

GRIFFIN LINE MAJOR INVESTMENT STUDY

ECONOMIC IMPACT ANALYSIS

by

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EXECUTIVE SUMMARY

This study projects the economic impact of the design, construction, and operation of a transitway running along a roughly 9 mile segment, the so-called *corridor*, from downtown Hartford to the Griffin Center in Bloomfield. Two transportation modes are compared--a light rail transitway (LRT) and a busway.

This study was commissioned by the Greater Hartford Transit District (GHTD) with support from:

- the Capitol Region Council of Governments (CRCOG),
- the Connecticut Department of Economic Development (DED),
- the U.S. Department of Transportation, and
- the Connecticut Department of Transportation (CTDOT),
- as well as other public and private funding sources,

to assess the economic costs and benefits of a transitway investment in the Griffin Line Corridor. The study relies on data provided by the above organizations as well as the Rideshare Company (the regional rideshare brokerage and major employer Transportation Management Organization [TMO]) and the corridor municipalities. Data and technical support were also provided by Bechtel Corporation, a project engineering and engineering management consultant to GHTD.

This study was funded to provide the Economic Impact Study necessary as part of an ongoing Major Investment Study of the Griffin Corridor under preparation by GHTD. In conjunction with a number of other reports and analyses, these results will be submitted to the Connecticut Department of Transportation and the Federal Transit Administration in 1995.

The LRT project involves a total capital expenditure of \$215 million while the busway alternative involves a total capital expenditure of \$127.2 million. The LRT capital expenditures are distributed as follows and the approximate years of expenditure: \$174.3 million (1993-2000), \$8.6 million (2011 and 2023), and \$23.5 million (2018). The busway alternative involves Capital expenditures of \$94 million (1993-2000), \$14.5 million in (2011 and 2023), and \$4.2 million (2018).

The study assumes that twenty percent of the capital expenditure is funded by the state with the remainder funded by federal sources; net operating expenses for the Griffin Line are assumed to be funded fully from state sources.

The results of the two alternatives are summarized in Table A. The impact is most pronounced in Hartford County. Therefore, the reporting effort focuses on the impact there.

**Table A. Economic Impact Summary, 1995-2030.
Hartford County.
*Connecticut in italics.***

Case	Net Private Sector Job-Years Created	Net Total Job-Years Created	Present Value of Change in Real GRP (\$1995)	Present Value of Change in Real Disposable Income (\$1995)
1. Light Rail Line Alternative	2,115	8,281	\$48.8 million	\$71.0 million
	<i>2,246</i>	<i>5,844</i>	<i>\$34.3 million</i>	<i>\$72.8 million</i>
2. Busway Alternative	1,340	5,588	\$24.8 million	\$43.3 million
	<i>1,498</i>	<i>4,281</i>	<i>\$17.1 million</i>	<i>\$44.9 million</i>

Case 1, with the Light Rail Line implemented, is clearly the most desirable on an employment basis. Of the 2,246 private-sector (nonfarm) net job-years created, 2,115 are in Hartford County and 131 are in the rest of Connecticut. More public sector jobs accrue to Hartford than elsewhere in the state; that Hartford is the site of the development as well as the state capitol makes this unsurprising. Moreover, in a state the size of Connecticut, Hartford jobs *are* state jobs; people commute to jobs in Hartford from every corner of the state.

The present value of the change in real disposable income reflects the change in household wealth and real buying power. Hartford County households increase the present value of their future buying power by about \$71.0 million, whereas households in the rest of Connecticut gain \$1.8 million in the present value of their buying power. This distribution of benefits is characteristic of such localized public investments. Although State funding is reduced elsewhere in the State, the remainder of the State (outside of Hartford) still enjoys a positive economic impact.

One way to evaluate the projected return is through the benefit/cost ratio. The benefit/cost ratio is State personal (pre-tax) income divided by the cost of the project to the State. It suggests how much pre-tax income the average taxpayer receives for every dollar of his or her taxes that is diverted to finance the project. Comparing total State expenditures to the change in the present value of real income suggests a benefit/cost ratio of 2.12 for the project under the assumptions of Case 1. This amounts to the average taxpayer receiving \$2.12 in income for every dollar the taxpayer gives up in taxes to sponsor the project. Essentially, the benefit/cost ratio must exceed 1.0 to imply a positive return. Due to the federal subsidy in particular, the ratio for the Griffin Rail Line is uncommonly high. More common favorable ratios typical to public works projects funded across the U.S. are on the order of 1.4-1.8. This implies that, aside from the fact that the benefit is greater to Hartford than elsewhere in the state, this project has considerable state-wide social benefit, and a more productive use of the funds involved is not likely to be found.

Case 2 implements a busway to service the Griffin Corridor. There is a slightly larger increase in both net total and private sector employment in the rest of Connecticut (158 versus 131), while in Hartford County employment increases by substantially less (1,340 net job-years versus 2,246 net job-years).

In Case 2, total economic activity in Hartford County increases by \$24.8 million (\$1995) and decreases by \$7.7 million elsewhere in the state. Over the 35-year period, real disposable income increases in Hartford by \$43.3 million, and increases elsewhere in the state by \$1.6 million. Comparing total State expenditures to the change in the present value of real income suggests a benefit/cost ratio of 2.21 for the project under the assumptions of Case 2. This amounts to the average taxpayer receiving \$2.21 in pre-tax income for every dollar the taxpayer gives up in taxes to sponsor the project. This is a productive use of funds that generates measurable social benefits.

On a benefit/cost basis, Case 2 is the slightly more advantageous case. The benefit/cost ratio, however should not be the sole measure by which the project is evaluated. In Hartford County, Case 1 produces two-thirds more new net job-years, twice the increase in Disposable Income and nearly two-thirds more gain in Gross State Product. By these critical measures Case 1 has the greatest positive economic benefit on the State.

In summary, either alternative produces highly desirable economic stimulus for the state as a whole. Each case examined the capital expenditures result in a reduction in disposable income for Connecticut residents outside Hartford County. The positive impact is largely localized in Hartford County, and in some cases comes at some cost to the rest of the state. Yet, on average, every taxpayer dollar spent brings \$2.12-\$2.21 to the taxpayer. These benefits are realized while fulfilling the goal of providing commuters a realistic means to get to jobs in and out of Hartford while reducing traffic congestion and vehicle pollutant emissions.

The light rail system may appear less desirable by some measures than the busway as a result of higher, up-front fixed costs combined with the study selection of a 9 mile corridor from Hartford to Griffin Center. Extending the line to Bradley Airport more completely leverages the investment. As shown in the March 1994 study, *Griffin Line Corridor Study: Economic Impact Analysis*, extending the light rail line to the airport increases the cost/benefit ratio to 5.24, and increases private-sector net job-years to 6,581 statewide, with 5,418 of them in Hartford. Gross State Product soars as well.

The study forecasts that the demand stimulus provided by the Griffin Line is not fully captured, representing a lost opportunity for the state. The growth in consumer demand resulting from the project is satisfied primarily through the "import" of goods and services from producers outside the state. Connecticut business expansion never catches up. This is probably because long-run business costs remain lower outside the state, so that it is cheaper to produce elsewhere and then ship to Connecticut. This results in a net "import" of goods into the state.

The problem here is not the Griffin Line Alternatives. If Connecticut business costs are higher than elsewhere in the country, it is a problem that exists prior to the Griffin Line. This project neither creates the problem nor appreciably exacerbates it. The Griffin Line modestly decreases business costs. This analysis simply highlights the obstacle that this cost competitiveness represents for any demand stimulus. The Griffin Line investment could be combined with other state programs to improve the state's competitiveness, resulting in substantially more positive impact than the programs could generate separately. A greater portion of the increased demand could be satisfied through local production and employment, providing a smoother, more sustainable growth path.

For example, the impact of the Griffin Line could be enhanced by the implementation of a parking policy in downtown Hartford. As reported in the prior study, *Griffin Line Rail Corridor Pilot Study: Phase 2A, Technical Memorandum 2.2: Parking Policy Scenarios* (January 1993), an optimal parking policy includes the adoption of market pricing for parking in the Hartford CBD and Asylum Hill areas in combination with a transit subsidy of \$60 per month per employee. The pro-

posed parking policy would create cost savings for Hartford CBD/Asylum Hill area businesses as employer parking subsidies would be replaced by lower cost transit subsidies. An earlier report *Griffin Line Corridor Study: Economic Impact Analysis* (March 1994) studied the effect of implementing this “optimal” parking policy in conjunction with the construction of a light rail line to serve the entire Griffin Corridor (to Bradley International Airport). The benefits of coupling the construction and parking policy is two-fold: businesses save and there is substantial additional stimulus to the State and local economies. The net combined effect of the extended LRT and the parking policy is to create *seven and a half times as much private employment* as the shorter LRT without the parking policy, and over three and a half times as much total employment. At the same time, real GRP expands by more than six times as much, and the after tax purchasing power of the populace is more than tripled.

Thus, it is possible to capture some of the lost opportunity by supplementing the project with other policies or projects. Broad-ranging reforms of business taxes, or alternatively, localized tax relief in the form of enterprise zones or targeted industry clusters could do much to foster long-term growth and employment.

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INTRODUCTION

This study was commissioned by the Greater Hartford Transit District (GHTD) with support from the Capitol Region Council of Governments (CRCOG), and with grant support from the Connecticut Department of Economic Development (CTDED), the U.S. Department of Transportation, and the Connecticut Department of Transportation (CTDOT), as well as other public and private funding sources, to assess the economic costs and benefits of transitway investment in the Griffin Line Corridor. The data underlying this study were developed over the past five years by these groups in cooperation with the corridor municipalities.

The Griffin Line Transit Project involves a 9 mile segment from downtown Hartford to the Griffin Center in Bloomfield, terminating at Griffin Center Office Park. The study supports an extensive Major Investment Study of the Griffin Line Corridor under preparation by GHTD for the Connecticut Department of Transportation and the Federal Transit Administration. This economic impact study considers the implications of alternative forms of public transit, a light rail line versus a busway, to service this study corridor.

The GHTD is performing a Major Investment Study (MIS) for the abandoned railroad right-of-way north of Hartford known as the "Griffin Line". As part of the MIS, GHTD is studying various engineering, community operational, ridership and financial aspects of the project on a feasibility/conceptual level. The most capital intensive alternatives are the busway and the Light Rail alternatives. The major objectives of the Griffin Line project are:

- To improve mobility and access in the Griffin Line Corridor,
- To provide a focal point and catalyst for economic and community development,
- To support the long term attainment and maintenance of the regional air quality standards and energy conservation.

The present study substantively provides the economic impact data required under the second item. Specifically, in this study we project the retention and expansion of economic activity, jobs, tax base, and economic welfare in the form of total and per capita real disposable income. Furthermore, we examine changes in employment by sector, changes in spending patterns by final demand, as well as demographic shifts.

Various associated programs and development projects, dependent upon the Griffin LRT and Busway are also evaluated:

- LRT and busway implications, and other development considerations required under the Clean Air Act and
- Increased number of jobs accessible to zero car households.

Along the way, ridership, traffic, and travel time savings are considered, as well as Phase 2A Capital and Operating Cost Estimates and Ridership Projections. For more on these topics see the *Greater Hartford Transit District, Griffin Line Rail Corridor Pilot Study: Phase 2A, Technical Memorandum*, Sections 1, 2.1-2.4, 3.1-3.2, 4 and 5, 1992 and *Griffin Line Corridor Study: Economic Impact Analysis, 1994* and the Technical Memoranda developed to support the current MIS.

This study is limited to the initial “leg” of the Griffin line ending at Griffin Center, and does not directly consider the following related proposed programs and development projects:

- Extension of the transit line to Bradley International Airport,
- Amphitheater and related development projects,
- Projections of additional development attracted to the Corridor,
- Enterprise Zone,
- CBD Loop, and
- Downtown Station.

These projects, although synergistic to the Griffin Line, were not included herein to provide a focus on Griffin Line impacts.

CCEA CONNECTICUT ECONOMETRIC MODEL

In 1992, with funding from the Connecticut Department of Economic Development (DED), the Department of Economics at the University of Connecticut acquired a microcomputer-based econometric model of the Connecticut economy from Regional Economic Models, Inc. (REMI). A Massachusetts-based firm with historical ties to the University of Massachusetts, REMI has developed an expertise in regional econometric modeling, and is a leading supplier and developer of such models. Following the acquisition of the model, the Department of Economics at the University began the formal process to create the Connecticut Center for Economic Analysis (CCEA).

In 1993, the CCEA, with funding again from DED and private sources, acquired another economic model from REMI that breaks out Hartford and Fairfield Counties, allowing each county to be studied in isolation or combined with the rest of the state.

The REMI models include all of the major inter-industry linkages among 466 private industries, aggregated into some 49 major industrial sectors. With the addition of farming and three public sectors (state & local government, civilian federal government, and military), there is a total of 53 sectors represented in the models.

At the root of the models are the results of extensive modeling efforts at the U.S. Department of Commerce (DoC). The DoC has developed, and continues to develop, an *input-output model* (or *I/O model*) for the United States. Modern input-output models, largely the result of the path-breaking research by Nobel laureate Wassily Leontief, focus on the inter-relationships between industries, and provide micro-level detail regarding factor markets (including the labor market), intermediate goods production, as well as final goods production and consumption. Conceptually, the model is constructed in the form of a table, a kind of cross-reference, in which each cell summarizes the sales-purchase relation between industries or sectors.

An example may help to make clear the value of this structure. Suppose that one cell changes; wages for labor rise in one specific sector. The labor cell in that sector would change. Then the change would flow through the table, affecting inputs and outputs in other industries along the chain of production. At the same time, businesses might substitute capital machinery (automation) or other inputs that appear more cost effective as a result of the change, offsetting to some extent the rising cost of labor. Workers may attempt to shift their employment to the sector with the higher wages. That is, all of the elements of the model, just like the economy it represents, are related to all other elements of the model.

The REMI Connecticut model takes the U. S. I/O “table” results and scales them according to traditional regional relationships and current conditions, allowing the relationships to adapt at reasonable rates to changing conditions. Additionally:

- Consumption is determined on an industry-by-industry basis, from real disposable income in Keynesian fashion.
- Wage income is related to sector employment factored by regional differences.
- Property income depends only on population and its distribution, adjusted for *traditional* regional differences, not on market conditions or building rates relative to business activity.

- Estimates of transfer payments depend upon unemployment details of the previous period. Moreover, government expenditures are proportional to the size of the population.
- Federal military and civilian employment is exogenous and maintained at a *fixed* share of the corresponding total U. S. values, unless specifically altered in the analysis.
- Migration into and out of the state is estimated based upon relative wages and the “amenities” of life in Connecticut versus other states.
- “Imports” and “exports” from other states are related to relative pricing and production costs in Connecticut versus elsewhere.

Depending on the analysis being performed, the nature of the chain of events cascading through the model (economy) can be as informative for the policymaker as the final aggregate results. Because the model generates such extensive sectoral detail, it is possible for experienced economists in this field to discern the dominant causal linkages involved in the result.

In the sections that follow, the final aggregate results are discussed and important causal linkages highlighted. The model output summary tables for the cases examined are included as an appendix.

METHODOLOGY AND ASSUMPTIONS

The transit alternatives are evaluated in comparison to each other. Our analysis provides detailed forecasts for Hartford County, the rest of Connecticut, and the State as a whole.

Because the *economic impact* is largely limited to Hartford County, we focus our analysis on changes in economic activity in the County. Because the *investment* is made by the State, and residents statewide will pay the State's share of the expenses in terms of higher taxes or reductions in other state services, the cost/benefit analysis is made for the State as a whole.

We outline the analysis and policy variables involved:

CAPITAL EXPENDITURES. Capital expenditures for the Light Rail Line alternative total \$215 (in 1994 dollars), over the period 1995-2030. By the year 2000, 81% of the total expenditures are made with the remainder of the capital expenditures made in 2011, 2018, and 2023 (\$8.6 million, \$23.5 million, and \$8.6 million, respectively). Total capital expenditures for the Busway are \$127.2 million with nearly three-quarters of the total capital expenditure made by 1999. The rest of these expenditures: \$14.5 million, \$4.2 million, and \$14.5 million are made in the years 2011, 2018, and 2023, respectively.

The State of Connecticut is expected to subsidize the continuing operations of either system. Riders will pay a fare that covers only a portion of the total cost of the ride. Given the State's balanced budget requirement, the cost of the subsidy was entered as a corresponding reduction in other state expenditures. Since the reduction was entered in percentage terms, each region of the state had its share of state spending reduced by the same proportion. (State and Local spending; variable 1314)

The total operating cost of each of these lines was entered as the output of that line. This variable is an "output translator"; the increase in output was entered in constant dollar terms, and it is distributed across the output sectors of the economy according to historical norms. (Variable 217)

OTHER COSTS. Over 1,700 cars daily are diverted from driving in or out of Hartford because their drivers will opt to ride on the Griffin Line Light Rail, while the implementation of the Griffin Busway will divert nearly 2,000 drivers. In each case, one half of the operating cost or just over 37 cents per mile for cars in Connecticut was allocated to depreciation and maintenance service. Multiplying this figure by the average daily trip distance for the work-trip cars and the non-work-trip cars and the average number of such riders, we obtained an estimated daily cost saving to the drivers of these diverted cars. The annual total of these savings from each alternative was entered into the model. (Variable 161)

The other half of the saving on auto costs discussed above was assumed to be spent on fuel. (Variable 166)

Approximately one-half of all the riders that will take the Griffin Line previously used other forms of public transit. The fare and state subsidy for these riders will be lost to the other forms of public transit and were therefore subtracted from that system as revenues. That is, the demand for "traditional" public transit was reduced by the total of the fares of the "transplanted" riders. (Variable 262)

Each car diverted (because their passengers opt to take the Griffin Line) is no longer renting a parking space in Hartford. Assuming the supply of parking space is perfectly inelastic and assuming demand has declined, we calculated a new rental rate for parking space. The change in rate times the traditional number of space rented in Hartford represents a loss to parking lot owners. The value of output in this industry was reduced by this figure. (Variable 184)

BENEFITS. The Griffin Line will reduce the travel time of the people who previously drove cars into and out of Hartford. With fewer vehicles on the roads, the remaining drivers will be able to make their trips into and out of Hartford in less time. Also, fewer vehicles on the road means better air quality due to fewer vehicle emissions. The value of these time savings were evaluated using USDOT benchmarks. These time savings improve the quality of life in the Hartford area, so they were considered in the model input as an amenity term. Amenity is measured according to value of these time savings as a percent of labor income. (Population variable 11)

Moreover, people will only ride the Line if the dollar cost of the ride is less than the dollar cost of their best alternative source of transportation. Above car savings for work riders and nonwork riders were mentioned. To these car savings, we added the savings on parking fees. At present the major employers are charging their employees only a fraction, on average, of their actual parking costs. Once we subtract the fare that these riders have to pay from their car and parking savings, we have a measure on new spendable income for workers and nonworkers alike. These net savings were entered as new disposable income for Hartford area residents. (Variable 1311)

The Griffin Line provides an additional mode of transportation for transit dependent households and therefore, has the potential to increase job accessibility/opportunities to zero car households. (Variable 999)

While the employee saves on parking fees, so also does the employer. At present, the major downtown employers are leasing nearly 7,000 parking spaces at \$115 per month on average. Each employee car diverted represents a saving to the employer of this parking lease fee less what they collected from the employee for the space. These savings to the employers were entered as a reduction in labor costs. (Variable 1314)

The study considers two transitway alternatives — a Light Rail and a Busway.

Case 1: Light Rail Line Alternative Is Implemented.

Case 2: Busway Alternative Is Implemented.

In each case, we examine the changes in important economic variables from the alternative forecasts, and compute a benefit/cost ratio based upon the present value of state expenditures and changes in real disposable income. It should be noted that the prior study for the entire corridor, *Griffin Line Corridor Study: Economic Impact Analysis (March 1994)* entails similar assumptions, however, they are slightly different in some cases. Detailed comparisons of the results should be done carefully.

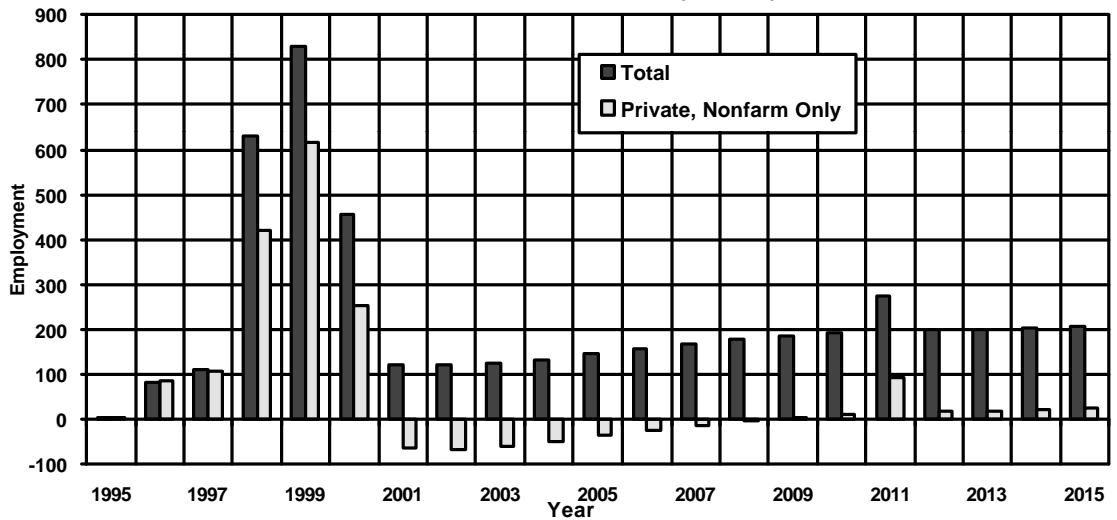
IMPACT ANALYSIS — CASE 1: GRIFFIN LIGHT RAIL LINE ALTERNATIVE

In this case a light rail line is implemented running between Hartford and Griffin Center. The State of Connecticut pays 20% of the capital costs, and 80% derives from federal sources. The State pays all of the net operating costs.

As shown in Figure 1, peak increases in *total* employment in Hartford, including the government and farming sectors, occur in 1999 with the addition of 829 total jobs. Of these, 616 jobs are in the private nonfarm sectors, and 213 are in the government sector. The majority of the annual, new job creation in the private, nonfarm sectors occurs during the construction and design period and the other periods of capital expenditure

Most of the early job creation is driven by the design and construction activity. Once normal operations commence and the direct construction jobs are lost, net job creation remains positive, and increases year by year. Once the construction activity is complete, the net increase in Hartford jobs in this period is lowest in 2002 with an increase in employment of 121 jobs, and rises to 425 jobs gained by 2018 due to additional capital expenditures. The net increase of 121 jobs in 2001 is attributable to a loss of 65 private, nonfarm jobs and an increase of 186 government sector jobs. The growth in government sector employment reflects Griffin Rail Line employment and the expansion of government services to support the population growth stimulated by the additional economic activity.

Figure 1. Total Employment in Hartford County Resulting from the Griffin Rail Line Investment (Case 1)

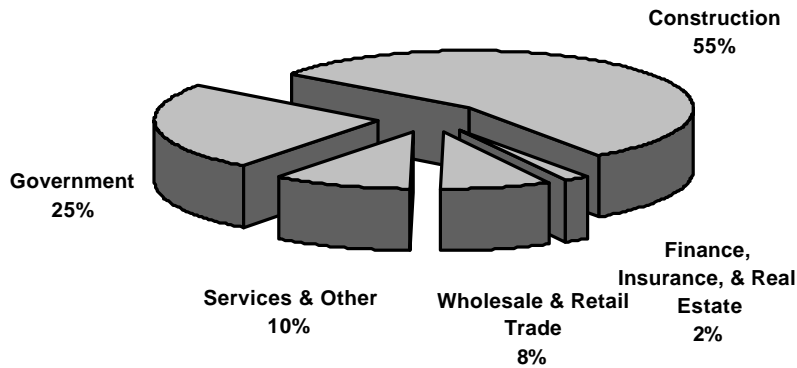


Prior to 2001, the design, planning, and construction, financed in large part by external funds, provide stimulus to the private sector. Once, the construction phase is complete, continuing operations are heavily subsidized by public funds; under the state's balanced budget constraint, this implies an increased reallocation of public resources. At a glance, Figure 3 reveals negative values of private nonfarm investment (external funding) from 2001-2008. However, these negative values are misleading. The construction phase stimulus results in firms re-scheduling some expansions. Capital projects that might have occurred in the years 2001-2008 based upon typical depreciation rates and earlier lower expectations of consumer demand, are moved up into the 1996-2000 period. Some

degree of post-construction investment slowing is therefore to be expected. The resulting business investment is better demonstrated by the net present value of investment, which is \$14.43 million (1995 dollars).

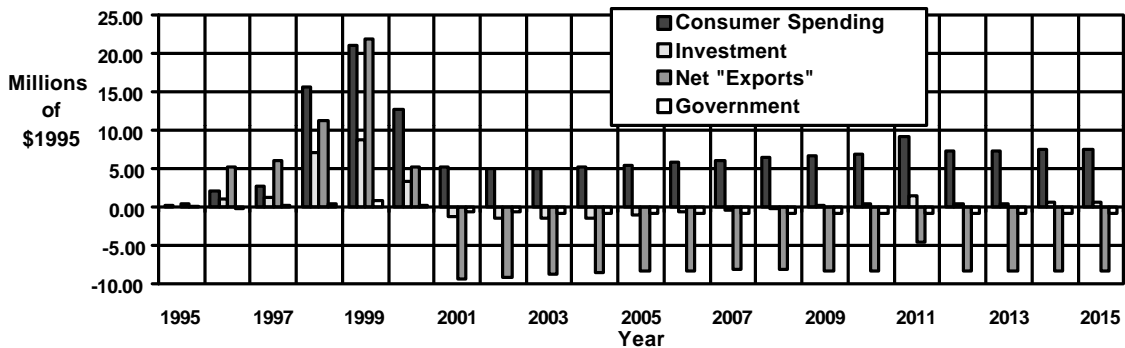
We can confirm that the early job creation in Hartford results from the design and construction effort by examining the breakdown of job creation in the peak year 1999. As shown in Figure 2, 463 of the jobs created in 1999 are in the construction industries; 80 of the jobs are in the service industries, reflecting, among other things, engineering and consulting services associated with the project. The wholesale and retail trade industries add 63 jobs.

Figure 2. Hartford County Employment Changes by Sector in 1999. (Case 1)



Approximately 55% of the employment change is in the construction sector, as compared with 10% in the service sector. As shown in Figure 3, the final demand stimulus comes primarily from consumer spending — about \$20.98 million in real terms (1995 dollars) in 1999. In the same year, fixed investment rises by \$8.75 million in real terms, driven mainly by a \$4.56 million increase in residential investment and \$3.32 million increase in business equipment.

Figure 3. Change in Spending by Final Demand in Hartford County. (Case 1)



As consumer spending is stimulated by the initial construction boom and subsequent capital expenditures, government spending decreases. The decline in the expansion of government spending

becomes negative as the benefits of the light rail outweigh the expense. Consumer demand declines from 2000-2003 (See Figure 3), then begins to rise as the benefits of increased employment and cost reductions are realized. Reduced demand in the automobile and the automobile service industries erode the demand for private investment. Growth in production in Hartford County is insufficient to meet demand causing “imports” from the rest of the state and elsewhere to exceed “exports” after 2000. Slower growth in private investment coupled with negative net exports make for a lost opportunity to expand the capital base enough to fully capture the economic benefit of the Griffin Line investment. This dominates the aggregate economy of Hartford County, after the year 2000 (See Figure 4). Hartford’s Real Gross Regional Product (GRP), a measure of the total economic activity in the region, is negative after 2000, as consumer demand is met by purchases from outside the region. The productive capacity for consumer goods in Hartford County does not grow sufficiently to absorb the increased consumer demand, forcing residents to “import” consumer goods. The excess of demand over productive capacity does not leave as much capacity for goods produced for “export,” reducing the potential for sales outside the region. Any ancillary policies enacted that reduce net imports would, then, also positively impact GRP and employment.

Figure 4. Change in Real Gross Regional Product of Hartford County. (Case 1)

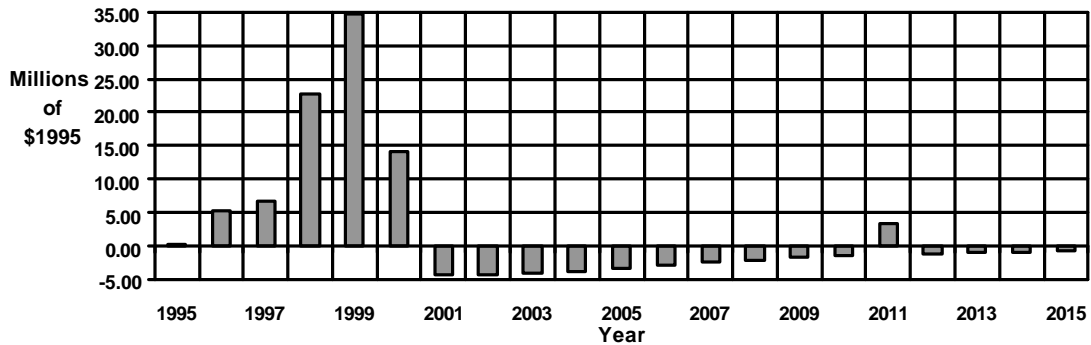
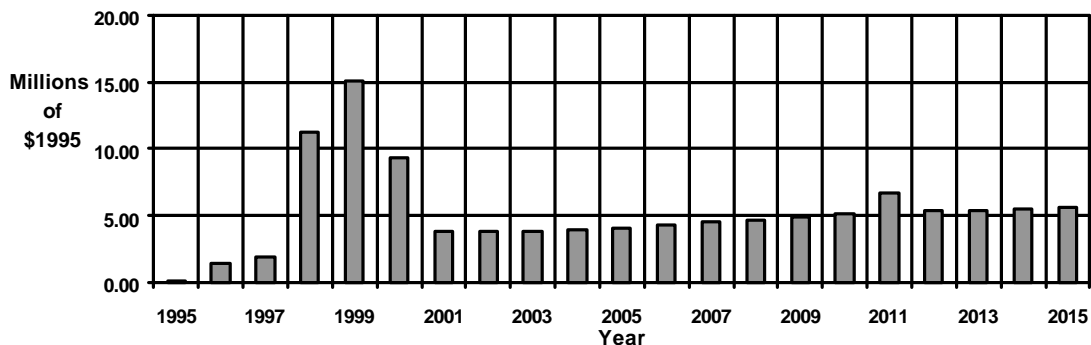


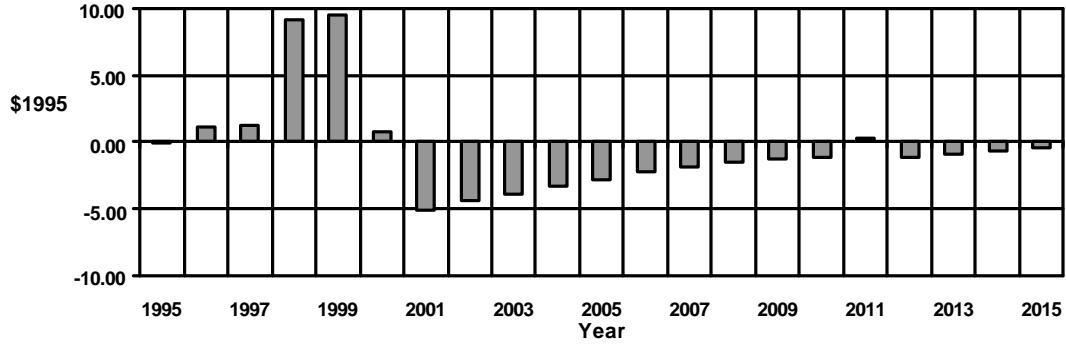
Figure 5. Change in Real Disposable Income of Hartford County. (Case 1)



On the other hand, the real disposable income remains positive and has been boosted throughout the post-construction period by subsequent capital expenditures throughout the analysis period (See Figure 5). Unfortunately, this does not translate so clearly into a GRP increase because this positive change in buying power relative to net business investment results in the negative change in net exports. Population changes can influence the average disposable income. Therefore, in Figure

6, we review the measure on a per capita basis as a proxy measure for the economic well-being of Hartford County residents.

Figure 6. Change in Per Capita Real Disposable Income in Hartford County. (Case 1)



The negative changes in *per capita* real disposable income from 2001 on can be attributed to immigration into Hartford County. Population levels increase by 480 and 469 in 2000 and 2001, respectively. Figure 6 shows that at the peak of Hartford's *per capita* real disposable income each person in Hartford County would receive an additional \$9.50 in after-tax income to spend in 1999.

At first glance, the negative changes in *per capita* real disposable income from 2001 on would seem to offset the earlier increases in the measure, but on a present value basis the earlier improvements dominate. It is the nature of present value computations that events further from the present are weighted less than events in neighboring years. Thus, the decreases in the measure are discounted more than the increases because they occur later.

Benefit/Cost Ratio. Because the entire state bears the cost of the proposed transitway, we compare statewide benefits, in terms of the change in real personal income, to the total expenditure financed by the state. Real personal income is the total *inflation-adjusted* income stream to residents. Increases in this measure represent improvements in real buying power, and therefore an improved (economic) standard of living. Thus it reflects the net economic welfare of the total populace. To compute the Benefit/Cost Ratio, we compare the real present values of the increase in real personal incomes to the real present value of the state expenditures by residents (the cost). That is, we form the ratio of the change in income (the change in disposable income plus cost) and the cost. This is accomplished in Table 1.

The computed Benefit/Cost Ratio of 2.12 compares favorably with other projects of this type. In fact, ratios of 1.4 to 1.8 would be more common for *favorable* results for similar public works projects. Principal reasons for this outcome are the injection of funds from outside the state. These results could be further improved by an increase in investment, improving productive capacity and therefore the ability to respond locally to the increase in consumption demand.

On a statewide basis, net private sector job-years created (2,246), net total job years created (5,588), the present value of the change in real gross state product (\$34.3 million), and the present value of the change in real disposable income (\$72.8 million) represent the more significant impact of the two cases studied. The positive economic impact of the Griffin Light Rail is uncommonly favorable. Coordinated with other public policy to improve the state's ability to competitively produce needed goods and services could increase the impact further.

Table 1
Case 1: Griffin Rail Line Alternative
Changes in Connecticut

<i>Year</i>	<i>Private Nonfarm Employment</i>	<i>Total Employment</i>	<i>Population</i>	<i>Personal Income</i>	<i>Disposable Income</i>	<i>Gross Regional Product</i>
1995	3	3	19	0.4	0.1	0.2
1996	98	76	34	4.0	1.7	5.2
1997	132	133	72	7.3	2.8	7.5
1998	536	736	272	41.6	16.1	27.4
1999	761	955	561	61.7	21.6	40.4
2000	292	436	685	40.1	11.8	14.2
2001	-118	-22	612	13.0	2.5	-8.8
2002	-117	-24	512	9.4	2.2	-8.8
2003	-104	-13	438	7.7	2.1	-8.4
2004	-86	4	376	7.3	2.2	-7.7
2005	-65	24	327	8.0	2.4	-6.8
2006	-44	44	291	9.6	2.7	-6.0
2007	-27	61	266	11.7	3.1	-5.2
2008	-12	76	250	14.3	3.4	-4.6
2009	0	90	240	17.3	3.7	-4.1
2010	10	101	235	20.6	3.9	-3.6
2011	107	198	253	37.9	6.3	1.8
2012	17	109	253	27.6	4.2	-3.4
2013	19	112	238	29.5	4.3	-3.2
2014	21	113	226	31.6	4.3	-3.1
2015	24	117	216	34.4	4.4	-3.0
2016	28	122	208	38.2	4.6	-2.8
2017	31	127	205	42.7	4.7	-2.6
2018	286	384	270	117.9	11.3	12.1
2019	29	141	293	63.1	5.4	-2.4
2020	30	148	281	67.6	5.6	-2.1
2021	29	148	282	71.5	5.7	-2.1
2022	29	148	285	76.9	5.8	-2.1
2023	124	244	312	120.6	8.4	3.4
2024	26	147	321	92.9	6.0	-2.2
2025	27	148	318	98.9	6.2	-2.1
2026	28	149	319	106.9	6.3	-2.0
2027	31	151	323	116.1	6.5	-1.9
2028	32	152	327	126.3	6.7	-1.8
2029	33	154	334	137.8	6.9	-1.7
2030	35	156	340	150.8	7.1	-1.6

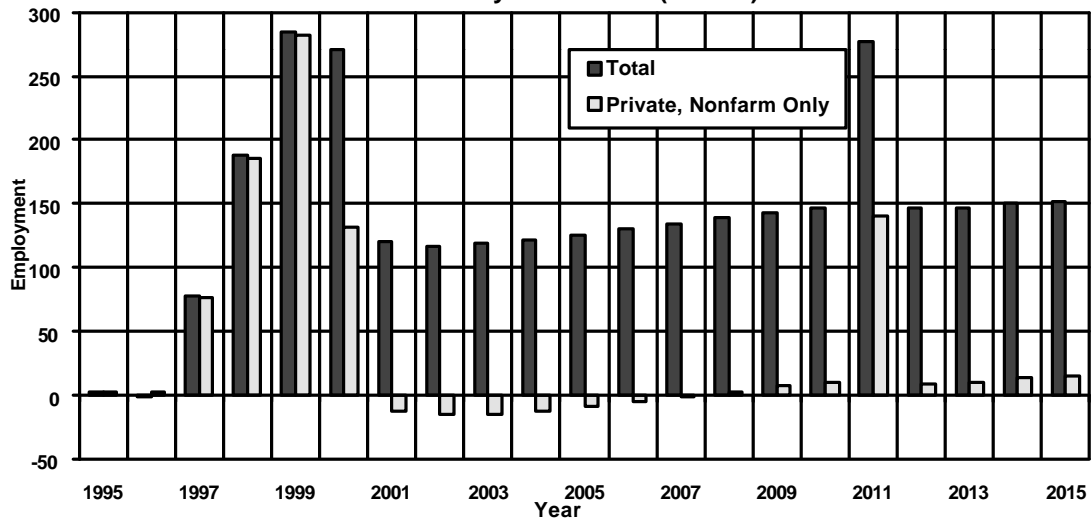
Notes: Disposable Income, Personal Income, and Gross State Product are in millions of 1995 dollars. The net present value of the Disposable Income series is \$72.8 (\$1995). The Benefit/Cost Ratio is 2.12.

IMPACT ANALYSIS — CASE 2: GRIFFIN BUSWAY ALTERNATIVE

This case study implements the Griffin Busway Alternative to service a route from Downtown Hartford to Griffin Center in Bloomfield Center. As in Case 1, the State of Connecticut pays 20% of the capital costs, and 80% derives from federal sources. The State pays all of the net operating costs.

Hartford County peak increases in *total* employment, including the government and farming sectors, occur in 1999 with the addition of 284 total jobs. Of these, 282 jobs are in the private non-farm sectors, and 2 are in the government sector. Most of these jobs are driven by the design and construction activity. Once normal operations commence, the net job increase is only positive because of growth in the government sector; private sector job losses peak in 2002 and 2003 with a loss of 15 jobs each year. We estimate that 9 of the jobs lost will be manufacturing jobs, while 6 are nonmanufacturing. While the creation of 134 and 133 government sector jobs in each of those same years reflects Griffin Busway employment however, most of the jobs are related to the expansion of government services to support the increased population. From 2008 on, job creation is positive in both the private and public sectors. The spike in private, nonfarm employment in 2011 corresponds to a projected capital expenditure of \$8.6 million.

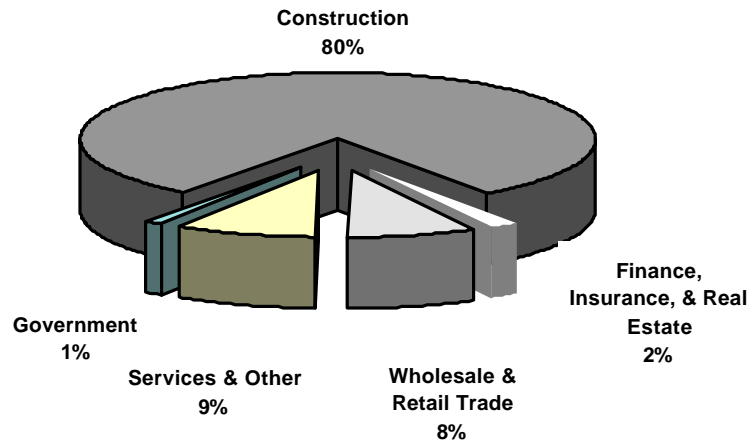
Figure 7. Total Employment in Hartford County Resulting from the Griffin Busway Investment (Case 2)



Prior to 2001, the design, planning, and construction, financed in part by external funds, provide stimulus to the private sector. In the years 2002-2010, the construction phase is complete, and the continuing operations proceed. These continuing operations are heavily subsidized by public funds; under the balanced state budget constraint, this implies that a portion state spending each year will be diverted from other uses to support the Griffin Line. The expanding productive capacity of the region is unable to keep pace with the new growth in demand, leading to increased “imports” into the region. Figure 9 shows only small positive values of private nonfarm investment (external funding) beginning in 2001. The construction phase stimulus results in firms re-scheduling some expansions. Capital projects that might have occurred in the years 2002-2010 based upon typical depreciation rates and earlier lower expectations of consumer demand, are moved up into the 1996-2001 period. The resulting business investment is better demonstrated by the net present value of investment, which is \$8.66 million (1995 dollars).

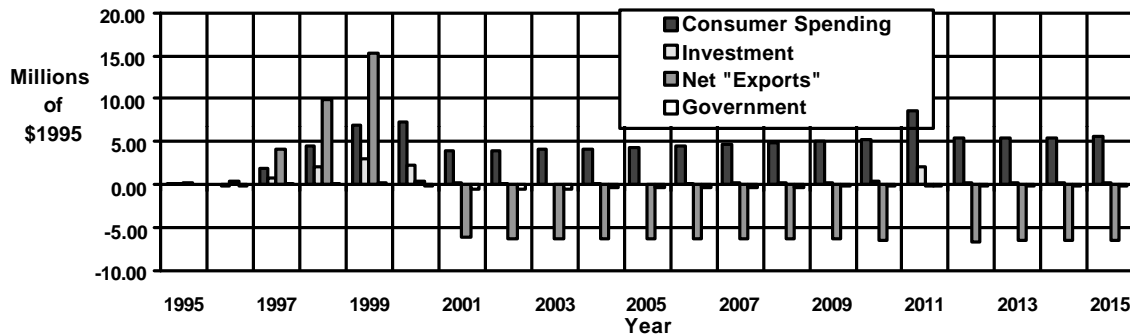
We can confirm that the early job creation results from the design and construction effort by examining the breakdown of job creation in the peak year 1999. As shown in Figure 8, 228 of the jobs created in 1999 are in the construction industries; 22 of the jobs are in the wholesale and retail trade industries, 28 of the jobs are in the service industries, reflecting, among other things, engineering and consulting services associated with the project.

Figure 8. Hartford County Employment Changes by Sector in 1999. (Case 2)



Approximately 80% of the employment change is in the construction sector, as compared with 1% in the government sector. As shown in Figure 9, the final demand stimulus comes primarily from net exports — about \$32.28 million in real terms (1995 dollars) in exports and \$16.96 million in imports in the peak year 1999. In the same year, consumer spending rises by \$6.98 million in real terms (1995 dollars), driven mainly by the \$1.20 million increase in services, other than health services and \$1.07 million increase in food and beverages.

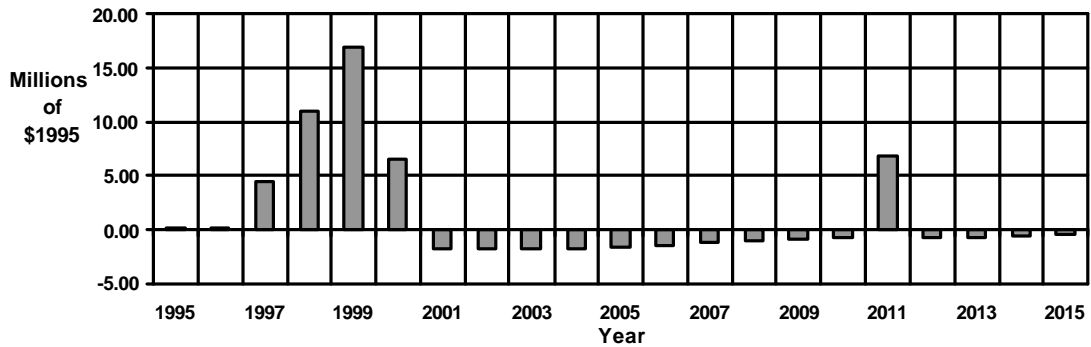
Figure 9. Change in Spending by Final Demand in Hartford County. (Case 2)



Year by year, the stimulus to consumer spending of the construction boom and increase in government spending decreases. Reduced demand for automobiles, automobile service, gas, oil, parts, etc., all reduce the demand for private business investment. The growth of production in Hartford County is insufficient to meet demand, causing “imports” from the rest of the State and elsewhere to exceed “exports” after 2000, a missed opportunity to expand the capital base enough

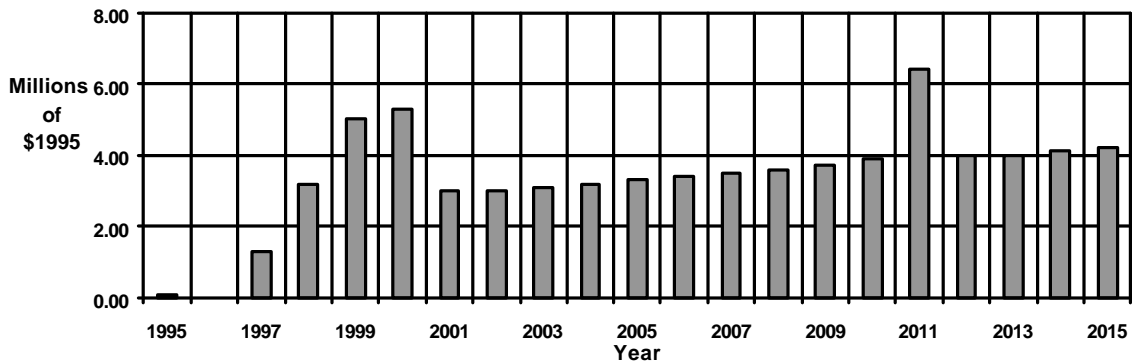
to fully capture the economic benefit of the Griffin Busway investment. This ultimately dominates the aggregate economy of Hartford County from 2001-2010 and 2012 forward (See Figure 10.). Real Gross Regional Product (GRP), a measure of the total economy activity in the region, declines during these years because consumer demand is being satisfied by purchases of goods produced outside the region. The productive capacity for consumer goods in Hartford County does not grow sufficiently to absorb the increased consumer demand, forcing residents to “import” consumer goods. The excess of demand over productive capacity does not leave as much capacity for goods produced for “export,” reducing the potential for sales outside the region.

Figure 10. Change in Real Gross Regional Product of Hartford County. (Case 2)



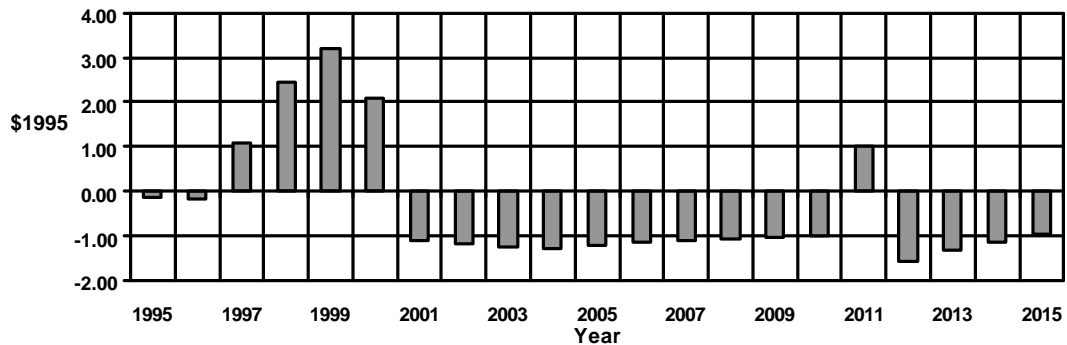
Real disposable income, on the other hand, remains positive throughout. Real disposable income is, loosely speaking, a measure of the after-tax buying power of the populace. Reflecting the increased government spending and consumer activity, this measure increases broadly in the early years, but appears to level-off in the later years (See Figure 11.). As mentioned before, this positive change in buying power relative to insufficient net business investment results in the negative change in net exports, although this could possibly be mitigated by aggressive state policies.

Figure 11. Change in Real Disposable Income of Hartford County. (Case 2)



Population changes can erode influence the average disposable income. Therefore, in Figure 12 we review the measure on a per capita basis as a proxy measure for the economic well-being of Hartford County residents.

Figure 12. Change in Per Capita Real Disposable Income in Hartford County. (Case 2)



At first glance, the negative changes in *per capita* real disposable income from 2001 on would seem to offset the earlier increases in the measure, but on a present value basis the earlier improvements dominate. It is the nature of present value computations that events further from the present are weighted less than events in neighboring years. Thus, the decreases in the measure are discounted more than the increases because they occur later.

Benefit/Cost Ratio. Because the entire state bears the cost of the proposed transitway, we compare statewide benefits, in terms of the change in real personal income, to the total expenditure financed by the State. Real personal income is the total *inflation-adjusted* income stream to residents. Increases in this measure represent improvements in real buying power, and therefore an improved (economic) standard of living. Thus it reflects the net economic welfare of the total populace. To compute the Benefit/Cost Ratio, we compare the real present values of the increase in real personal incomes to the real present value of the state expenditures by residents (the cost). That is, we form the ratio of the change in income (the change in disposable income plus cost) and the cost. This is accomplished in Table 2.

The computed Benefit/Cost Ratio of 2.21 compares favorably with other projects of this type. In fact, ratios of 1.4 to 1.8 would be more common for *favorable* results for similar public work projects. One of the principal reasons for this outcome are the injection of funds from outside the state. The results could be further improved by an increase in investment, improving productive capacity and therefore the ability to respond locally to the increase in consumption demand.

On a statewide basis, net private sector job-years created (1,498), net total job years created (4,281), the present value of the change in real gross state product (\$17.1 million), and the present value of the change in real disposable income (\$44.9 million) all represent desirable outcomes. The positive economic impact of the Griffin Busway is uncommonly favorable. Coordinated with other public policy to improve the state's ability to competitively produce needed goods and services could increase the impact further.

Table 2
Case 2: Griffin Busway Alternative
Changes in Connecticut

<i>Year</i>	<i>Private Employment</i>	<i>Total Employment</i>	<i>Population</i>	<i>Personal Income</i>	<i>Disposable Income</i>	<i>Gross Regional Product</i>
1995	2	2	18	0.4	0.1	0.2
1996	-3	-15	11	-0.4	-0.2	-0.3
1997	92	92	31	4.7	1.9	5.2
1998	224	222	94	12.5	4.7	12.5
1999	335	327	183	20.8	7.2	18.9
2000	157	262	269	21.4	6.7	6.8
2001	-30	49	277	10.1	2.5	-3.8
2002	-33	47	258	9.4	2.5	-3.8
2003	-30	51	247	9.4	2.5	-3.7
2004	-26	55	236	9.7	2.6	-3.5
2005	-18	65	229	10.7	2.7	-3.2
2006	-11	74	224	12.1	2.9	-2.8
2007	-5	79	221	13.5	3.0	-2.5
2008	2	88	221	15.4	3.2	-2.3
2009	7	93	221	17.2	3.4	-2.1
2010	12	100	223	19.7	3.5	-1.8
2011	167	252	261	45.6	7.2	6.9
2012	9	96	269	25.6	3.7	-2.0
2013	9	95	252	25.9	3.6	-2.0
2014	13	100	242	27.7	3.7	-1.8
2015	15	102	232	29.5	3.7	-1.7
2016	20	107	224	32.5	3.9	-1.5
2017	22	109	218	35.4	3.9	-1.4
2018	71	161	226	52.1	5.2	1.4
2019	30	127	231	47.5	4.5	-0.8
2020	32	130	230	52.1	4.6	-0.6
2021	34	134	232	57.3	4.7	-0.5
2022	34	135	235	62.4	4.8	-0.5
2023	188	286	278	127.7	8.9	8.4
2024	23	121	287	74.1	4.7	-1.1
2025	21	119	273	75.4	4.7	-1.2
2026	22	119	265	79.2	4.8	-1.2
2027	25	123	262	86.1	5.0	-0.9
2028	27	125	259	93.0	5.1	-0.8
2029	29	126	258	101.0	5.2	-0.8
2030	31	128	259	110.2	5.4	-0.7

Notes: Disposable Income, Personal Income and Gross State Product are in millions of 1995 dollars. The net present value of the Disposable Income series is \$44.87 (\$1995). The Benefit/Cost Ratio is 2.21.

CONCLUSIONS

In Case 1 it is clear that, (1) assuming federal funding of 80% and state funding of 20% of the capital cost of building the Griffin Light Rail, (2) state funding of all of the net operating costs, and (3) capital expenditures totaling \$215 million, the construction and operation of the line would be a net benefit to the residents of Connecticut (Table 5.). Net, almost 5,600 job years, averaging 160 jobs per year, would be created between 1995 and 2030. In real, present value terms, total economic activity in the State would increase by \$34.3 million and total consumer buying power would increase by \$72.8 million over the years 1995-2030. For every tax dollar spent by the state, the income of the populace increases by \$2.12.

In Case 2, the same capital cost scheme as in Case 1 and a total capital expenditure of \$127.2 million, there is a net gain of 1,498 private-sector job-years and 4,281 total job-years. Total economic activity in the state (real GRP) increases by \$17.1 million and total consumer buying power increases by \$44.9 million on a present value basis. Every tax dollar required is repaid with 2.21.

Table 5. Economic Impact, State of Connecticut 1995-2030 — Summary.

Case	Net Private Job-Years Created	Net Total Job-Years Created	Present Value of Change in Real GRP (\$1995)	Present Value of Change in Real Disposable Income (\$1995)	Capital Expenditures (\$1994)	Benefit/Cost Ratio (Based on Real Disposable Income)
1. Light Rail Line Alternative	2,246	5,588	\$34.3 million	\$72.8 million	\$215 million	2.12
2. Busway Alternative	1,498	4,281	\$17.1 million	\$44.9 million	\$127.2 million	2.21

As suggested earlier, one sector of economic activity that consistently showed room for improvement was net exports. As consumer demand grows in the model, the Connecticut economy produces too little business investment to allow business expansion to keep up. This is not rectified in the face of rapidly increasing consumer demand, and is likely the result of higher costs of doing business in Connecticut than elsewhere. Thus, increasingly, consumers and retailers are forced to turn to suppliers and producers outside the state. Coupling the Griffin Line development with programs designed to stimulate business investment and expansion could result in dramatically better results than those reported here.

The economic impact of the Griffin Light Rail could be enhanced by the extension of the line to cover the 14 mile stretch from downtown Hartford to Bradley International Airport with the implementation of a parking policy. Table 6 shows a cost/benefit ratio of 5.24, nearly two and a half times the cost/benefit ratio of the shorter project. If the Griffin Light Rail were extended, for the cost of approximately doubling the construction costs, the State would nearly triple its gains in private sector job years, and create more than two and a half times as many total job years. Further-

more, economic activity (real GRP) is quadrupled and after-tax purchasing power is nearly tripled. Clearly, there is an economy of scale that substantially favors the larger transitway investment.

As earlier mentioned, the implementation of a parking policy in downtown Hartford along with the Griffin Light Rail would make the plan even more desirable. The benefits of the construction and parking policy is two-fold: businesses save through a reduction in labor costs and consumers accrue additional spendable income which stimulates the State and local economies. The net combined effect of the extended line and the parking policy is to create *seven and a half times as much private employment* as the shorter LRT without the parking policy, and over three and a half times as much total employment. At the same time, real GRP expands by more than six times as much, and the after tax purchasing power of the populace is more than tripled.

Clearly, the extension of the Griffin Line in conjunction with a parking policy would be not only socially beneficial but considerably more beneficial than Case 1 as considered in this study. For more details on the effects of the extension of the line to cover the 14 mile stretch from downtown Hartford to Bradley International Airport with the implementation of a parking policy see *Griffin Line Corridor Study: Economic Impact Analysis, 1994*.

Table 6. Economic Impact, State of Connecticut 1995-2030 — Transitway Construction.

Case	Net Private Job-Years Created	Net Total Job-Years Created	Present Value of Change in Real GRP (\$1995)	Present Value of Change in Real Disposable Income (\$1995)	Construction Costs	Benefit/Cost Ratio (Based on Real Disposable Income)
1. Light Rail Line Alternative: No Parking Policy Implemented	2,246	5,588	\$34.3 million	\$72.8 million	\$174.3 million (\$1994)	2.12
2. Light Rail Line Alternative: No Parking Policy. Extension to Bradley International Airport	6,581	14,351	\$142.6 million	\$206.6 million	\$355.3 million (\$1995)	5.24
3. Light Rail Line Alternative: Parking Policy Implemented & Extension to Bradley International Airport	16,820	20,011	\$211.9 million	\$377.1 million	\$335.3 million (\$1995)	3.93

With the increase in productive capacity, regional demand could be satisfied within the region. This turns negatives in net exports into positives in regional consumption. Moreover, the buying power retained within the region continues to cascade from consumer to producer, further expanding economic activity.

In summary, then, the Griffin Line (as analyzed) is a good investment for the State of Connecticut. The federal contribution, leverages the state's resources to result in a benefit/cost ratio for the state that is atypically high for a public works project. More important, the jobs gains and economic growth exhibited are impressive.

The results of this analysis and the earlier study of a transitway to Bradley International Airport demonstrate the importance of the project implementation plan. An effective project implementation plan, coordinated statewide, can further maximize the substantial benefits demonstrated herein for the corridor, the region, and the state.

APPENDIX: MODEL DETAIL

Model detail, Cases 1 & 2, are provided in a separate appendix.