effect on the economic condition of communities. However, the amount by which the community is affected has more to do with aspects of the community that are not related to highway and bypass construction. **After reviewing the other studies that had been completed, Liff concluded that in the aggregate the studies were inconclusive in determining if highways and bypasses had**

any influence on the economy of local communities.

This particular study used the results from other studies that were done by other researchers; meaning that the methods that were used varied according to what the researchers thought to be the best method. Liff concluded that there is no one best method that can be used to determine the effects that a new highway or bypass would have on communities. Therefore, any method used in a previous bypass study is suitable for studying the economic impact on rural communities of construction of highways and/or bypasses. **After reviewing all of the other studies, Liff concluded that the economic effects on communities due to highway and/or bypass construction could not be determined since factors other than the construction of highways and bypasses play a role in affecting the economy of a particular community**.

Chapter 3

Impact of Highway Bypasses on Total Employment of Bypass Towns

3.1 Why Measure the Impact of the Bypass on Total Employment?

There are several reasons for measuring the impact of highway bypasses on total employment in bypass towns. The survey of owners and managers of travel-related firms located in bypass towns indicated the effect of the bypass on employment of their company. However, the travel-related sector is just a part, although an important part, of the total local economy. Furthermore, the impact of the bypass on the non-travel-related businesses could be different from that of the travel-related sector. Another reason for focusing on total employment is that employment data is the only data available for small towns on a monthly, quarterly, and annual basis.

KDHR collects employment and payroll data in order to administer the unemployment compensation tax. Referred to as the ES-202 data, it is collected from Employer's Quarterly Wage Reports and Contribution Returns, and from the Multiple Worksite Report (BLS Form 3020). The data set consists of detailed firm level records that include employment of the firm for each month, and the total payroll of the firm for the quarter. Each record also contains the Standard Industry Code (SIC) of the firm and its name and address. Total average annual employment for the small Kansas towns in the sample can be obtained since the data is classified by zip code. Thus total annual average employment for the bypass and control towns is computed by adding the monthly employment data and dividing by 12. The database excludes employment of persons not subject to the unemployment insurance tax. The most important group in this category for purposes of this study is sole proprietorships since several of the travel-related firms are owned and operated by one person. The total average annual employment

of the bypass and control towns for the 1988 to 2001 period is in Tables 3 to 11 and in Figures 10 to 18. Examination of these figures does not indicate obvious differences in total employment trends of the bypass and control towns following construction of the bypasses. Thus regression analysis was employed to determine if bypasses had a statistically significant impact on total employment of bypass towns.

3.2 Expected Economic Relationships

The impact of highway bypasses on total employment of bypass towns is estimated using regression analysis. The analysis is based on the assumption that national and local economic forces will have the same impact on the bypass and control towns. Thus any difference between the total employment of the bypass town and its control towns is attributed to the bypass. Therefore the expected sign of the regression coefficients for the total employment of the control towns is positive.

The impact of the highway bypasses on total employment of the bypass towns is measured with a dummy variable. This variable has a value of zero for all years in the estimation period prior to construction of the bypass and a value of 1.0 for all years following the completion of the bypass. If the bypass was completed in the first six months of the year, the dummy variable had a value of 1.0 for that year. In contrast, if the bypass was completed in the last six months of the year, the value of the dummy variable is zero for that year.

There is no a prior relationship between the dummy variable and total employment in the bypass town. If the bypass resulted in less traffic congestion, improved safety, fewer vehicle emissions, less noise, and improved highway access for the town's businesses, the town may attract new business and the regression coefficient of the dummy variable would be positive. On the other hand, if reduced non-resident auto traffic reduces sales and employment of travel-

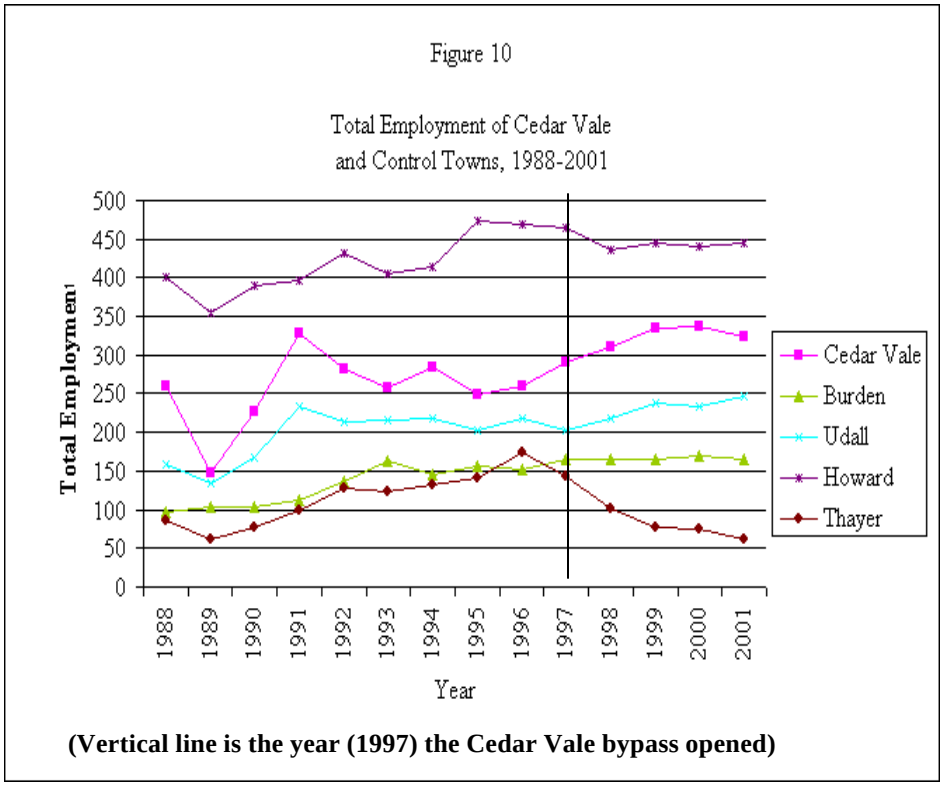
related business firms, ultimately leading to closure of these firms, the coefficient of the dummy variable would be negative.

3.3 Empirical Results

Average annual total employment of each bypass town was regressed on average annual total employment of its control towns and the bypass dummy variable. The equations were estimated by ordinary least squares (OLS) regression for the 1988 to 2001 period. The only exception to this was the Troy equation which was estimated for the 1988 to 2000 period. This was necessary since the 2001 total employment of one of the Troy control towns was inconsistent with previous employment of the town. Initial estimation of the equations revealed that total employment of some of the control towns was highly correlated with total employment of other control towns in the regression equation. This multicollinearity problem makes it difficult to accurately measure the statistical significance of each of the variables in the equation. High correlation of total employment among the control towns was not unexpected since the criteria employed to select the control towns were designed to identify towns that were similar to the bypass town; thus the control towns are similar to each other. The multicollinearity problem was reduced by deleting some of the control towns from the regression equations. The estimated regression equations are in Table 12.

TABLE 3: Total Employment of Cedar Vale and Control Towns 1988 to 2001

Year	Cedar Vale	Burden	Udall	Howard	Thayer
1988	261	98	158	400	85
1989	147	104	135	355	61
1990	226	104	168	390	76
1991	329	113	234	397	100
1992	282	136	214	432	128
1993	257	164	215	406	123
1994	285	146	219	413	132
1995	250	157	203	474	142
1996	260	153	217	470	173
1997	290	166	202	464	144
1998	310	166	218	437	101
1999	334	166	238	446	77
2000	338	169	233	440	75
2001	323	165	246	446	61

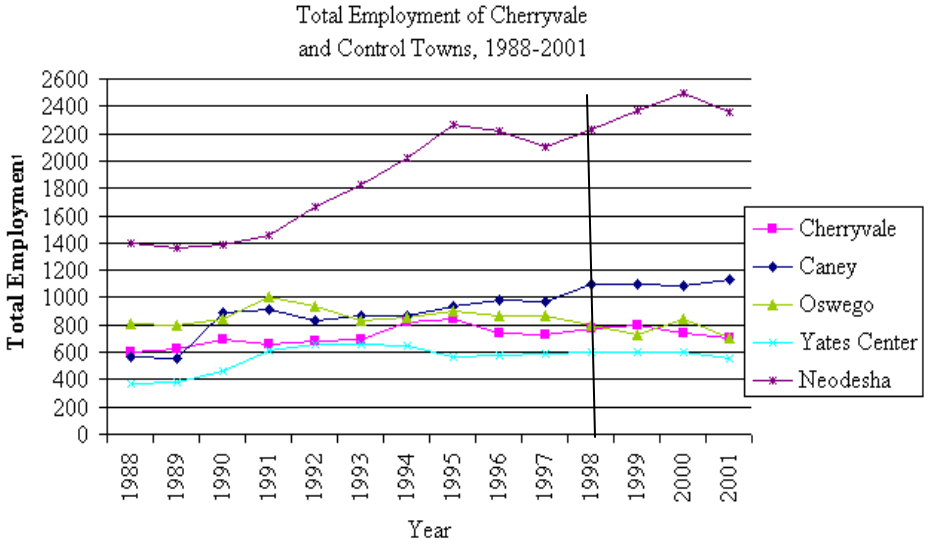


(Vertical line is the year (1997) the Cedar Vale bypass opened)

TABLE 4: Total Employment of Cherryvale and Control Towns 1988 to 2001

Year	Cherryvale	Caney	Oswego	Yates Center	Neodesha
1988	602	572	804	369	1399
1989	625	556	797	383	1369
1990	691	894	844	459	1388
1991	663	909	1007	607	1453
1992	684	836	937	664	1665
1993	692	863	829	662	1825
1994	826	867	854	651	2017
1995	849	934	903	565	2269
1996	734	980	862	577	2222
1997	728	970	863	587	2105
1998	777	1093	796	604	2227
1999	796	1100	733	599	2364
2000	744	1089	846	601	2500
2001	710	1127	700	554	2360

Figure 11

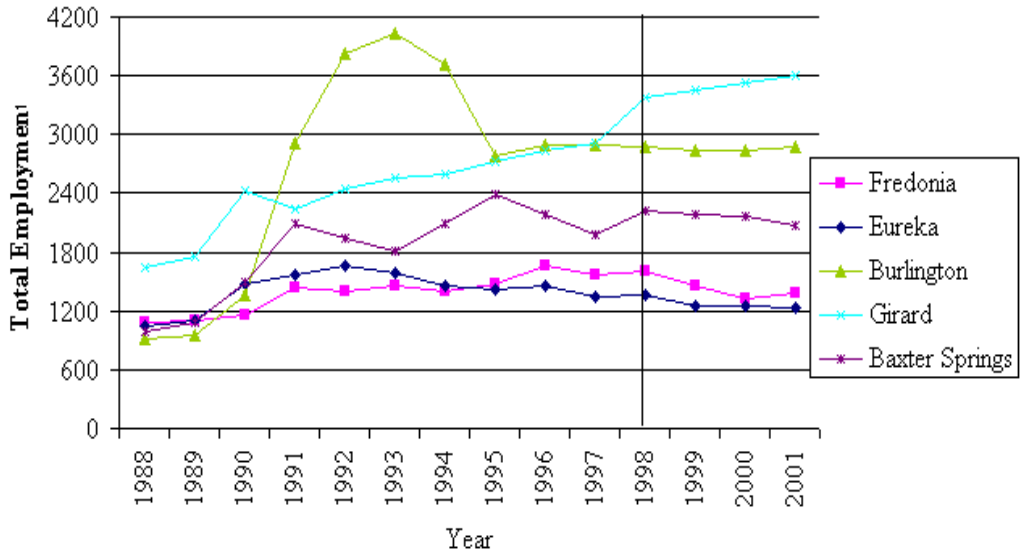


(Vertical line is the year (1998) the Cherryvale bypass opened)

TABLE 5: Total Employment of Fredonia and Control Towns 1988 to 2001

Year	Fredonia	Eureka	Burlington	Girard	Baxter Springs
1988	1092	1044	909	1642	994
1989	1093	1100	952	1756	1076
1990	1157	1466	1360	2421	1496
1991	1442	1562	2908	2247	2096
1992	1406	1660	3828	2444	1946
1993	1457	1596	4037	2551	1807
1994	1405	1456	3720	2602	2085
1995	1467	1411	2789	2718	2393
1996	1664	1452	2898	2831	2184
1997	1572	1345	2888	2912	1986
1998	1599	1356	2876	3373	2220
1999	1453	1250	2842	3457	2180
2000	1331	1258	2843	3524	2165
2001	1386	1241	2871	3603	2075

Figure 12



(Vertical line is the year (1998) the Fredonia bypass opened)

TABLE 6: Total Employment of Haven and Control Towns 1988 to 2001

Year	Haven	Ellinwood	Halstead	Sterling	Andale
1988	454	557	1148	499	333
1989	460	539	1075	496	353
1990	696	564	1773	650	424
1991	671	657	1855	767	434
1992	710	672	1952	731	426
1993	749	694	2081	863	473
1994	711	688	1961	886	465
1995	634	685	2002	834	458
1996	621	696	1958	856	410
1997	639	737	1710	881	440
1998	645	741	1584	1031	516
1999	624	719	1269	1005	516
2000	629	678	1156	1024	540
2001	622	626	1329	1118	559

Figure 13

(Vertical line is the year (1998) the Haven bypass opened)

TABLE 7: Total Employment of Peabody and Control Towns 1988 to 2001

Year	Peabody	Burrton	Inman	Moundridge	Sedgwick
1988	284	216	307	962	218
1989	287	215	325	1036	237
1990	315	217	340	1220	324
1991	332	237	412	1126	356
1992	330	249	421	1172	370
1993	362	257	470	1188	386
1994	326	278	468	1242	392
1995	349	286	466	1347	399
1996	363	304	443	1337	394
1997	394	290	485	1422	309
1998	401	303	480	1508	341
1999	443	312	471	1597	346
2000	435	324	413	1725	342
2001	438	310	549	1730	402

Figure 14

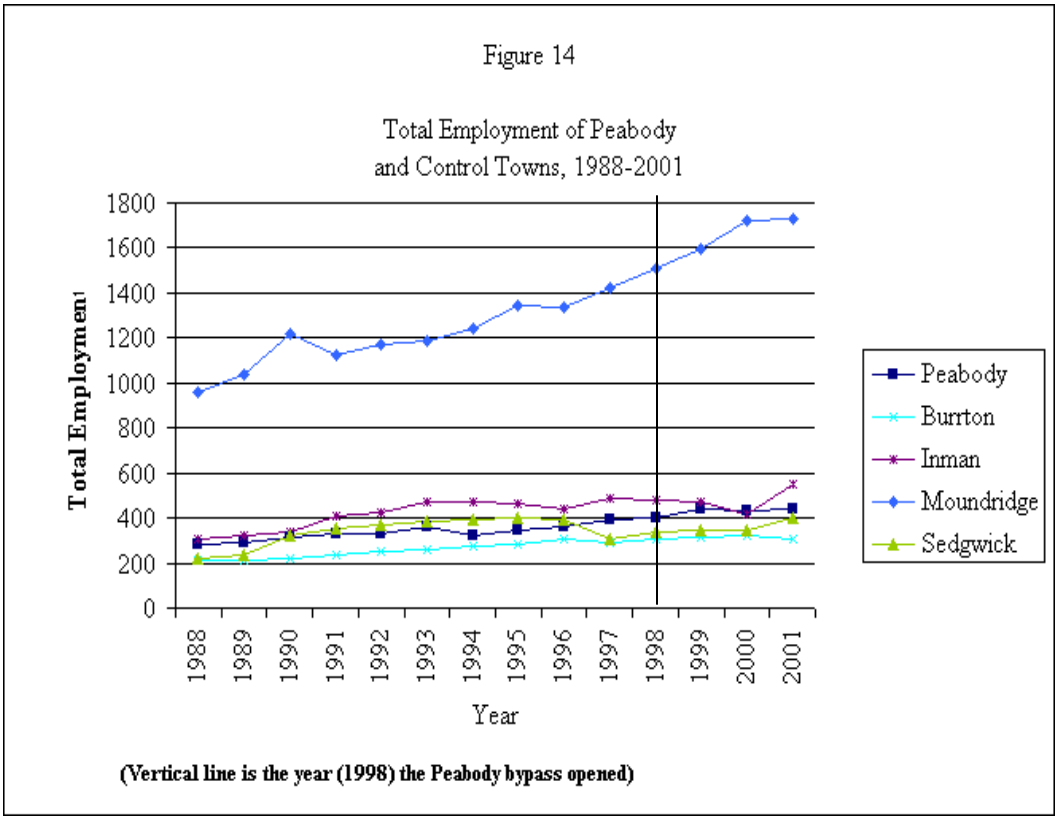
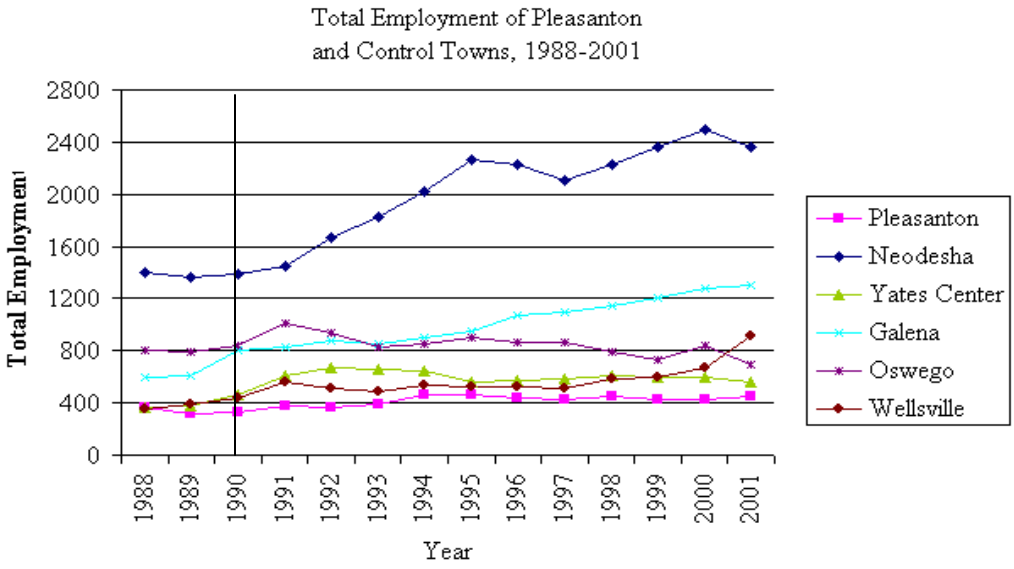


TABLE 8: Total Employment of Pleasanton and Control Towns 1988 to 2001

Year	Pleasanton	Neodesha	Yates Center	Galena	Oswego	Wellsville
1988	369	1399	369	598	804	355
1989	317	1369	383	604	797	393
1990	333	1388	459	809	844	441
1991	372	1453	607	828	1007	557
1992	360	1665	664	879	937	509
1993	387	1825	662	853	829	491
1994	464	2017	651	900	854	531
1995	468	2269	565	946	903	526
1996	443	2222	577	1075	862	523
1997	427	2105	587	1101	863	514
1998	447	2227	604	1147	796	583
1999	425	2364	599	1210	733	601
2000	427	2500	601	1279	846	666
2001	445	2360	554	1304	700	918

Figure 15

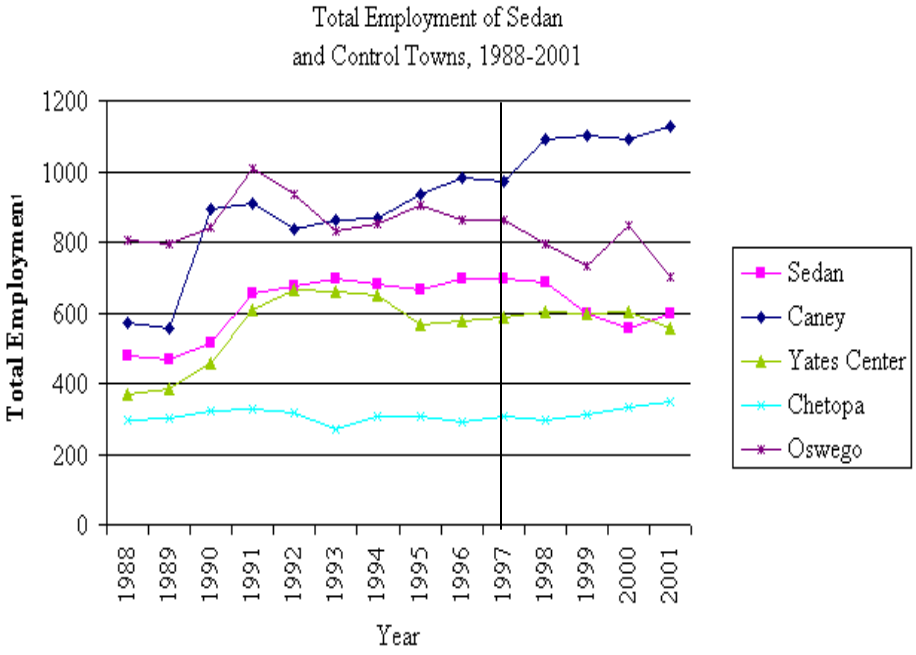


(Vertical line is the year (1990) the Pleasanton bypass opened)

TABLE 9: Total Employment of Sedan and Control Towns 1988 to 2001

Year	Sedan	Caney	Yates Center	Chetopa	Oswego
1988	477	572	369	296	804
1989	468	556	383	299	797
1990	516	894	459	321	844
1991	657	909	607	326	1007
1992	676	836	664	319	937
1993	694	863	662	270	829
1994	681	867	651	305	854
1995	663	934	565	305	903
1996	695	980	577	290	862
1997	694	970	587	304	863
1998	688	1093	604	297	796
1999	598	1100	599	314	733
2000	556	1089	601	334	846
2001	600	1127	554	350	700

Figure 16

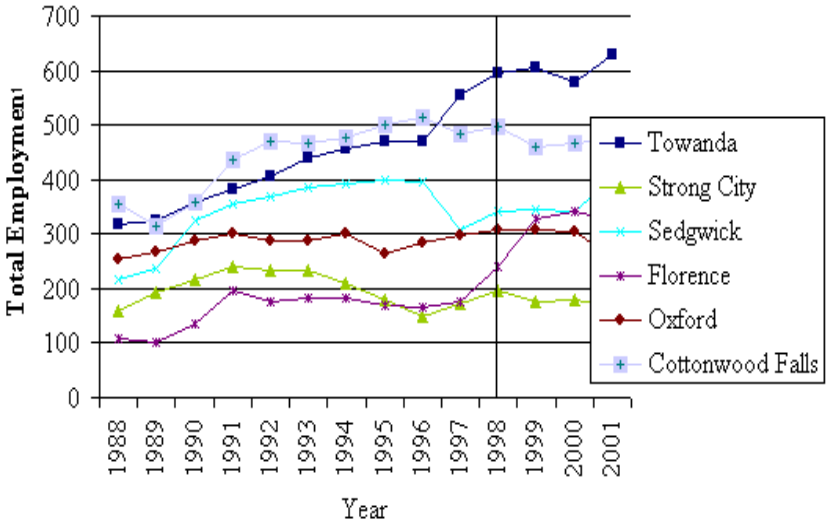


(Vertical line is the year (1997) the Sedan bypass opened)

TABLE 10: Total Employment of Towanda and Control Towns 1988 to 2001

Year	Towanda	Strong City	Sedgwick	Florence	Oxford	Cottonwood Falls
1988	319	159	218	107	254	354
1989	326	193	237	103	268	313
1990	357	216	324	136	289	360
1991	381	239	356	195	302	435
1992	406	232	370	176	288	471
1993	440	235	386	181	289	467
1994	455	209	392	181	300	476
1995	469	179	399	169	264	501
1996	470	150	394	167	283	513
1997	554	174	309	175	299	482
1998	595	195	341	239	307	497
1999	606	177	346	329	307	460
2000	577	180	342	341	306	466
2001	629	165	402	325	257	474

Figure 17

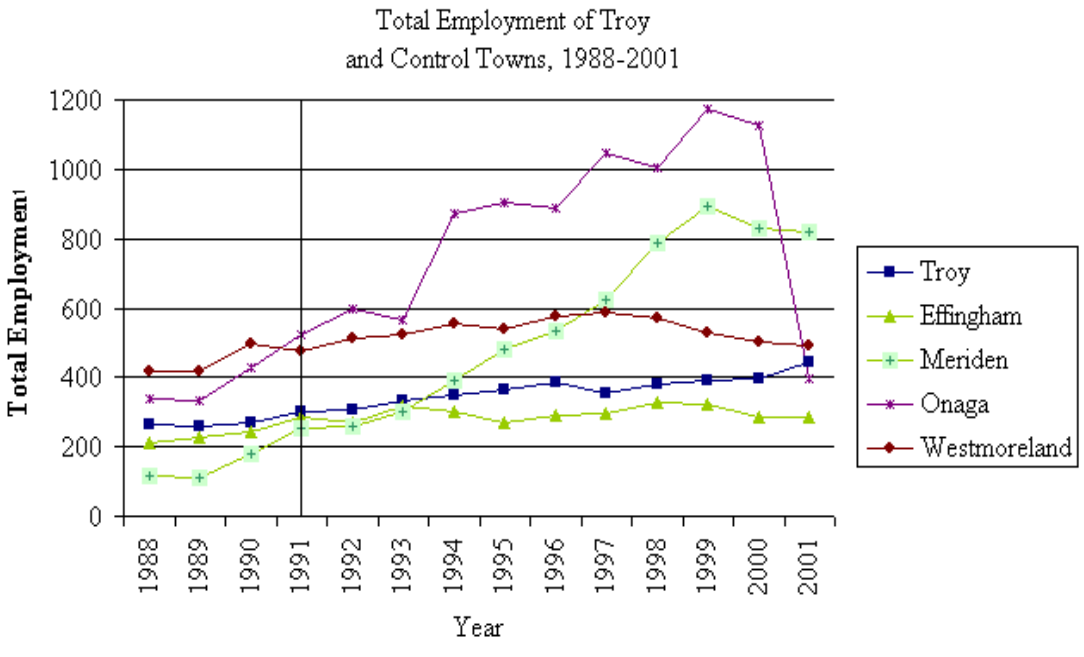


(Vertical line is the year (1998) the Towanda bypass opened)

TABLE 11: Total Employment of Troy and Control Towns 1988 to 2001

Year	Troy	Effingham	Meriden	Onaga	Westmoreland
1988	262	212	114	337	417
1989	258	227	112	331	415
1990	271	243	179	428	496
1991	302	288	254	525	476
1992	304	272	258	600	512
1993	335	318	303	565	523
1994	348	303	393	870	553
1995	366	271	483	903	541
1996	384	290	536	890	574
1997	355	297	623	1046	585
1998	383	328	790	1002	569
1999	389	324	893	1171	528
2000	399	287	829	1125	501
2001	443	284	818	398	491

Figure 18



(Vertical line is the year (1991) the Troy bypass opened)

TABLE 12: Bypass Town Total Employment Regression Equations

Cedar Vale

CEDAR = -60.5 + 1.32UDALL*** - 0.36THA + 0.24HOW - 0.49BYP
(-0.40) (3.68) (-0.53) (0.54) (-0.01)

Adjusted R-square = 0.72
Durbin-Watson Statistic = 2.09

CEDAR - Cedar Vale Total Employment
UDALL - Udall Total Employment
THA - Thayer Total Employment
HOW - Howard Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1998-2001; Zero in Other Years

Cherryvale

CHERRY = 348.5 + 0.04CAN + 0.02OSW + 0.07YAT + 0.15NEO* - 62.9BYP
(1.58) (0.23) (0.09) (0.32) (2.21) (-1.22)

Adjusted R-Square = 0.48
Durbin-Watson Statistic = 1.86

CHERRY - Cherryvale Total Employment
CAN - Caney Total Employment
OSW - Oswego Total Employment
YAT - Yates Center Total Employment
NEO - Neodesha Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1999-2001; Zero in Other Years

Fredonia

FRED = 842.8***-0.25EUR + 0.06BUR + 0.146GIR + 0.21BAX - 265.3BYP**
(2.83) (-1.02) (1.30) (1.45) (1.63) (-2.64)

Adjusted R-Square = 0.76
Durbin-Watson Statistic = 2.25

FRED - Fredonia Total Employment
EUR - Eureka Total Employment
BUR - Burlington Total Employment
GIR - Girard Total Employment
BAX - Baxter Springs Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1999-2001; Zero in Other Years

Haven

HAV = 97.5 - 0.17ELL + 0.69AND* + 0.20HAL***+16.1BYP
(0.86) (-0.71) (1.93) (4.15) (0.28)

Adjusted R-square = 0.80
Durbin-Watson Statistic = 1.55

HAV - Haven Total Employment
ELL - Ellinwood Total Employment
AND - Andale Total Employment
HAL - Halstead Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1999-2001; Zero in Other Years

Peabody

PEA = 95.3**+0.30INM+0.13MOU**-0.11SED + 15.8BYP
(2.39) (1.74) (2.40) (-0.90) (0.82)

Adjusted R-square = 0.91
Durbin-Watson Statistic = 1.96

PEA - Peabody Total Employment
INM - Inman Total Employment
MOU - Moundridge Total Employment
SED - Sedgwick Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1999-2001; Zero in Other Years

Pleasanton

PLE = 334.6**+ 0.08NEO**-0.20YAT - 0.07WEL + 80.2BYP
(2.76) (2.63) (-0.91) (-0.86) (1.28)

Adjusted R-square = 0.72
Durbin-Watson Statistic = 1.96

PLE - Pleasanton Total Employment
NEO - Neodesha Total Employment
YAT - Yates Center Total Employment
WEL - Wellsville Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1991-2001; Zero in Other Years

Sedan

SED = 449.2**+0.24CAN*+0.54YAT**-1.14CHE + 0.02OSW - 70.5BYP
(2.30) (2.08) (3.05) (-1.77) (0.10) (-1.60)

Adjusted R-square = 0.82
Durbin-Watson Statistic = 2.08

SED - Sedan Total Employment
CAN - Caney Total Employment
YAT - Yates Center Total Employment
CHE - Chetopa Total Employment
OSW - Oswego Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1998-2001, Zero in Other Years

Towanda

TOW = 295.5 - 0.10SEDG + 0.23OX + 0.10COTF - 1.52STR*+2.17FLO* -235.9BYP
(1.08) (-0.21) (0.23) (0.17) (-2.31) (-2.35) (-1.51)

Adjusted R-square = 0.96
Durbin Watson Statistic = 2.25

TOW - Towanda Total Employment
SEDG - Sedgwick Total Employment
OX - Oxford Total Employment
COTF - Cottonwood Falls Total Employment
STR - Strong City Total Employment
FLO - Florence Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1999-2001, Zero in Other Years

Troy

TROY = 184.9**+0.13EFF + 0.13ONA***+0.01WES + 19.1BYP
(2.41) (0.46) (4.76) (0.05) (0.85)

Adjusted R-square = 0.89
Durbin-Watson Statistic = 2.80

TROY - Troy Total Employment
EFF - Effingham Total Employment
ONA - Onaga Total Employment
WES - Westmoreland Total Employment
BYP - Bypass Dummy Variable, Equal to 1.0 for 1991-2001, Zero in Other Years

t - statistics in parentheses
* - Statistically Significant at .10 level
** - Statistically Significant at .05 level
*** - Statistically Significant at .01 level

In general, the equations have a good fit with all of the adjusted R^2s $\geq$ 0.72, except for the Cherryvale total employment equation. Five of the equations have adjusted $R^2 \geq 0.80$. None of the equations have statistically significant serial correlation as indicated by the Durbin-Watson statistics. A total of 72 percent of the coefficients of the control town total employment variables had the expected positive sign, and about 44 percent of the positive coefficients were statistically significant. Only one of the control town total employment variables had a statistically significant negative coefficient.

The sign of the coefficient of the dummy variable was negative in five equations and positive in four cases. However, the dummy variable was statistically significant only in the Fredonia equation, and the impact on total employment was negative. Thus the statistical results are consistent with the hypothesis that the bypasses did not have a statistically significant effect on total employment of the bypass towns.

As is generally the case with dummy variables it cannot be claimed with certainty that the variable actually measures what it is hypothesized to measure. It is possible that the dummy variable reflects other events that occurred in the bypass towns during the period following completion of the bypass. However, employing accepted, standard statistical procedures it does not appear that the bypass had a significant impact on total employment of the bypass towns.

Chapter 4

Survey of Owners and Managers of Travel-Related Businesses in Bypass Towns

4.1 Survey Background

With one exception, the analysis in the previous chapter concluded that highway bypasses did not have a statistically significant positive or negative effect on total employment of the sample bypass towns. However, Objectives 2, 3 and 4 of the study are concerned with determining which types of businesses are impacted by highway bypasses, and the quantitative magnitude of the impact.

In the summer of 2002, the owners and managers of 54 travel-related business firms in the nine bypass towns were interviewed to obtain their opinions concerning the impact of the highway bypass on their company's retail sales, employment, and labor costs, as well as the impact on the town as a whole. To confirm information obtained in the interviews, the business owners and managers were also asked to complete questionnaires that addressed these areas and 65 percent of the respondents returned them. The survey respondents were asked to estimate the impact of the bypass for the three year period from 1999 through 2001. About 20 percent of the businesses were started after the bypass was completed, but the owners or managers were able to answer the four questions that required it from a hypothetical standpoint. Instead of asking these business representatives "what impact did the bypass have on your retail sales or employment," we asked them "would your retail sales or employment be different if the bypass had never been built?" Thus about 20 percent of the sample respondents had to answer hypothetically four of the 26 questions on the questionnaire.

The sample of travel-related firms was obtained with the assistance of KDHR and

personnel of the Chambers of Commerce in the bypass towns. KDHR collects unemployment insurance data at the firm level for purposes of administering the unemployment insurance tax. The data collected from each firm includes employment, payroll, the SIC code of the firm, and its name and address. The SIC code was used to identify travel-related firms, and the names and addresses provided the necessary contact information to conduct the interviews. The unemployment insurance data does not include partnerships or sole proprietorships. Therefore we contacted personnel at the Chambers of Commerce in the bypass towns to obtain names, addresses, and phone numbers of all travel-related businesses in the town. All the travel-related firms identified by the KDHR database and the Chambers of Commerce were contacted and a large majority agreed to be interviewed.

The travel-related firms in the survey were grouped into four categories which were restaurants, convenience stores, auto and truck repair shops, and motels. The numbers of firms in each category and the industry percentage distribution of the sample firms are as follows:

Industry Category	**Number of Firms**	**Percent of Total Firms**
Restaurants	23	43%
Convenience Stores	14	26%
Auto and Truck Repair Shops	14	26%
Motels	3	5%
Total	54	

To verify that the firms in the sample were travel-related the owners or managers were asked, "How dependent is your business on non-resident auto traffic passing through town?" A total of 52 percent of the sample firm business representatives said their business was very dependent on non-resident auto traffic. Another 30 percent said their business was somewhat dependent on transient auto traffic. Only 18 percent of the firm owners and managers said their business was not at all dependent on auto traffic. All the restaurant and convenience store owners

or managers that indicated their business was somewhat dependent on transient auto traffic mentioned that their business was very dependent on this traffic before the bypass was completed. However, after the bypass opened they became primarily dependent on the local area market.

4.2 The Total Sample Results

4.2.1 Retail Sales

The business owners or managers were asked a series of questions concerning their perceptions regarding the impact of the highway bypass on their firm's retail sales. The first question was, "since completion of the highway bypass my company's retail sales have increased, decreased, or stayed the same." A total of 55 percent of the sample firm representatives said their sales decreased, 26 percent said sales had increased, and 19 percent indicated no change in sales.

For the business owners and managers that reported an increase in sales, most of the increases ranged from 1 to 10 percent although one firm had a 15 to 20 percent gain. There was much greater variation in the percentage decreases in sales. Seven business owners and managers said sales fell 1 to 10 percent, five reported an 11 to 20 percent decline, six said their sales decreased by 21 to 30 percent, and seven reported a sales decline of more than 30 percent.

Next, the business owners and managers were asked their opinions regarding the impact of the bypass on their company's retail sales during the 1999 to 2001 period. The alternative responses were major, minor, or no effect. The three alternatives were not defined in terms of specific monetary amounts, but rather the perceptions of the individual respondents. A majority of the respondents (55%) replied that the bypass had a major effect on sales, an additional 24 percent said the bypass had a minor effect, and the remaining 21 percent reported that the bypass

had no impact on their sales.

The business owners and managers were asked if they thought the retail sales of their firm would have been higher if the bypass had never been built. A total of 76 percent of the sample responded in the affirmative. Only 11 percent said sales would not have been higher and 11 percent were uncertain.

4.2.2. Employment

The respondents were asked if employment in their company had changed since completion of the bypass. A majority of the firms (56%) experienced no change in employment, while 33 percent reported a decrease, and the remaining 11 percent had an increase in employment. Five of the 18 business owners and managers reporting a decline in employment said company employment fell by more than four employees. The eight other firms that reported their employment decreases experienced employment losses of one to four employees.

The business owners and managers were asked their opinions concerning the effect of the highway bypass on their company's employment during the 1999 to 2001 period. The alternative responses were major, minor, or no effect. The three alternatives were not defined in terms of specific numbers of employees, but rather the perceptions of the individual respondents. A majority of the respondents (54%) said the bypass had no impact on their firm's employment, 28 percent reported that the bypass had a major effect, and 18 percent of the firm representatives said the bypass had a minor effect on company employment.

To determine the impact of the bypass on employment, the business owners and managers were asked if they thought employment in their firm would have been higher in the 1999 to 2001 period if the bypass had never been built. Almost half of the respondents (49%) said employment in their company would have been greater if the bypass had never opened.

However, 36 percent of the firm representatives said employment in their company would not have been greater, and 15 percent were uncertain of the impact on employment.

4.2.3 Labor Cost Per Employee

If the bypasses affected economic activity in the bypass towns it could impact the derived demand for labor and thus labor cost per employee which is directly related to wages per employee.

The business owners and managers were asked if their labor cost per employee had changed since the completion of the bypass. A majority of the respondents (57%) said that labor cost per employee had remained the same, 41 percent of the business representatives said that labor cost per employee had increased, and only one firm reported a decrease. However, the latter case was due to the replacement of full-time workers who had employee benefits with part-time workers who do not have benefits.

Of the 22 firms that reported an increase in labor cost per employee, 12 had increases of 1 to 10 percent in the 1999 to 2001 period. Four firms experienced an increase of more than 10 percent, and six companies did not report the percentage increase in labor cost per employee.

The business owners and managers were asked their opinions regarding the impact of the bypass on labor cost per employee in the 1999 to 2001 period. A large majority (77%) of the firm representatives said that the bypass had no effect on labor cost per employee, while 15 percent reported that the bypass had a minor effect, and only 8 percent said the bypass had a major impact on labor cost per employee. Most of business owners and managers said that labor cost per employee increased due to competition for labor and increases in the cost of living, not because of the bypass.

4.2.4 Impact on the Town

The business owners and managers of the travel-related firms in the bypass towns were asked their opinions concerning the impact of the bypass on the town as a whole. The responses are summarized as follows:

Impact of Bypass on the Town	Percent of Respondents
Negative Effect	67%
Positive Effect	14%
Both Positive and Negative Effects	9%
Uncertain	7%
No Effect	2%

Thus two-thirds of the respondents said that bypasses had a negative impact on the town as a whole. About one-fourth of the firm representatives said the bypass either had a positive impact or both positive and negative impacts.

The business owners and managers who thought the bypass had a negative impact on the town stressed the reduction in demand for travel-related business, and the closure of local businesses. They noted the difficulty of attracting intercity traffic from the bypass due to the lack of signs on the bypass to inform motorists of the businesses located in the bypass town, and the placement of the bypass several miles from the bypass town.

Those business owners and managers who cited the positive impacts of the bypass on the town stressed the reduction in noise and traffic congestion, improved traffic safety, development of new businesses, and improved accessibility to other cities in the area.

4.3 Industry Group Variation of Bypass Impacts

4.3.1 Retail Sales

Although all the 54 firms in the sample are travel-related businesses, there was considerable variation in perceptions of the impact of the bypass on the retail sales, employment and labor cost of the four industry groups. For example, the business owners and managers were

asked the following question: "Since completion of the highway bypass my company's retail sales have?"

The possible responses were increased, decreased, or stayed the same. The responses by industry group were as follows:

Response	Total Sample	Restaurants	Convenience Stores	Auto and Truck Repair	Motels
Increased	26%	36%	14%	28%	0
Decreased	55%	50%	72%	36%	100%
Stayed the Same	19%	14%	14%	36%	0

Analysis of the above data indicates that a relatively high percentage (compared to that of the 54 firm total sample) of the restaurants experienced an increase in sales following completion of the bypass, while a relatively low percentage of convenience stores and motels had a gain in sales. As would be expected, the convenience stores and motels had a much higher percentage (relative to that of all 54 firms in the sample) of firms that suffered a decline in sales following completion of the bypass. In contrast, the auto and truck repair shops had a relatively low percentage of firms that had a decline in sales. The auto and truck repair shops also had a relatively large percentage of firms that experienced no change in sales following completion of the bypass.

There was also great deal of variation in the percentage change in retail sales within each of the four industry groups. One of the restaurants had a 1 to 5 percent decrease in sales following completion of the bypass while another suffered a 70 percent decline. Three of the convenience store owners and managers reported a sales decline of 6 to 10 percent while another said sales plunged by 80 percent. Two of the auto and truck repair firms experienced a 1 to 5 percent gain in sales while another had a 15 to 20 percent increase following completion of the bypass. In contrast, the owners of two auto and truck repair firms reported a 20 percent decrease

in sales. Of the three motel owners in the sample, one said sales fell only 1 to 5 percent after the bypass opened, but the other two reported sales decreases of 40 percent and 57 percent. The latter owner said it was likely the motel would close at the end of 2002.

To further assess the impact of the bypass on retail sales the business owners and managers were asked the following question: "Which of the following concerning the impact of the highway bypass on your company's sales in the 1999 to 2001 period is correct?"

The possible responses to the question were no effect, minor effect, and major effect. The three alternatives were not defined in terms of specific monetary amounts, but rather by the perceptions of the individual respondents. The responses by industry group were as follows:

Response	Total Sample	Restaurants	Convenience Stores	Auto and Truck Repair	Motels
No Effect	21%	9%	7%	58%	0
Minor Effect	24%	36%	7%	21%	33%
Major Effect	55%	55%	86%	21%	67%

Examination of the data reveals that a relatively low percentage (compared to that of the 54 firm total sample) of restaurants, convenience stores, and motels experienced no effect on sales as a result of the bypass. In contrast, a much higher relative percentage of the auto and truck repair shop owners perceived no effect on sales. A comparatively higher percentage of the restaurant and motel owners and managers had the opinion that the bypass had a minor impact on sales, whereas a relatively low percentage of convenience store representatives thought that the bypass had a minor effect. A much higher percentage of the representatives of the convenience stores and motels had the opinion that the bypass had a major impact on sales, while the auto and truck repair shops as a group had a relatively low percentage of firm owners perceiving a major bypass-related effect on sales.

To further examine the impact of the highway bypass on retail sales the respondents were asked the following question: "If the highway bypass had never been built, would the retail sales of your company been higher during the 1999 to 2001 period?"

The alternative responses to the question were yes, no, or uncertain, the percentages of the firms in each industry group selecting the various responses are as follows:

Response	Total Sample	Restaurants	Convenience Stores	Auto and Truck Repair	Motels
Yes	76%	82%	93%	42%	100%
No	13%	9%	7%	29%	0
Uncertain	11%	9%	0	29%	0

Inspection of the above data indicates that relative to the percentage responses of the total sample, a comparatively high percentage of the owners and managers of the convenience stores and motels had the opinion that sales would have been higher if the bypass had never been built. In contrast, a relatively low percentage of the owners of the auto and truck repair firms thought that their sales would have been higher. The auto and truck repair industry group also had a relatively high percentage of negative and uncertain responses to the question.

Summarizing, convenience stores and motels have a relatively high percentage of firms (compared to the entire sample) that experienced a sales decrease following the completion of the bypass. The auto and truck repair group had a relatively low percentage of firms that had a sales decline following the opening of the bypass, and a relatively high percentage of firms that experienced no change in sales. In the opinions of the firm representatives the bypass had a major impact on retail sales of a relatively large percentage of the convenience stores and motels, but a relatively low percentage for the auto and truck repair firms. The latter group of firms also had a relatively high percentage of owners who thought that the bypass had no effect on their retail sales. A comparatively large percentage of the owners and managers of the convenience

stores and motels thought that their retail sales would have been higher in the 1999-2001 period if the bypass had never been built. A relatively low percentage of the auto and truck repair firm owners had the same response.

4.3.2 Employment

To measure the impact of the highway bypass on employment, the owners and managers of the sample firms were asked the following question: "Since the completion of the highway bypass, my company's employment has....." The alternative responses to the question were increased, decreased, and stayed the same. The percentages of the firms in each industry group that selected the various responses are as follows:

Response	Total Sample	Restaurants	Convenience Stores	Auto and Truck Repair	Motels
Increased	11%	13%	7%	14%	0
Decreased	33%	26%	57%	29%	0
Stayed the Same	56%	61%	36%	57%	100%

In contrast to retail sales, for employment there was less variation in the percentages of the industry groups selecting the various responses, relative to the total sample. The exception was convenience stores which experienced a relatively high percentage of employment declines and a comparatively low percentage of firms that had no change in employment following the completion of the bypass. Motels had a high percent of firms that had no employment change.

To further assess the role of the bypass on employment, the survey respondents were asked the following question: "Which of the following concerning the effect of the highway bypass on your company's employment during the 1999 to 2001 period is correct?"

The alternative responses to the question were no effect, minor effect, or major effect. The three alternatives are not defined in terms of specific numbers of employees, but rather the

perceptions of the individual respondents. The responses of the various industry groups are as follows:

Response	Total Sample	Restaurants	Convenience Stores	Auto and Truck Repair	Motels
No Effect	54%	48%	43%	72%	67%
Minor Effect	18%	22%	14%	14%	33%
Major Effect	28%	30%	43%	14%	0

Examination of the above data indicates that a relatively high percentage (compared to the 54 firm total sample) of the owners of the auto and truck repair shops and the motels thought that the bypass had no effect on their firm's employment. In contrast, the convenience store industry group had a relatively low percentage of respondents that perceived no effect of the bypass on employment, and a relatively high percentage of firm representatives that thought the bypass had a major impact on employment. A relatively low percentage of the owners of the auto and truck repair shops and the motels had the opinion that the bypass had a major effect on company employment.

To further measure the impact of highway bypasses on industry employment, the survey respondents were asked the following question: "If the bypass had never been built, would employment of your company been higher during the 1999 to 2001 period?"

The potential responses to the question were yes, no, or uncertain. The percentages of the firms of the four industry groups that selected the various responses are as follows:

Response	Total Sample	Restaurants	Convenience Stores	Auto and Truck Repair	Motels
Yes	49%	50%	72%	21%	67%
No	36%	32%	14%	65%	33%
Uncertain	15%	18%	14%	14%	0

Analysis of the above data indicates that a much higher percentage (relative to the 54 firm total sample) of the owners and managers of convenience stores and motels thought that their firm's employment would have been higher if the bypass had never been built. In contrast, the auto and truck repair industry group had a relatively low percentage of firm owners that thought they would have had higher employment in the absence of the bypass. A relatively low percentage of the respondents in the convenience store group had the opinion that their company employment would not have been higher if the bypass had never opened, while a relatively high percentage of owners in the auto and truck repair group had this opinion.

In summary, a relatively high percentage (compared to that of the 54 firm total sample) of the convenience stores experienced a decrease in employment following completion of the bypass. A relatively high percentage of the convenience store and a comparatively low percentage of the motel and auto and truck repair firm respondents thought that the bypass had a major effect on their firms' employment. A relatively large percentage of the owners and managers of the convenience stores and motels had the opinion that employment of their firm would have been higher in the 1999 to 2001 period if the bypass had never been built. A relatively low percentage of the firm owners in the auto and truck repair group agreed.

4.3.3 Labor Cost Per Employee

To assess the impact of the bypass on labor cost per employee the survey respondents were asked the following question: "Which of the following concerning the impact of the highway bypass on your company's labor cost per employee during the 1999 to 2001 period is correct?" The alternative responses to the question were no effect, minor effect, or major effect, the responses to the question were as follows:

Response	Total Sample	Restaurants	Convenience Stores	Auto and Truck Repair	Motels
No Effect	77%	71%	86%	79%	67%
Minor Effect	15%	29%	7%	0	33%
Major Effect	8%	0	7%	21%	0

Unlike retail sales and employment there was very little industry group variation in the estimate of the bypass effect on labor cost per employee. A large majority of the firms in all the industry groups said the bypass had no effect on labor cost per employee.

4.3.4 Impact on the Town

The owners and managers of the 54 travel-related firms were asked to assess the impact of the bypass on their town. The potential responses were negative effect, positive effect, negative and positive effect, no effect, or uncertain. The percentages of the firms in each industry group that selected the various alternatives are as follows:

Response	Total Sample	Restaurants	Convenience Stores	Auto and Truck Repair	Motels
Negative Effect	67%	73%	80%	47%	67%
Positive Effect	14%	4%	20%	27%	0
Negative and Positive Effect	9%	14%	0	7%	33%
No Effect	2%	0	0	7%	0
Uncertain	7%	9%	0	13%	0

Analysis of the above data indicates that a relatively large percent of the owners and managers of the convenience stores perceived that the bypass had a negative effect on their town, while a relatively small percentage of the auto and truck repair firm owners thought the bypass had a negative impact. A relatively small percentage of the restaurant and motel owners thought that the bypass had a positive effect on their town, while a relatively large percentage of the owners of auto and truck repair shops thought that the bypass had a positive impact

Chapter 5

Impacts of Highway Bypasses on County Road Expenditure

5.1 Introduction

Objective 5 of this study is to measure the incremental impact on the county's road and bridge maintenance expenditures as a result of assuming maintenance responsibility for the previous state road. The objective was accomplished through personal interviews during the summer of 2002 of county engineers or road supervisors of the counties containing the nine bypass towns. The respondents were also given questionnaires that requested additional details on the topic, and seven of the eight county representatives returned the questionnaires. The counties that participated in the survey with their associated bypass town in parentheses are as follows:

Butler (Towanda)
Chautauqua (Sedan and Cedar Vale)
Linn (Pleasanton)
Marion (Peabody)
Montgomery (Cherryvale)
Reno (Haven)
Wilson (Fredonia)

5.2 County Road Conditions

Prior to discussing the financial impact of highway bypasses on county road and bridge maintenance budgets, it is important to first assess the general conditions of roads in the counties containing the bypass towns.

Collectively the seven counties are responsible for 6,784 miles of road, with the individual county mileage varying from a low of 417 miles to a high of 1,608 miles. Of the

6,784 miles, only 10 miles are concrete roads (0.01%), while 1,630 miles (24%) are asphalt, and the remaining 5,144 miles (76%) are unpaved gravel roads.

As a group, the county engineers or road supervisors classified 4 percent of their asphalt roads to be in very poor condition, 13% in poor condition, 26% in fair condition, 42% in good condition, and 15% in very good condition. Thus 83% of the county asphalt roads are in fair to very good condition and the other 17% are in poor or very poor condition.

To further assess the overall condition of the roads in the seven counties, the county engineers or road supervisors were asked to compare the overall condition of the county's roads compared to five years ago. Four of the respondents said the roads were in better condition than they were five years ago, one said they are worse, and two indicated they were unchanged from five years ago.

To gain additional perspective on road conditions in the bypass counties, the county representatives were asked if their counties have any roads and bridges that are closed to heavy trucks (80,000 pound five axle tractor-trailer trucks). Six of the seven counties had some roads and/or bridges closed to heavy trucks.

In general, the bypass counties are already responsible for an average of 969 miles of roads and hundreds of bridges. While over half (57%) of the asphalt roads are in good to very good condition, only 24 percent of the collective seven county road mileage is asphalt surface. The other 76 percent of the miles are unpaved.

5.3 Bypass County Road and Bridge Maintenance Financing

Total and average road and bridge maintenance expenditures of bypass counties during the 1997 to 2001 period are displayed in Table 13. The collective total expenditure of the seven counties rose from $15,563,209 in 1997 to $17,383,325 in 2001, an 11.7 percent gain over the five year

period or about an average gain of 2.3 percent per year (not inflation adjusted). The average annual expenditure for road and bridge maintenance for the seven counties increased from $2,223,316 in 1997 to $2,483,332 in 2001, an 11.7 percent increase (not inflation adjusted). There was wide variation in the annual road and bridge maintenance expenditure of the seven counties. For example, in 2001 expenditures ranged from a low of $875,704 to a high of $5,800,000.

TABLE 13: Total and Average Road and Bridge Maintenance Expenditure of Bypass Counties (1997 to 2001)

Year	Seven County Total Road and Bridge Maintenance Budget	Seven County Annual Average Budget	Lowest County Expenditure	Highest County Expenditure
1997	$15,563,209	$2,223,316	$487,491	$6,000,000
1998	15,903,505	2,271,929	588,907	6,200,000
1999	16,419,299	2,345,614	770,600	6,100,000
2000	16,538,624	2,362,661	764,400	5,600,000
2001	17,383,325	2,483,332	875,704	5,800,000

Table 14 contains the revenue sources (taxes) employed by the seven counties to finance their road and bridge maintenance budgets. All seven of the counties used the property tax, and four county representatives cited federal aid for bridge repairs as an important revenue source. Three respondents mentioned state fuel tax transfers and other local taxes as significant revenue sources.

TABLE 14: Road and Bridge Maintenance Revenue Sources of Bypass Counties

Revenue Source (Tax)	Number of Counties Citing the Revenue Source
Property tax	7
Federal aid (bridge repairs)	4
State fuel tax transfers	3
Local fuel tax	3
Local sales tax	1
Motor vehicle tax	1
Local AdValorem Tax Reduction (LAVTR)	1

To place bypass county financing of road and bridge maintenance in perspective, the county engineers or road supervisors were asked if their current budget for road and bridge maintenance was sufficient to maintain an adequate level of service on the county's roads. Four of the respondents said the current budget was not adequate. One county engineer said that to restore all the county's roads to good condition would require twice the current annual budget for a 15 year period. One of the county engineers that said the current maintenance budget was adequate qualified that statement by saying that there has been substantial deferred maintenance in the county, and that to maintain adequate service would require a 30 percent increase in the maintenance budget in the next fiscal year.

The county engineers or road supervisors that said the current maintenance budget is insufficient to maintain an adequate level of service on the county's roads were asked to estimate the budget shortfall for their county. For example, if the budget is 90 percent of what is needed to provide adequate service, the budget shortfall would be 10 percent. Three of the five respondents in this category estimated a budget shortfall of 11 to 20 percent, and the other two said the shortfall was 21 to 30 percent.

Thus a majority of the representatives of the seven counties said that their current road and bridge maintenance budgets are insufficient to provide adequate transport service on the county's roads, and that the budget shortfall is substantial (10 to 30 percent).

5.4 Impact of Highway Bypasses on Bypass County Road and Bridge Maintenance Expenditure

When a bypass or new alignment is constructed, typically the old road is refurbished by the state and then given to the county in which the bypass was constructed. In some cases the old road is in good condition and no refurbishing is done. Since the old road was previously part of the state highway system its quality is often higher than that of the typical county road.

The county engineers or road supervisors in the bypass counties were asked if the state of Kansas performed any maintenance on the old alignment (road) just prior to or during construction of the new alignment (bypass). If this occurred, the respondents were asked to describe the work that was performed by KDOT.

The state of Kansas performed no work on US-166 Business passing through Sedan. In addition, no KDOT maintenance occurred on the old US-50 alignment passing through the northern edge of Peabody in Marion County, nor on the old K-96 alignment on the southern edge of Haven in Reno County. However, KDOT performed substantial maintenance in the following cases.

- Old alignment of K-254 through Towanda in Butler County
- Old alignment of US-166 through Cedar Vale in Chautauqua County
- Old alignment of K-96 through Fredonia in Wilson County
- Old alignment of US-160/169 through Cherryvale in Montgomery County
- Old alignment of US-69 through Pleasanton in Linn County

Since KDOT wanted to limit access to the new alignment of K-254, Butler County inherited 7.5 miles of frontage road. Five miles of this total was subsequently transferred to townships in Butler County. KDOT put a one inch bituminous overlay on all 7.5 miles, and Butler County striped it and built the shoulders. KDOT put a 1-inch overlay on the old alignment of US-166 through Cedar Vale and resigned the road as well. As a result of the U.S. 400 bypass around Fredonia, Wilson County inherited maintenance responsibility for about 5 miles of former state road. KDOT put a 2-inch asphalt overlay on all 5 miles that were transferred to Wilson County with the exception of the old K-96 alignment north of Fredonia that was slurry sealed. Four miles of the old alignment of US-160/169 were transferred to Montgomery County maintenance as a result of the US-169 bypass around Cherryvale. KDOT put a 2-inch overlay on the part of the old alignment outside the Cherryvale city limits. They also re-striped the old alignment and repaired the overpass just north of Cherryvale. KDOT resurfaced and re-striped the old alignment of US-69 through Pleasanton in Linn County.

The county engineers or road supervisors of the bypass counties were asked if the county had to do any maintenance on the roads they inherited from the state since the bypass (realignment) was completed. The representative of Linn County reported that the city of Pleasanton conducted maintenance on the old alignment, but not Linn County. The city of Haven has maintenance responsibility for the old K-96 alignment in Reno County. Representatives of Reno County reported that Haven would contract out any maintenance on the old alignment to the county and no requests for such work had been received at the time of the interview. Marion County had performed no post-bypass maintenance on the old US-50 alignment through Peabody. However, the county engineers or road supervisors for Butler, Wilson, Montgomery,

and Chautauqua counties reported post-bypass maintenance on the alignments they inherited from the state.

Butler County spent $5,000 performing normal routine annual maintenance including mowing, striping and shoulder maintenance. The road supervisor for Wilson County reported spending $3,500 to patch potholes, mowing and sign installation. According to the Montgomery County engineer, the county spent $15,000 to repair guardrails, mow grass, clear ditches and installation of signs. Chautaqua County spent $4,000 patching the asphalt on the old US-166 alignment through Cedar Vale. The city of Pleasanton in Linn County spent $25,000 to resurface and re-stripe the old US-69 alignment.

When the county inherits the old alignment from the state it also inherits the financial responsibility for maintaining the road. These costs vary widely because of county differences in the mileage inherited from the state and in county road maintenance management practices. However, based on data furnished by KDOT it is possible to estimate how much a county would have to spend, over the 20-year life cycle of the road, to maintain roads they inherited from the state as a result of bypasses.

Based on data supplied by KDOT personnel, the per mile cost of asphalt overlays during the 20-year life of the road is $155,000. This figure is obtained by assuming that a 1.5-inch overlay is applied to the road every 6.5 years, resulting in 3.1 (20 ÷ 6.5) applications. If the per mile cost per overlay is $50,000, the 20-year resurfacing cost per mile is $155,000 ($50,000 x 3.1).

In addition to the resurfacing costs there is routine annual maintenance such as striping, chip seals, crack sealing, signs, shoulders, mowing, and clearing ditches. KDOT estimates the annual per mile cost of routine annual maintenance to be $2,712, or $54,240 (20 · $2,712) per

mile during the assumed 20-year life of the road. When the per mile asphalt overlay and annual maintenance costs are combined, the estimated 20-year per mile cost is $209,240 ($155,000 + $54,240).

Using the above figures it is possible to estimate the total 20-year maintenance cost of each of the old alignments by multiplying the $209,240, 20-year maintenance cost per mile by the number of miles of road inherited by the county as a result of the bypass. According to the data in Table 15, the counties containing the sample bypass towns inherited 26.935 miles of road from the state, resulting in a total estimated 20-year county maintenance cost of $5,635,879, or $281,794 per year ($5,635,879 ÷ 20). The latter figure amounts to 1.6% ($281,794 ÷ $17,383,235) of the 2001 seven county total road and bridge maintenance budget (see Table 13).

TABLE 15: County Maintenance Costs of Roads Inherited as a Result of Bypasses

Bypass Town (Route)	Miles of Road Inherited by the County	Total 20-Year County Maintenance Cost*
Cedar Vale (U.S. 166)	2.055	$429,988
Cherryvale (U.S. 169/160)	3.652	$764,144
Fredonia (U.S. 400)	5.043	$1,055,197
Haven (Kansas 96)	0	0
Peabody (U.S. 50)	0.263	$55,030
Pleasanton (U.S. 69)	1.385	$289,797
Sedan (U.S. 166)	0	0
Towanda (Kansas 254)	2.734	$572,062
Troy-Highland (U.S. 36)**	11.803	$2,469,660
Total	**26.935**	**$5,635,879**

* Total 20-year maintenance cost obtained by multiplying the miles of road inherited by the county by $209,240.

** The U.S. 36 bypass jointly impacted Troy and Highland, making it very difficult to scientifically allocate Troy's share of the 11.8 miles of road inherited by Doniphan County.

There was wide county variation in the number of miles of road inherited from the state, and the resulting total 20-year maintenance cost. The 20-year cost ranged from zero in Reno and Chautauqua Counties as a result of the Haven and Sedan bypasses to $2,469,660 for the Troy-Highland bypass. The latter figure was relatively high since the US-36 bypass jointly affected Troy and Highland, making it very difficult to scientifically allocate Troy's share of the 11.8 miles of road inherited by Doniphan County.

Chapter 6

Conclusion

6.1 Impact of Highway Bypasses on Total Employment of Bypass Towns

The impact of the bypasses on total employment of the bypass towns was analyzed using regression analysis. Employing ES-202 data compiled by KHDR, total average annual employment in each bypass town was regressed on total average annual employment of each of its control towns and a bypass dummy variable that measured the impact of the bypass on total employment of the bypass town. The analysis is based on the assumption that national and local economic forces will have the same impact on the bypass and control towns. Thus any differences between the total employment of the bypass town and its control towns is attributed to the bypass.

Total average annual employment of each bypass town was regressed on total average annual employment of its control towns and the bypass dummy variable. The equations were estimated by ordinary least squares (OLS) regression for the 1988 to 2001 period.

The statistical results are consistent with the conclusion that the bypasses did not have a statistically significant effect on total employment in the bypass towns. In eight of the nine bypass towns the bypass dummy variable was not statistically significant. The sole exception was Fredonia as the bypass dummy variable was negative and statistically significant at the .05 probability level.

As is generally the case with dummy variables it cannot be claimed with certainty that the variable measures what it is hypothesized to measure. It is possible that the bypass dummy variable reflects other events that occurred in the bypass towns after the bypass opened.

However, employing the best available statistical techniques it does not appear that the bypasses had a significant impact on total employment of most of the bypass towns.

6.2 Impact of Highway Bypasses on Travel-Related Businesses–Total Sample

In the summer of 2002, the owners and managers of 54 travel-related business firms in the nine bypass towns were interviewed to obtain their opinions concerning the impact of the highway bypass on their company's retail sales, employment and labor costs, as well as the impact on the town.

A majority of the respondents (55%) were of the opinion that the bypass had a major effect on their sales in the 1999 to 2001 period, and an additional 24 percent thought the bypass had a minor impact on sales. A large majority of the firm representatives (76%) thought that their sales would have been higher in the 1999 to 2001 period if the bypass had never been built.

With respect to employment, the perception of the majority of the respondents (54%) was that the bypass had no effect on their firm's employment in the 1999 to 2001 period, while 28 percent of the sample thought that the bypass had a major impact on employment. Almost half (49%) of the business owners and managers were of the opinion that employment in their company would have been higher in the 1999 to 2001 era if the bypass had never been built, while 36 percent thought employment in their company would not have been greater in the absence of the bypass.

Two-thirds (67%) of the representatives of the travel-related businesses thought that the bypass had a negative effect on their town. The perception of about one-fourth (23%) of the business owners and managers was that the bypass had a positive effect or both positive and negative impacts.

The business owners and managers who thought the bypass had a negative effect on the town stressed the reduction in the demand for travel-related business, and the closure of local businesses. They noted the difficulty of attracting intercity traffic from the bypass due to the lack of signs on the bypass to inform motorists of the businesses located in the bypass town, and the placement of the bypass several miles from the bypass town. Those business owners and managers who stressed the positive impacts of the bypass on the town cited the reduction in noise and traffic congestion, improved traffic safety, development of new businesses, and improved accessibility to other cities in the region.

6.3 Industry Group Variation of Bypass Impacts

There was substantial variation regarding the perception of the impact of the bypass on the retail sales and employment of the four industry groups (restaurants, convenience stores, auto and truck repair shops, and motels) in the sample. With regard to retail sales, the bypass was perceived to have had a major impact on the sales of a relatively high percentage (compared to the entire 54 firm sample) of the convenience stores and motels, but a relatively low percentage for the auto and truck repair firms. The latter group of firms also had a relatively high percentage of owners that thought the bypass had no effect on their retail sales. A comparatively large percentage of the owners and managers of the convenience stores and motels had the opinion that their retail sales would have been higher in the 1999 to 2001 period if the bypass had never been built. A relatively low percentage of the auto and truck repair firm owners had the same response.

With respect to employment, a relatively high percentage (compared to that of the total 54 firm sample) of the owners and managers of convenience stores and a comparatively low percentage of the motel and auto and truck repair firm owners thought that the bypass had a

major impact on their firms' employment. A relatively high percentage of the owners and managers of the convenience stores and motels thought employment of their firm would have been higher in the 1999 to 2001 period if the bypass had never opened. A relatively small percentage of the owners in the auto and truck repair group agreed.

A relatively high percent of the owners and managers of the convenience stores had the opinion that the bypass had a negative effect on their town, while a relatively low percentage of the auto and truck repair firm representatives thought the bypass had a negative effect. A relatively small percentage of the restaurant and motel owners thought that the bypass had a positive effect on their town, while a relatively high percentage of the owners of the auto and truck repair shops perceived that the bypass had a positive impact.

6.4 Road Conditions and Maintenance Expenditure Financing of Bypass Counties

County engineers and road supervisors in seven of the eight counties that contained the nine bypass towns provided data on their road conditions and road and bridge maintenance expenditures. In general, the bypass counties are responsible for an average of almost 1,000 miles of road and hundreds of bridges. While over one-half (57%) of the asphalt roads are in good to very good condition, only 24 percent of the collective seven county road mileage is paved. The other 76 percent are unpaved gravel roads.

In the 1997 to 2001 period, total road and bridge maintenance expenditures of the seven counties increased from $15,563,209 to $17,383,325, an average increase of 2.3 percent per year over the five year period (not inflation adjusted). The average annual expenditure for road and bridge maintenance of the seven counties rose from $2,223,316 (1997) to $2,483,322 (2001). To finance road and bridge maintenance, all seven counties employed the property tax. Other revenue sources cited by the county representatives included federal-aid for bridge repair, state

fuel tax transfers, and other local taxes. A majority of the county engineers or road supervisors of the seven counties said that their current road and bridge maintenance budgets are insufficient to provide adequate transport service on the county's roads, and that the budget shortfall is substantial (10 to 30 percent).

6.5 Impact of Highway Bypasses on County Road and Bridge Maintenance Expenditure

KDOT performed significant maintenance on five of eight previous road alignments prior to transferring them to county maintenance responsibility. Typically, KDOT applied a one to two inch asphalt overlay on these old alignments. Four of the seven participating counties spent $3,500 to $15,000 on normal annual maintenance of the roads they inherited from the state. The city of Pleasanton in Linn County spent $25,000 to resurface the old US-69 alignment.

Based on KDOT data it is possible to estimate how much a county would have to spend, over the 20-year life of the road, to maintain roads they inherited from the state as a result of the bypass. The estimated 20-year per mile maintenance cost is $209,240. It is possible to estimate the 20-year maintenance cost of each of the old alignments by multiplying the $209,240, 20-year maintenance cost per mile by the number of miles of road inherited by the county as a result of the bypass.

The counties containing the sample bypass towns inherited 26.935 miles of road from the state, resulting in a total estimated 20-year county maintenance cost of $5,635,879, or $281,794 per year. The latter figure amounts to 1.6 percent of the 2001 seven county total road and bridge maintenance budget. There was wide county variation in the number of miles of road inherited by the state, and the resulting total 20-year maintenance cost.

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Appendix A

Kansas Highway Bypass Impact Study Questionnaire

I. GENERAL QUESTIONS

1. What is the name and location of your company?

(a) Company Name _____
(b) Company Location _____

2. What is the primary business of your company?

3. How many years has your firm been in its current location?

4. How many locations does your firm have in Kansas?

5. Has your firm changed locations in the last five years? (i.e. since 1997)

(a) Yes ____
(b) No ____

6. If the answer to question 5 is yes, what were the principal reasons for relocation?

7. If the answer to question 5 is yes, did the completion of the highway bypass in 1998 have an impact on your decision to relocate?

(a) Yes _____
(b) No _____

8. How dependent is your business on non-resident auto traffic passing through town?

(a) Very dependent _____
(b) Somewhat dependent _____
(c) Not at all dependent _____

II. IMPACT OF HIGHWAY BYPASS ON RETAIL SALES

9. Since completion of the highway bypass in 1998 my company's retail sales have:

(a) increased _____
(b) decreased _____
(c) stayed the same _____

10. If retail sales of your firm have increased since the completion of the highway bypass in 1998, by how much have sales increased in the 1999-2001 period?

(a) 1% to 5% _____
(b) 6% to 10% _____
(c) 11% to 15% _____
(d) 16% to 20% _____
(e) more than 20% _____

11. If the retail sales of your company have decreased since the completion of the highway bypass in 1998, by how much have sales decreased in the 1999-2001 period?

(a) 1% to 5% _____
(b) 6% to 10% _____
(c) 11% to 15% _____
(d) 16% to 20% _____
(e) more than 20% _____

12. Which of the following concerning the impact of the highway bypass on your company's retail sales during the 1999-2001 period is correct? Check the response that best applies to your situation.

(a) the bypass had no effect on sales _____
(b) the bypass had a minor effect on sales _____
(c) the bypass had a major effect on sales _____

13. If the answer to question 12 is (b) or (c), when did the greatest impact on your company's retail sales occur? Check the one response that best applies to your situation.

(a) 1998 _____
(b) 1999 _____
(c) 2000 _____
(d) 2001 _____
(e) the impact was the same in all the above years _____

14. If the highway bypass had never been built, would the retail sales of your company been higher during the 1999-2001 period?

(a) yes _____
(b) no _____
(c) uncertain _____

III. IMPACT OF HIGHWAY BYPASS ON EMPLOYMENT

15. Since completion of the highway bypass in 1998, my company's employment has:

(a) increased _____
(b) decreased _____
(c) stayed the same _____

16. If the employment of your firm has increased since completion of the highway bypass in 1998, by how much has employment increased during the 1999-2001 period?

(a) one additional employee _____
(b) two additional employees _____
(c) three additional employees _____
(d) four additional employees _____
(e) more than four additional employees _____

17. If the employment of your firm has decreased since completion of the highway bypass in 1998, by how much has employment decreased during the 1999-2001 period?

(a) one less employee _____
(b) two less employees _____
(c) three less employees _____
(d) four less employees _____
(e) more than four less employees _____

18. Which of the following concerning the effect of the highway bypass on your company's employment during the 1999-2001 period is correct? Check the response that best applies to your situation.

(a) the bypass had no effect on employment _____
(b) the bypass had a minor effect on employment _____
(c) the bypass had a major effect on employment _____

19. If the answer to question 18 is (b) or (c) when did the greatest impact on your company's employment occur? Check the response that best applies to your situation.

(a) 1998 _____
(b) 1999 _____
(c) 2000 _____
(d) 2001 _____
(e) the impact was the same in all the above years _____

20. If the bypass had never been built, would employment of your company been higher during the 1999-2001 period?

(a) yes _____
(b) no _____
(c) uncertain _____

IV. IMPACT OF HIGHWAY BYPASS ON LABOR COST PER EMPLOYEE

21. Since completion of the highway bypass in 1998 my firm's labor cost per employee has:

(a) increased _____
(b) decreased _____
(c) stayed the same _____

22. If the labor cost per employee of your company increased since completion of the highway bypass in 1998, by how much has labor cost per employee increased during the 1999_2001 period?

(a) 1% to 5% _____
(b) 6% to 10% _____
(c) 11% to 15% _____
(d) 16% to 20% _____
(e) more than 20% _____

23. If the labor cost per employee of your company decreased since completion of the highway bypass in 1998, by how much has labor cost per employee decreased during the 1999-2001 period?

(a) 1% to 5% _____
(b) 6% to 10% _____
(c) 11% to 15% _____
(d) 16% to 20% _____
(e) more than 20% _____

24. Which of the following concerning the impact of the highway bypass on your company's labor cost per employee during the 1999-2001 period is correct? Check the response that best applies to your situation.

(a) the bypass had no effect on labor cost per employee _____
(b) the bypass had a minor effect on labor cost per employee _____
(c) the bypass had a major effect on labor cost per employee _____

V. SUMMARY

25. On balance, the highway bypass has positively affected the town (i.e. less traffic congestion, improved safety, fewer vehicle emissions, improved access for the town's businesses)? Do you agree?

(a) yes ____
(b) no ____
(c) uncertain ____

26. On balance, the highway bypass has negatively affected the town (i.e. reduced non-resident auto traffic)? Do you agree?

(a) yes ____
(b) no ____
(c) uncertain ____

Appendix B

Highway Bypasses and County Roads Survey

PART I, GENERAL QUESTIONS

1. How many miles of road is the county responsible for?

2. How many miles of the county's roads are in the following categories?

(a) cement _____

(b) asphalt _____

(c) unpaved _____

3. For the county's cement roads, what percent of the miles are in the following categories? Total must add to 100 percent.

(a) very poor _____

(b) poor _____

(c) fair _____

(d) good _____

(e) very good _____

4. For the county's asphalt roads, what percent of the miles are in the following categories? Total must add to 100 percent.

(a) very poor _____

(b) poor _____

(c) fair _____

(d) good _____

(e) very good _____

5. Has the number of paved miles in the county declined in recent years?

(a) yes _____

(b) no _____

(c) no change _____

6. Which of the following best describes the overall condition of the county's roads compared to five years ago?

(a) much worse _____

(b) worse _____

(c) unchanged _____

(d) better _____

(e) much better _____

7. Does the county have any roads and bridges that are closed to heavy trucks (i.e., 80,000 pound trucks)?

(a) yes _____

(b) no _____

PART II, FINANCIAL

8. What was the county's annual expenditure (budget) for road and bridge maintenance in the following years?

(a) 2001 _____

(b) 2000 _____

(c) 1999 _____

(d) 1998 _____

(e) 1997 _____

9. Is the current budget for road and bridge maintenance sufficient to maintain an adequate level of service on the county's roads?

(a) yes _____

(b) no _____

10. If the answer to the previous question is no, put a checkmark for the response that best describes the maintenance budget shortfall. For example, if the budget is 90% of what is needed to provide adequate service, the budget shortfall is 10%.

(a) 10 percent or less _____

(b) 11 to 20 percent _____

(c) 21 to 30 percent _____

(d) 31 to 40 percent _____

(e) 41 percent or more _____

11. What are the sources of revenue for the county's road and bridge maintenance budget. Check all of the following that apply.

(a) local property tax _____

(b) local fuel tax _____

(c) grants from the state _____

(d) other (please specify) _____

PART III, IMPACT OF THE HIGHWAY BYPASS (REALIGNMENT)

12. Did the state of Kansas perform any maintenance on the old route (the one going through town) just prior to or during construction of the highway bypass (realignment).

(a) yes _____

(b) no _____

13. If the answer to the previous question is yes, describe the maintenance that was performed by the state of Kansas (i.e., resurfacing, reconstruction, etc.).

14. Since construction of the highway bypass (realignment), what has happened to vehicle traffic on the old route (the one going through town)?

(a) no change _____

(b) small increase (less than 10%) _____

(c) large increase (greater than 10%) _____

(d) small decrease (less than 10%) _____

(e) large decrease (greater than 10%) _____

15. Has the county had to do any maintenance on the old route since the highway bypass (realignment) was completed?

(a) yes _____

(b) no _____

16. If the answer to the previous question is yes, describe the maintenance that was performed by the county (i.e., resurfacing, reconstruction, etc.).

17. For the maintenance project described in the previous question, what was the cost to the county?

18. How much will the county have to spend to maintain the old route during its life cycle?