The Impact of the Regional Transit Strategy on The Capitol Region of Connecticut:

A Dynamic Impact Analysis

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January 25, 2001

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Executive Summary

The Capitol Region Council of Governments has commissioned the Connecticut Center for Economic Analysis to assess the economic impact of certain transportation improvements on the Capitol Region of Connecticut. This work is being performed as part of the Regional Transit Strategy that considers several alternatives for enhancing the existing transportation infrastructure based on certain capital requirements ranging from a 'no-build' scenario to a 'high capital' scenario. The High Capital alternative comprises a series of proposed transit projects (identified as corridors), based on the provision of higher quality public transit services, typically configured in a radial pattern centered on the City of Hartford.

For purposes of this study, there are two scenarios: essentially a status quo or no-build improvement scenario, and the High Capital scenario. The former assumes that required maintenance on the existing road network will be performed. The High Capital scenario assumes that busways and commuter rail are added to the existing transportation network. It should be noted that the *recommended* RTS system includes the High Capital improvements *plus* certain low capital improvements to the bus system. These low capital improvements are ***not*** included in this economic evaluation. Therefore, the economic impacts of the full RTS proposal are expected to be greater than those summarized here. Furthermore, for purposes of modeling, the no-build scenario assumes that the costs incurred due to greater congestion are equal to the costs avoided and saved in the High Capital scenario. This means that we can use the current forecast of the regional economy as the reference against which to compare the high-capitalization scenario. In reality, the opportunity cost of the no-build scenario is greater than the costs saved and avoided in the alternative scenario, because the forecast of the regional economy doesn't know how much costs will increase as a result of approaching capacity constraints. Therefore, the no-build scenario is an optimistic forecast.

The RTS estimates construction costs for the High Capital scenario to be $408.7 million. We assume the federal and state government funds the capital costs at 80% and 20%, respectively. The increase in annual operating and maintenance cost for the High Capital Scenario is estimated at $16.45 million and we assume this will be funded by fare revenue and state subsidy.

Public investment (Federal and State) in the RTS transit improvements will have a positive impact on the region's economy:

- Population will increase by an average of 1100 each year relative to the no-build scenario.
- More than 600 jobs will be created (average per year relative to the no-build scenario).
- Personal income, disposable income, gross state product, and local tax revenue will increase by $415 million, $333 million, $726 million, and $23 million, respectively (all figures listed in terms of present value of increase) as a consequence of the High Capital development.

And we know that these numbers are conservative. They do not include the impact of the low capital improvements, which will be a part of the Regional Transit Strategy. Nor do they adequately reflect the avoidance of traffic congestion that is likely to occur if the investments are not made. An investment in public transit is expected to prevent economic stagnation in the region due to roadway congestion and will also help to grow the economy by linking workers with job sites and by allowing for the efficient flow of goods and services. The table below presents the key results for the Capitol Region. The report contains detailed results for Hartford and Tolland Counties and Connecticut.

Key Changes in Fiscal Variables at the Local and State Level in the Capitol Region.

Variable	Average Annual Increases from No Build	Present Value of Increases over 25 years
Private Non-Farm Employment (units)	633	-
Gross State Product ($ Mil)	$68.55	$725.85
Personal Income ($ Mil)	$35.86	$414.76
Disposable Income ($ Mil)	$29.25	$333.15
Population (units)	1121	-
Total New State Tax Revenue ($ Mil)	$3.07	$33.47
Total New Local Tax Revenue ($ Mil)	$2.41	$22.98
Incentives and Induced Gov't Spending ($ Mil)	$8.53	$91.53
Net New State Tax Revenue ($ Mil)	-$4.50	($51.95)
Net New Local Tax Revenue ($ Mil)	$1.44	$16.86

Introduction

The Capitol Region Council of Governments has commissioned the Connecticut Center for Economic Analysis to assess the economic impact of certain transportation improvements on the Capitol Region of Connecticut. This work is being performed as part of the Regional Transit Strategy that considers several alternatives for developing the existing transportation structure based on certain capital requirements ranging from a 'no-build' scenario to a 'High Capital' scenario. The High Capital alternative comprises a series of proposed transit projects (identified as corridors), based on the provision of higher quality public transit services, typically configured in a radial pattern centered on the City of Hartford.

For purposes of this study, there are two scenarios: essentially a status quo or no-build improvement scenario, and the High Capitalization scenario. The former assumes that required maintenance on the existing road network will be performed. The high capitalization scenario assumes that busways and commuter rail are added to the existing transportation network. It should be noted that the recommended RTS system includes the High Capital improvements plus certain low capital improvements to the bus system. These low capital improvements are not included in this economic evaluation. Therefore, the economic impacts of the full RTS proposal are expected to be greater than those summarized here.

Two questions are posed: in the absence of any major capital improvements to the Capitol Region's transportation network, what are the long run economic consequences, and considering implementation of the High Capital scenario, what are the long run economic consequences? To help answer these questions from a theoretical framework, a review of the salient literature is provided. In general, the absence of major infrastructure improvements in the face of potential economic growth stifles this growth and in fact, may result in relative economic decline with respect to neighboring regions that are more aggressive in accommodating and promoting economic growth. Economic growth does not necessarily portend large increases in population and the growth of public services; there can be growth in productivity and in the quality of goods and services, both public and private. These improve regional competitiveness and the local quality of life.

The High Capital scenario affirmatively promotes economic growth by relieving congestion in the region especially for labor and goods traffic into and out of Hartford, the Capitol Region's core city. The overall reduction in transaction costs has several contributors: reduced commuter delay time; increased trucking productivity, reduced pollution, accidents, noise, and gasoline consumption. These in turn improve the attractiveness of the Region as a place for firms to locate and expand. The improvements also increase the amenity value of the region as a place to live and work.

We assume that the project is funded by external sources, in which capital expenditures consist of 80% Federal and 20% State funds while operating costs are fully funded by the state, although a funding plan for the project has not been confirmed. Operating costs would be offset by fare revenue. The geography of interest is the Capitol Region consisting of 29 towns in Hartford and Tolland Counties. The study horizon extends through 2025.

The High Capital Scenario

In the initial stages of the project nine corridors were selected. These corridors were then evaluated based on ridership projections; right-of-way (ROW) concerns – typically grade crossing impacts and community acceptance, and the cost of construction. Based on this screening, five corridors were selected. These include the New Britain busway (Bus Rapid Transit mode or BRT), the Griffin Corridor (BRT mode), the Manchester Corridor (BRT mode), the Rocky Hill Corridor (BRT mode), and the New Haven-Hartford-Springfield Commuter Rail.

Benefits of the Transit Strategy

The proposed actions like any new transportation project provide both short- and long-term benefits for the economy of the Capitol Region and its neighboring towns. (Please note that the commuters rail proposal, extending from Hartford to New Haven and Springfield, will clearly have benefits beyond the Capitol Region.) First, there are "Direct User Benefits". All modes of transportation –including roads, rail and air – provide direct benefits to users. These immediately realized benefits might be in terms of reduced congestion cost and include ease of access, comfort, safety, travel times and/or travel costs.

Secondly there are “Direct Economic Benefits”. These benefits in turn lead to monetary benefits for some users and non-users (individuals and businesses) within a geographic area. For affected businesses there may be “Economic Efficiency Benefits” in terms of production cost, product quality and product availability, stemming from changes in labor market access, and the cost of obtaining as well as supplying inputs to customers and obtaining outputs from intermediaries.

For affected residents, benefits may include reduced costs for obtaining goods and services, an increased variety of work and recreational opportunities associated with greater locational accessibility, and reduced pollution that adds to the amenity value of the area.

Thirdly, there are induced impacts, including among other things “Indirect Business Impacts” for suppliers to directly affected businesses. “Induced Business Impacts” result from the extra spending (which originates from reduced cost of travelling) on other goods. There are “Other Induced Impacts” which come from shifts in the broader population and business location patterns, land use and the resulting land value patterns, which may also affect government costs and revenues (e.g., parking revenues and taxes). These changes will ultimately affect income, wealth and/or “well being” – both overall and for particular groups of people in the affected geographic area.

Last, but not least, are the “Construction and Maintenance Spending Impacts”. There is a short-term economic impact associated with the construction of transportation facilities and services, and other long-term impacts associated with maintenance and operation of facilities and services. The capital costs are expected to be funded by the federal and state governments (80% and 20% assumed respectively), while ongoing maintenance and operations costs, offset by fare revenue, we assume are borne by the State.

The REMI economic model of Connecticut and its counties provides the aggregate results of these impacts.

Expected Changes with the High Build Scenario

The Connecticut Center for Economic Analysis has used its eight county Regional Economic Model[1] to analyze the long run consequences of such enhancements in transportation facilities and subsequent economic improvements in the Capitol Region. The Capitol Region serves the City of Hartford and 28 surrounding suburban and rural communities. Among these twenty-nine towns, eight are in Tolland County and the rest are in Hartford County.

Due to the unavailability of a town-specific macroeconomic simulation model, we considered the impacts on Hartford and Tolland Counties. We developed weights assigned to each Capitol Region town on the basis of their importance in their respective county measured by the share of commuters to and from Hartford to these towns. The REMI inputs and results are discussed in detail below.

REMI Inputs

The long-term impacts of the improved facilities were specified to define the project's direct effects in terms of the following class of input variables for the REMI model:

- Additional spending in the Construction sector associated with transit construction and maintenance, that generates demand for labor, equipment and materials for selected years;
- Reduction in business costs associated with time and expense savings for truck and other carriers;
- Shifts in consumer expenditure associated with the increase in disposable income due to reduction in highway-related expenditures to other consumption goods; and,
- Increased "amenity value" associated with safety improvements, and pollution and accident reduction. Amenity value refers to the not easily measured relative attractiveness of a region.

The Regional Transit Strategy includes estimated construction costs of $408.7 million. We assume that the construction phase lasts five years from 2001 to 2005 and have divided the

[1] REMI is created and maintained by Regional Economic Models, Inc. of Amherst, MA (see Appendix 1 for details).

construction cost in five equal distributions of $81.54 million each. In 2005, we assume $24.4 million of the construction expenditure purchases transportation equipment such as buses and rail cars. These are simplifying assumptions; we know that the construction phase for all the proposals will extend over more than five years. The annual operating and maintenance cost is estimated to be $16.45 million annually. The operating expenditure, regarded as the cost of the public provision of the service, acts as a positive shock to the Connecticut economy and enters as REMI input for the years 2006 through 2025. Connecticut subsidizes this cost offset by fare revenue.

The data for mobility improvements are mainly in the form of a reduction of vehicle miles traveled (VMT). The High Capital scenario projects an annual reduction in VMT by 169,210 miles. From the VMT reduction, CRCOG has calculated the Energy Reduction as 1,110,510 BTUs. We converted these units into money terms by taking the price of gasoline per barrel as of December 1, 2000. The estimated cost reduction in monetary terms comes to around $9,803.12 each year. Ninety two percent of this total reduction in fuel cost materializes in a reduction in consumer spending on oil and gas. The remaining 8% yields a production cost reduction in the trucking industry. The reduction in pollution due to reduced green house gas emissions is calculated from the reduction in vehicle miles traveled as well. We use $0.009/VMT (1981 FHWA study for this purpose) as the average cost for green house gas emissions. The total saving due to green house gas reduction is thus calculated to be $10,200 annually. Added to this is the money value of total annual travel time saved, which is $24,166,039. These two together yield an estimate for the non-pecuniary amenity aspects of the High Capital scenario.

The input for this analysis is placed in Hartford County as the primary location for the increased economic activity. The results accrue to each county and are apportioned to Capitol Region towns according to the weights assigned to the towns in the Capitol Region that is the primary geography of interest.

Results for the Capitol Region

The REMI model provides detailed results for Hartford and Tolland Counties. The weights multiply the County specific results of each town in the Capitol Region. The weight for each town is the ratio of the total number of to-and-from commuters to the City of Hartford from the town with respect to those commuters to and from the City of Hartford from each County as a whole. The City of New Britain is included in this weight computation even though it is outside the CRCOG region. This is because New Britain is directly served by one of the four busways. The resultant changes in output, employment and personal income for each Capitol Region town are added up to get the changes for the Capitol Region as a whole. Appendix 2 provides a description of the method.

Table 1 below shows the impact on the Capitol Region, in the form of increased employment and output. These are increases above the REMI baseline or status quo forecast of the Connecticut economy (that is coincidentally the no-build scenario), that is, absent extraordinary developments.

Table 1: Key Economic Changes in the Capitol Region

	2001	2002	2003	2004	2005	2006	2010	2015	2020	2025
Total Emp.(units)	**1,072**	**928**	**880**	**833**	**794**	**273**	**415**	**596**	**709**	**866**
Private Non-Farm Emp.(units)	**1,060**	**984**	**926**	**872**	**825**	**298**	**418**	**574**	**674**	**753**
GRP (Mill 92$)	**45.35**	**38.60**	**36.27**	**33.91**	**37.63**	**-0.98**	**6.80**	**17.48**	**24.56**	**34.01**
Pers Inc (Mill Nom $)	**40.97**	**41.34**	**43.23**	**44.25**	**48.15**	**17.89**	**19.59**	**30.85**	**42.45**	**62.08**
Population (units)	**158**	**338**	**457**	**552**	**644**	**749**	**1,038**	**1,342**	**1,526**	**1,649**

Total Employment increases by 1,072 jobs above the baseline in the first year of construction. This seems reasonable given the need for both direct and indirect manpower requirements in the initial stages of construction. The number of new jobs added in 2006 is 273. The rate picks up and finally in the year 2025 the number of new jobs created reaches almost 866 above the baseline. Most of this increment occurs in the private non-farm sector. This increase in employment is due to new business opportunities created by a better transport infrastructure. We can not calculate percent changes for the Capitol Region because we do not have a baseline or reference forecast for the Region from which to measure the level changes. The level changes represented here are sums of the fractions of the level changes in Hartford and Tolland Counties.

The construction of the proposed facilities also gives a boost to the region's Gross Revenue Product (GRP). GRP measures the value of goods and services produced in a region in a year on a value added basis to eliminate double counting intermediate goods. GRP increases approximately $45 million in the first year of construction in constant 1992 dollars. In the year 2006 it decreases by $1 million approximately, because construction expenditure ends. New business in the Capitol Region, enhanced by the changed transportation infrastructure, increases the change in GRP slowly to $34.01 million at the end of 2025.

Unlike GRP and employment, personal income steadily rises from the beginning of construction. Its increase somewhat dampens at the end of the construction period and then begins to rise at a slow rate. The population growth rate on the other hand shows a steady increase. In fact, the change in population is a mere 158 people in 2001 and reaches 1,649 people at the end of the study period (2025).

Results for Hartford County

Compared to the Capitol Region, the results for Hartford County are slightly higher. This is reasonable given the existing demographics of the regions. Hartford County has less land area (735.5 sq. miles) and houses more people and provides more jobs than the Capitol Region (747.3 sq. miles). In 1998, Hartford County had a population of 824,956 of whom 551,696 were employed. The Capitol Region on other hand had a population of 692,087 with 486,475 people employed. Regarding Hartford County as a whole, the increments (in absolute terms) in employment and GRP will certainly be higher than those of the Capitol Region, which constitutes a part of Hartford County and some towns from Tolland County. The number of new jobs created along with GRP and personal income increases is higher for Hartford County on a year-to-year basis. Table 2 below gives changes in the variables over the period in absolute terms from the baseline or status quo forecast for Hartford County.

Table 2: Key Economic Changes in Hartford County

	2001	2002	2003	2004	2005	2006	2010	2015	2020	2025
Total Emp (units)	**1,054** +0.18%	**910** +0.15%	**862** +0.15%	**816** +0.14%	**776** +0.13%	**266** +0.04%	**410** +0.06%	**588** +0.09%	**700** +0.11%	**855** +0.13%
Priv Non-Farm Emp (units)	**1,044** +0.2%	**970** +0.19%	**914** +0.17%	**860** +0.16%	**813** +0.15%	**298** +0.05%	**416** +0.07%	**570** +0.1%	**668** +0.11%	**745** +0.12%
GRP (Mil 92$)	**44.70** +0.14%	**37.91** +0.12%	**35.57** +0.11%	**33.22** +0.10%	**36.89** +0.11%	**-1.24**	**6.60** +0.02%	**17.16** +0.04%	**24.17** +0.05%	**33.48** +0.07%
Pers Inc (Mil Nom $)	**37.71** +0.13%	**37.96** +0.12%	**39.67** +0.12%	**40.60** +0.12%	**44.20** +0.13%	**16.39** +0.05%	**18.49** +0.04%	**29.25** +0.06%	**40.21** +0.07%	**58.41** +0.08%
Population (units)	**139** +0.02%	**297** +0.4%	**404** +0.05%	**490** +0.06%	**574** +0.08%	**684** +0.09%	**1,000** +0.13%	**1,312** +0.16%	**1,497** +0.18%	**1,612** +0.19%

Similarly, if one compares the increments in employment and output of the Capitol Region with those of Connecticut, the numbers are higher for the State. The results in the Capitol Region show the total impact on the region alone, which then trigger developments in the entire State.

Table 3: Key Economic Changes in Connecticut

	2001	2002	2003	2004	2005	2006	2010	2015	2020	2025
Total Emp (units)	**1,341** +0.06%	**1,158** +0.05%	**1,086** +0.05%	**1,017** +0.05%	**979** +0.04%	**253** +0.01%	**448** +0.02%	**683** +0.03%	**819** +0.03%	**1,003** +0.04%
Priv Non-Farm Emp (units)	**1,323** +0.07%	**1,210** +0.06%	**1,125** +0.06%	**1,046** +0.05%	**997** +0.05%	**267** +0.01%	**444** +0.02%	**655** +0.03%	**776** +0.04%	**873** +0.04%
GRP (Mill 92$)	**56.99** +0.05%	**48.4** +0.04%	**44.93** +0.04%	**41.44** +0.03%	**46.04** +0.04%	**-3.83**	**6.866** +0.01%	**20.84** +0.01%	**29.42** +0.02%	**40.73** +0.02%
Pers Inc (Mill Nom $)	**61.95** +0.05%	**62.24** +0.04%	**64.33** +0.04%	**65.06** +0.04%	**70.45** +0.04%	**22.31** +0.01%	**23.44** +0.01%	**39.86** +0.02%	**55.94** +0.02%	**83.47** +0.03%
Population (units)	**250** +0.01%	**531** +0.02%	**705** +0.02%	**842** +0.03%	**968** +0.03%	**1,044** +0.03%	**1,230** +0.04%	**1,541** +0.04%	**1,746** +0.05%	**1,916** +0.05%

Thus the new transportation strategy contributes 1,341 new jobs to the State of which 1,054 jobs are in Hartford County. The number of new jobs in the Capitol Region alone is 1,072. Gross State Product (GRP at the state level) increases by $57 million in constant 1992 dollars above the baseline forecast in the first year of the construction period. GSP declines to $4 million below the forecast in the year 2006 and then rises steadily to $41 million above the forecast at the end of the study period. Connecticut's population increases steadily by 250 people above the baseline forecast in 2001 to 1,916 people above the forecast in 2025 due to this transportation strategy.

The overall trend in the pattern of growth is similar in the Capitol Region and Hartford County. The rates of change however, are higher in the Capitol Region. This signifies the impact of the Regional Transit Strategy on the Capitol Region's economy through a higher rate of growth than the neighboring areas. That the rate of change is higher in the Capitol Region seems reasonable given the geographical area of the Capitol Region. The Capitol Region contains towns around the City of Hartford. There are eight towns, which are in Hartford County but not in the Capitol Region. The effect on these towns is small compared to that on the eight towns in Tolland County located in the Capitol Region. This accounts for higher overall growth rates for the Capitol Region. The higher rate of growth for the Capitol Region also gives us an idea of the importance of the project for the economy of the Capitol Region. The initiation of the High Capital Transit Project acts as a driving force for the economy of the Region. It fuels the economy thereby resulting in a higher growth rate for the Region compared to Hartford County

and Connecticut. We provide detailed REMI tables showing the changes in selected variables in Appendix 4.

The growth rate of employment for Hartford County is higher than that for the State. The rate measured as a percentage change from the baseline forecast is on average approximately 0.11% for Hartford County. The percentage change in the employment growth rate for Connecticut is 0.03%. The time paths of the key economic variables described above are shown in the charts in Appendix 3.

The construction of new transportation facilities stimulates Connecticut's economy through increased employment and output. The effects are more concentrated in the Capitol Region. The long-run stimulus takes the form of reduced transactions costs for workers and firms. The Region's amenity value increases as pollution, delay time, and motor vehicle accidents are reduced. Trucking productivity increases and the locational advantages of being close to large markets can be more fully realized in an enhanced transportation environment.

Fiscal Analysis.

The Regional Transit Strategy seeks to improve the economic, environmental and social attractiveness of the Capitol Region by improving the efficiency of its transportation system. This in turn attracts new and expanded businesses and new people to the Region. The increased economic activity generates additional government tax revenue through increased collections of the corporate profits tax, sales tax, income tax and property taxes. Induced public spending for public safety and education also rises in order to keep pace with the rising population. In addition, operating costs (offset by fare revenue) and debt service contribute to the State's net negative tax flow. Net local tax revenues are positive on average over the study period. These fiscal impacts are summarized in Table 4 below.

Table 4: Key Changes in Fiscal Variables at the Local and State Level in the Capitol Region.

Variable	Average Annual	Present Value
Private Non-Farm Employment (units)	633	-
Gross State Product ($ Mil)	$68.55	$725.85
Personal Income ($ Mil)	$35.86	$414.76
Disposable Income ($ Mil)	$29.25	$333.15
Population (units)	1121	-
Total New State Tax Revenue ($ Mil)	$3.07	$33.47
Total New Local Tax Revenue ($ Mil)	$2.41	$22.98
Incentives and Induced Gov't Spending ($ Mil)	$8.53	$91.53
Net New State Tax Revenue ($ Mil)	-$4.50	($51.95)
Net New Local Tax Revenue ($ Mil)	$1.44	$16.86

The present value of the total new tax revenue (state and local) generated is $56 million, of which $23 million goes to Local Tax Revenue and $33 million goes to State Tax Revenue. Induced Government Spending (state and local) increases by $91 million making the net addition to Total Tax Revenue negative at $36 million. Net New State Tax revenue decreases at an average of $4.5 million over the 25 years of the study period, while Net New Local Tax revenue increases on average annually by $1.44 million. Net quantities result from subtracting a portion of induced government spending (state and local) from total new revenue. The present value is the discounted stream of future revenues using a 6.5% discount rate over 25 years. The annual average values above are the sum of the increases above the baseline forecast divided by 25 years.

Comparison with Griffin Corridor (Busway Alternative Only)

Previous studies examined the economic impact of developing the Griffin Corridor for light rail and busway alternatives in conjunction with a variety of parking policies in Hartford. Because many people are familiar with the Griffin work, those results and the RTS results are compared here for information purposes. The numbers are not directly comparable because of different assumptions and levels of detail in each study as discussed below. However, in terms of levels of magnitude, the RTS seems to replicate the estimated benefits of the Griffin Corridor, but on a region wide basis.

The current study includes several busway corridors, but does not include a parking policy in Hartford. Moreover, we report the current results for the Capitol Region, Hartford County and the entire State, whereas the earlier studies reported results in Hartford County and Connecticut. We compare the current result with the 1995 Griffin Line busway alternative (and LRT alternative) results in some detail. The differences arise because there were different assumptions made in each case, there was more detailed data available in the earlier study, and the REMI model was calibrated differently in the earlier study. Additional detail was available for the economic impact analysis for the Griffin study, because it was a detailed corridor study. The RTS is a region wide study, involving macro level analysis, and therefore, was unable to provide the same level of detail as the Griffin work. REMI uses the national and regional economic forecasts as the baseline with which to compare developments such as the Griffin Line or RTS projects. The 1993 forecast for the Connecticut economy was different in the 1995 model from what it was in 1997 for the 1999 model (typically REMI forecasts begin two years prior to the current year). Connecticut was emerging from a severe recession in 1993 and was growing rapidly in 1997. In addition, the structure of Connecticut's economy has been changing as it moves from a manufacturing dominated economy to a service dominated economy. REMI reflects Connecticut's changing structure as it is updated and recalibrated over time. The detailed differences in the two studies' assumptions are presented in Table 5 on the next page. Table 4 below presents a comparison of the principal results of the two studies. Net job-years are simply the sum of all changes in total or non-farm employment (jobs) over the study period that in the Griffin case was 35 years and in the RTS case is 25 years. In the Griffin study, jobs decreased from the baseline forecast; this is not the case in the RTS study. The Griffin study

reports real monetary quantities in 1995 dollars, which was the REMI default at the time. REMI currently reports real dollars using 1992 as the base year. Because the Personal Consumption Expenditure Index (REMI's deflator) changes over time, conversion from 1995 to 1992 base dollars is not meaningful. As would be expected, the results for the RTS study are significantly higher than those for the Griffin corridor, because the RTS includes five corridors and the Griffin examined only one. In all categories, except real disposable income, the RTS results are more than five times the Griffin results (if the RTS results are increased to reflect the difference in study period.) In the case of personal income, the corridor level Griffin study was able to identify personal income benefits not measurable in the region-wide, macro scale Regional Transit Strategy.

Table 4: Principal Results from 1995 Griffin and RTS Studies

	Griffin Busway	RTS	Griffin Busway	RTS	Griffin Busway	RTS	Griffin Busway	RTS
	Net Private Sector Job-Years	Net Private Sector Job-Years	Net Total Job-Years	Net Total Job-Years	PV of Real GRP Changes ($1995)	PV of Real GRP Changes ($1992)	PV of Real Disposable Income ($1995)	PV of Real Disposable Income ($1992)
Hartford County	**1,340 (2115)**	**16,955**	**5,588 (8281)**	**17,274**	**$24.8 mil ($48.8 m)**	**$283.4 mil**	**$43.3 mil ($71 m)**	**$176.8 mil**
Connecticut	**1,498 (2246)**	**18,200**	**4,281 (5844)**	**18,799**	**$17.1 mil ($34.3 m)**	**$319.8 mil**	**$44.9 mil ($72.8 m)**	**$248.1 mil**

( ) reports the Griffin Light Rail Transit results

Griffin Busway -- RTS Assumptions

	Griffin	RTS
1	Assumes operating subsidy not offset by fares.	Assumes operating subsidy offset by fares.
2	Assumes operating cost is distributed as output across all sectors.	Assumes operating cost as sales under local and interurban transportation.
3	Assumes specific number of cars divested and $0.37/ mile depreciation and maintenance cost. Assumes average daily trip distance for work and non-work trips. Savings entered in REMI in variable161? Additional savings as fuel cost entered as variable 166?	Used VMT from FHA ridership model to calculate cost savings from energy saved (fuel cost), delay time, pollution due to green house gas emission. Entered as amenity cost (saving).
4	Assumes riders substitute Griffin for other public transit and subtracts revenues lost due to this substitution. Demand for traditional public transit was reduced by the number of diverted riders.	Assumes savings from reduced auto maintenance and service raises income and demand for all goods and services.
5	Estimates value of time savings using U.S. DoT benchmarks and uses amenity value as a percent of labor income.	Uses the value of estimated time saved as discussed in RTS VMT table.
6	Assumes savings on parking fees increase disposable income.	No parking opportunity costs.
7	Assumes increased job opportunities for zero car households.	Not considered.
8	Assumes saved employer parking cost reduces labor cost.	Not considered.
9	Assumes $ 127.2 million capital expenditures	Assumes $443.5 million capital expenditure for entire system. RTS capital expenditure for the Griffin portion is $95.1 million.
19	Operating expense not stated.	Operating expense is $16.3 million annually following the construction period.
11	Assumes 80% rule for Federal/State funding: (80 % Fed / 20% State)	Assumes 80% rule in Federal/State funding: (80 % Fed / 20% State)
12	Unknown discount factor.	6.5% discount rate based on 30 year Treasury bill rate.
13	35 year horizon.	25 year horizon. Five year construction period + 20 years for the maturity of the bond issue.

Conclusions

The results above (and in Appendix 4) show that the High Capital projects will lead to an increase of more than 600 jobs each year throughout the 25-year analysis period. Population increases by 1,600 people in the final year of analysis. The present value of the change in personal income is $415 million while gross state product increases by $725 million. And we know that these figures are conservative. This type of analysis assesses transportation project benefits in terms of jobs and income growth. A limitation of this analysis is that it accounts only for effects on private sector business and consumer income. It places no value on the activity of individuals, and there is no value placed on social, environmental and quality of life benefits except so far as they lead to an exchange of money or can quantified in money terms.

In addition with the no-build scenario, we know that the high cost of congestion ensures the Capitol Region's declining attractiveness as a business center, however, the model has been unable to capture this as the reference scenario. Increases in congestion lead existing businesses to make decisions not to expand and to consider locating elsewhere. Workers seek employment opportunities in areas that are less congested, less polluted and offer greater amenities. Businesses looking to locate in the Capitol Region find higher transaction costs for moving goods and people and look elsewhere. These impacts cannot be quantified, however, without detailed micro-level analysis that was beyond the scope of the Regional Transit Strategy and this economic impact study.

Appendix 1: The Connecticut Economic Model

In 1992, with funding from the Connecticut Department of Economic and Community Development (DECD), the Department of Economics at the University of Connecticut acquired a microcomputer-based economic 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 expertise in regional economic modeling and is a leading supplier and developer of such models. Following its acquisition of the model, the Department of Economics at the University of Connecticut began the formal process of creating the Connecticut Center for Economic Analysis (CCEA).

The REMI model includes all of the major inter-industry linkages among 466 private industries, which are 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 model.

At the core of the model 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 are largely the result of groundbreaking research by Nobel laureate Wassily Leontief. They focus on the interrelationships 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. This would offset, to some extent, the rising cost of labor. Workers may attempt to shift their employment to

the sector with 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 a Keynesian fashion, i.e. prices are fixed in the short run and gross domestic product (GDP) is determined entirely by aggregate demand.
- Wage income is related to sector employment and is 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 and is based on relative wages and the "amenities" of life in Connecticut versus other states.
- "Imports" and "exports" from other states are related to relative prices 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 results.

Appendix 2: The weights of each town in the Capitol Region

The Capitol Region consists of 29 towns. The towns along with the number of commuters they generate (according to 1990 census data) 'to and from' Hartford is given below. Shares are calculated as the ratio of number of commuters from the town and the number of commuters from the County to the City of Hartford.[2]
W = Total number of commuters 'to and from' Hartford for the town/Total number of commuters 'to and from' Hartford for the County.

Tolland County

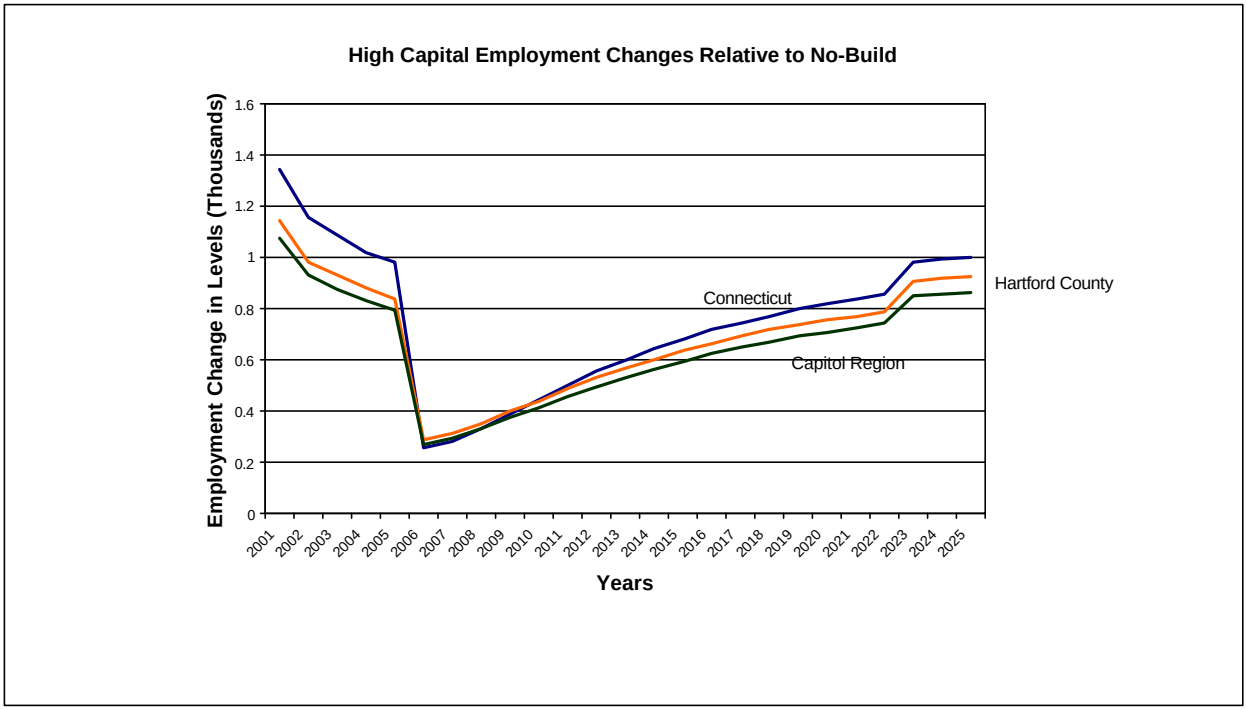
Town	to Hartford	from Hartford	total commuters	Shares (w)
Andover	323	0	323	0.031629
Bolton	569	0	569	0.055719
Ellington	904	0	904	0.088523
Hebron	476	0	476	0.046612
Somers	256	23	279	0.027321
Stafford	482	0	482	0.047199
Tolland	1233	0	1233	0.12074
Vernon	3449	0	3449	0.33774
Tolland County	10175	37	10212	1.00

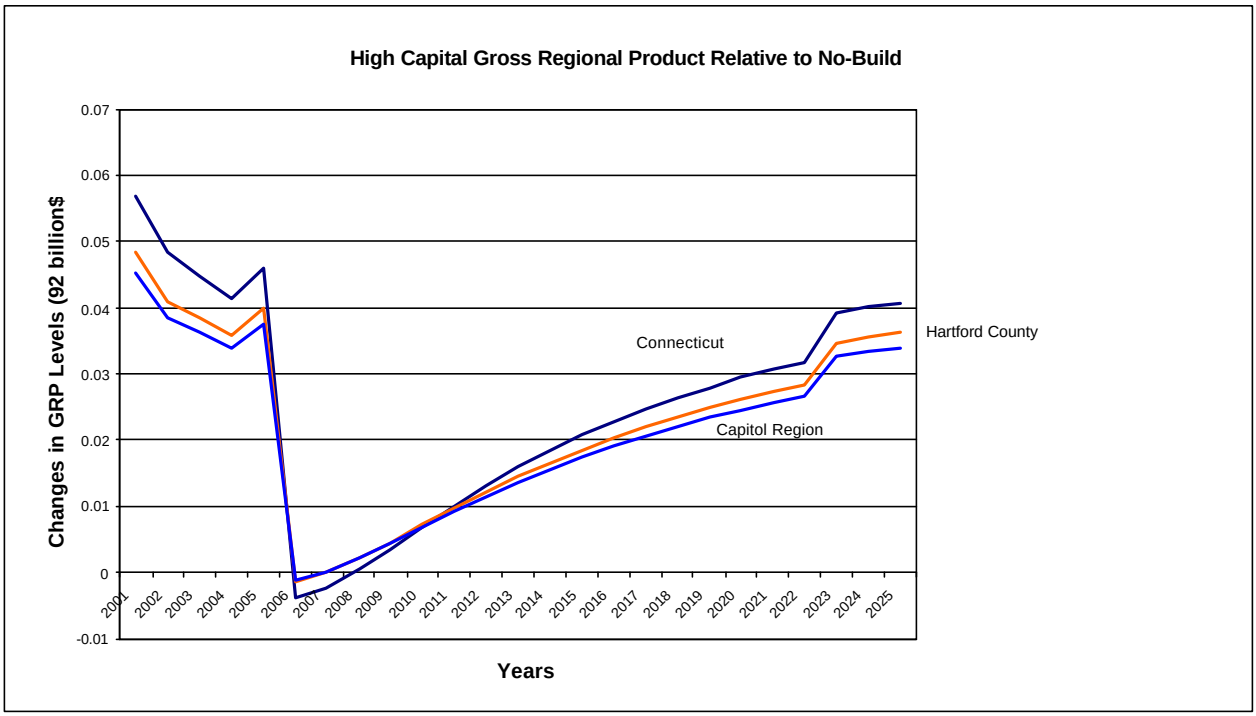
[2] Source : Connecticut Town Profiles;1997.

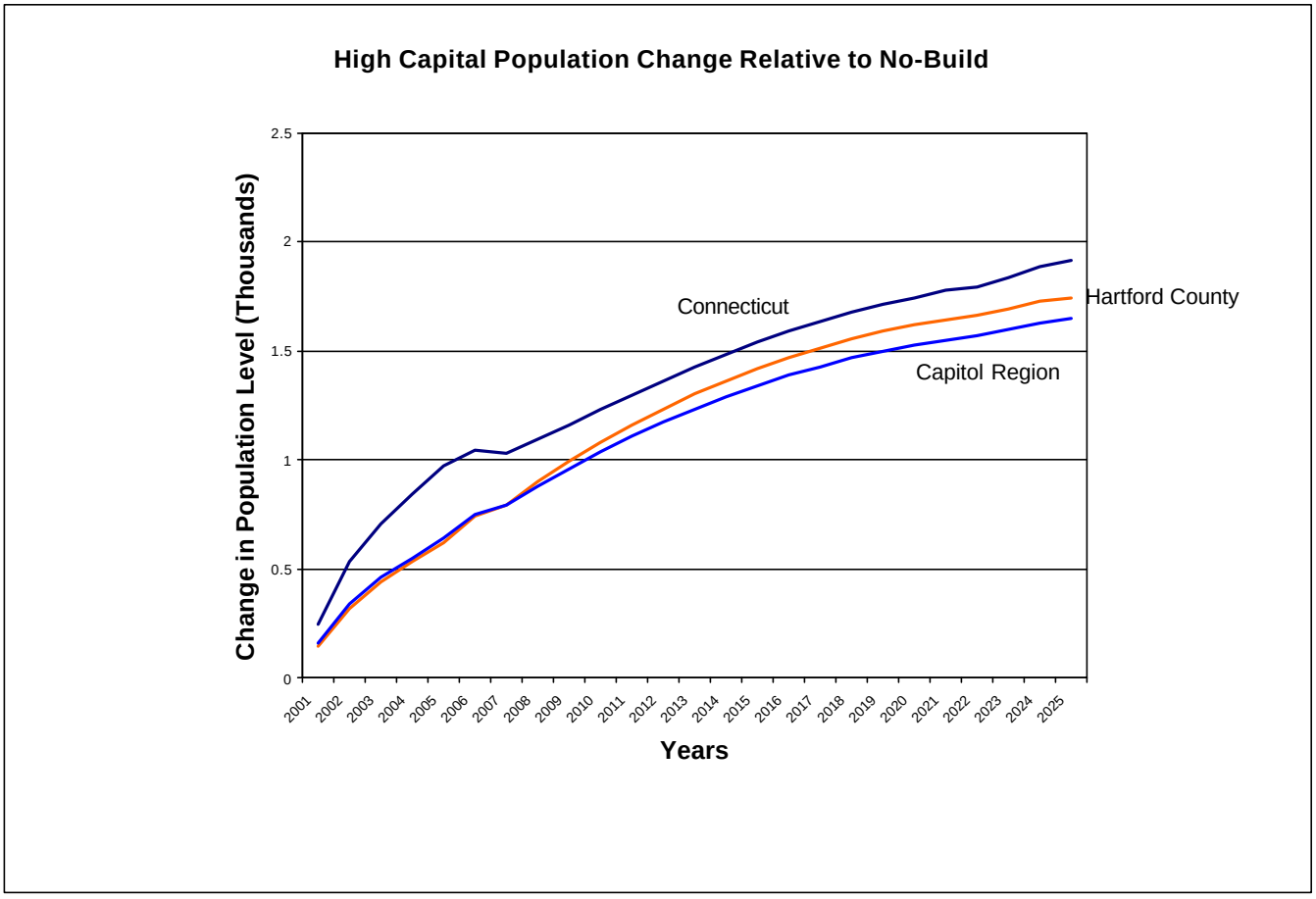
Hartford County

Town	to Hartford	from Hartford	total commuters	shares (w)
Avon	1524	0	1524	0.016303
Bloomfield	3738	2621	6359	0.068025
Canton	755	0	755	0.008077
East Granby	332	79	411	0.004397
East Hartford	7208	2775	9983	0.106793
East Windsor	681	134	815	0.008718
Enfield	2411	390	2801	0.029964
Farmington	2154	884	3038	0.032499
Glastonbury	4184	549	4733	0.050631
Granby	865	40	905	0.009681
Manchester	6214	731	6945	0.074294
Marlborough	681	0	681	0.007285
Newington	3774	1473	5247	0.05613
New Britain	4286	568	4854	0.0519
Rocky Hill	2777	846	3623	0.038757
South Windsor	3544	639	4183	0.044748
Suffield	540	0	540	0.005777
West Hartford	9868	4134	14002	0.149786
Wethersfield	4479	1365	5844	0.062516
Windsor	3685	1443	5128	0.054857
Windsor Locks	798	458	1256	0.013436
Hartford County	73678	19802	93480	1.00

Appendix 3: Charts showing differences in rates of growth






High Capital Population Change Relative to No-Build
Change in Population Level (Thousands)
2.5
2
1.5
1
0.5
0
Connecticut
Hartford County
Capitol Region
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Years

Appendix 4: REMI Output Tables

Table 1: Changes in levels of key economic variables for the Capitol Region

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025
Total Emp (Thous)	1.07	0.93	0.88	0.83	0.79	0.273	0.294	0.332	0.373	0.415	0.457	0.495	0.532	0.565	0.596	0.709	0.866
Priv Non-Farm Emp (Thous)	1.06	0.98	0.93	0.87	0.82	0.298	0.316	0.347	0.381	0.418	0.454	0.487	0.519	0.548	0.574	0.674	0.753
GRP (Bil 92$)	0.05	0.04	0.04	0.03	0.04	-0	1E-04	0.002	0.004	0.007	0.009	0.011	0.014	0.016	0.017	0.025	0.034
Pers Inc (Bil Nom $)	0.04	0.04	0.04	0.04	0.05	0.018	0.017	0.017	0.018	0.02	0.022	0.024	0.026	0.028	0.031	0.042	0.062
Disp Pers Inc (Bil Nom $)	0.03	0.03	0.03	0.03	0.04	0.015	0.014	0.014	0.015	0.016	0.018	0.02	0.022	0.024	0.026	0.035	0.051
PCE-Price Index 92$	0.05	0.06	0.07	0.07	0.07	0.04	0.027	0.017	0.01	0.005	0.001	-0	-0	-0	-0.01	-0.01	-0.01
Real Disp Pers Inc (Bil 92$)	0.02	0.02	0.02	0.02	0.02	0.005	0.006	0.007	0.008	0.01	0.011	0.012	0.013	0.014	0.015	0.019	0.025
Real Disp Pers Inc Per Cap (Thous 92$)	0.03	0.02	0.01	0.01	0	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03

Table 1A: Changes in levels of key economic variables for the State of Connecticut

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025
Total Emp (Thous)	1.34	1.16	1.09	1.02	0.98	0.25	0.28	0.33	0.39	0.45	0.5	0.55	0.6	0.64	0.68	0.82	1
Priv Non-Farm Emp (Thous)	1.32	1.21	1.13	1.05	1	0.27	0.29	0.34	0.39	0.44	0.49	0.54	0.58	0.62	0.66	0.78	0.87
GRP (Bil 92$)	0.06	0.05	0.04	0.04	0.05	-0	-0	0	0	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.04
Pers Inc (Bil Nom $)	0.06	0.06	0.06	0.07	0.07	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.06	0.08
Disp Pers Inc (Bil Nom $)	0.05	0.05	0.05	0.05	0.05	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.05	0.07
PCE-Price Index 92$	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0	0	0	-0	-0	-0	-0	-0	-0	-0
Real Disp Pers Inc (Bil 92$)	0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03
Real Disp Pers Inc Per Cap (Thous 92$)	0.01	0	0	0	0	-0	-0	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Population (Thous)	0.25	0.53	0.71	0.84	0.97	1.04	1.03	1.1	1.16	1.23	1.3	1.36	1.42	1.48	1.54	1.75	1.92

Table 1B: Changes in levels of key economic variables for Tolland County

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	202
Total Emp (Thous)	0.023	0.024	0.024	0.023	0.024	0.008	0.0063	0.006	0.006	0.007	0.007	0.008	0.009	0.009	0.01	0.012	0.01
Priv Non-Farm Emp (Thous)	0.021	0.018	0.017	0.015	0.015	-0	-7E-04	-2E-04	6E-04	0.002	0.003	0.004	0.004	0.005	0.006	0.008	0.01
GRP (Bil 92$)	9E-04	9E-04	9E-04	9E-04	1E-03	3E-04	0.0003	2E-04	2E-04	3E-04	3E-04	3E-04	4E-04	4E-04	4E-04	5E-04	7E-0
Pers Inc (Bil Nom $)	0.004	0.004	0.005	0.005	0.005	0.002	0.0016	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.00
Disp Pers Inc (Bil Nom $)	0.003	0.003	0.004	0.004	0.004	0.002	0.0013	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.00
PCE-Price Index 92$	0.018	0.02	0.021	0.021	0.021	0.008	0.0038	0.002	6E-04	2E-04	4E-04	7E-04	0.001	0.002	0.002	0.004	0.00
Real Disp Pers Inc (Bil 92$)	0.002	0.002	0.003	0.003	0.003	0.001	0.0009	9E-04	8E-04	9E-04	9E-04	9E-04	9E-04	1E-03	0.001	0.001	0.00
Real Disp Pers Inc Per Cap (Thous 92$)	0.014	0.009	0.007	0.005	0.004	-0.01	-0.006	-0.005	-0.004	-0.003	-0.003	-0.002	-0.001	-9E-04	-4E-04	0.001	0.00
Population (Thous)	0.026	0.054	0.07	0.082	0.093	0.085	0.0706	0.062	0.055	0.05	0.047	0.044	0.042	0.041	0.04	0.038	0.0

Table 1C: Changes in levels of key economic variables for Hartford County

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025
Total Emp (Thous)	1.14	0.984	0.932	0.882	0.839	0.288	0.313	0.354	0.398	0.443	0.488	0.529	0.568	0.604	0.636	0.757	0.924
Priv Non-Farm Emp (Thous)	1.129	1.049	0.988	0.93	0.88	0.322	0.343	0.375	0.412	0.45	0.488	0.524	0.558	0.588	0.616	0.722	0.806
GRP (Bil 92$)	0.048	0.041	0.038	0.036	0.04	-0.001	-1E-04	0.002	0.005	0.007	0.01	0.012	0.014	0.017	0.019	0.026	0.036
Pers Inc (Bil Nom $)	0.041	0.041	0.043	0.044	0.048	0.018	0.017	0.017	0.018	0.02	0.022	0.024	0.027	0.029	0.032	0.043	0.063
Disp Pers Inc (Bil Nom $)	0.031	0.031	0.033	0.034	0.037	0.014	0.014	0.014	0.015	0.017	0.018	0.02	0.022	0.024	0.026	0.036	0.052
PCE-Price Index 92$	0.034	0.046	0.054	0.058	0.059	0.037	0.026	0.017	0.01	0.005	9E-04	-0.002	-0.004	-0.006	-0.008	-0.014	-0.013
Real Disp Pers Inc (Bil 92$)	0.018	0.017	0.016	0.016	0.017	0.004	0.005	0.007	0.008	0.01	0.011	0.012	0.014	0.015	0.016	0.02	0.025
Real Disp Pers Inc Per Cap (Thous 92$)	0.018	0.011	0.006	0.003	0.002	-0.018	-0.019	-0.02	-0.022	-0.023	-0.024	-0.026	-0.027	-0.027	-0.028	-0.03	-0.029
Population (Thous)	0.15	0.321	0.437	0.53	0.621	0.74	0.796	0.9	0.994	1.081	1.159	1.232	1.299	1.361	1.419	1.619	1.743

Table 2A: Percentage change in levels for key economic variables for Tolland County

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	202
Total Emp (Thous)	0.04%	0.04%	0.04%	0.04%	0.04%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%
Priv Non-Farm Emp (Thous)	0.05%	0.04%	0.04%	0.03%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%
GRP (Bil 92$)	0.03%	0.04%	0.04%	0.03%	0.04%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%
Pers Inc (Bil Nom $)	0.10%	0.10%	0.11%	0.10%	0.11%	0.04%	0.03%	0.03%	0.03%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.05%
Disp Pers Inc (Bil Nom $)	0.10%	0.10%	0.10%	0.10%	0.10%	0.04%	0.03%	0.03%	0.03%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%
PCE-Price Index 92$	0.02%	0.02%	0.02%	0.02%	0.02%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
Real Disp Pers Inc (Bil 92$)	0.08%	0.08%	0.08%	0.08%	0.09%	0.03%	0.03%	0.03%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%
Real Disp Pers Inc Per Cap (Thous 92$)	0.06%	0.04%	0.03%	0.02%	0.02%	-0.03%	-0.02%	-0.02%	-0.02%	-0.01%	-0.01%	-0.01%	-0.01%	0.00%	0.00%	0.00%	0.01%
Population (Thous)	0.02%	0.04%	0.05%	0.06%	0.07%	0.06%	0.05%	0.05%	0.04%	0.04%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%

Table 2B: Percentage change in levels for key economic variables for Hartford County

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	202
Total Emp (Thous)	0.18%	0.15%	0.15%	0.14%	0.13%	0.04%	0.05%	0.05%	0.06%	0.06%	0.07%	0.08%	0.08%	0.09%	0.09%	0.11%	0.13%
Priv Non-Farm Emp (Thous)	0.20%	0.19%	0.17%	0.16%	0.15%	0.05%	0.06%	0.06%	0.07%	0.07%	0.08%	0.08%	0.09%	0.09%	0.10%	0.11%	0.12%
GRP (Bil 92$)	0.14%	0.12%	0.11%	0.10%	0.11%	0.00%	0.00%	0.01%	0.01%	0.02%	0.02%	0.03%	0.03%	0.04%	0.04%	0.05%	0.07%
Pers Inc (Bil Nom $)	0.13%	0.12%	0.12%	0.12%	0.13%	0.05%	0.04%	0.04%	0.04%	0.04%	0.05%	0.05%	0.05%	0.06%	0.06%	0.07%	0.08%
Disp Pers Inc (Bil Nom $)	0.12%	0.12%	0.12%	0.12%	0.12%	0.05%	0.04%	0.04%	0.04%	0.05%	0.05%	0.05%	0.05%	0.06%	0.06%	0.07%	0.08%
PCE-Price Index 92$	0.03%	0.03%	0.04%	0.04%	0.04%	0.03%	0.02%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	-0.01%	-0.01%
Real Disp Pers Inc (Bil 92$)	0.09%	0.08%	0.08%	0.08%	0.08%	0.02%	0.02%	0.03%	0.04%	0.04%	0.05%	0.05%	0.06%	0.06%	0.06%	0.08%	0.09%
Real Disp Pers Inc Per Cap (Thous 92$)	0.08%	0.04%	0.03%	0.01%	0.01%	-0.07%	-0.07%	-0.08%	-0.08%	-0.09%	-0.09%	-0.09%	-0.10%	-0.10%	-0.10%	-0.10%	-0.10%
Population (Thous)	0.02%	0.04%	0.05%	0.06%	0.08%	0.09%	0.10%	0.11%	0.12%	0.13%	0.14%	0.14%	0.15%	0.16%	0.16%	0.18%	0.19%

Table 2C: Percentage change in levels for key economic variables for the State of Connecticut

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025
Total Emp (Thous)	0.06%	0.05%	0.05%	0.05%	0.04%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%
Priv Non-Farm Emp (Thous)	0.07%	0.06%	0.06%	0.05%	0.05%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%
GRP (Bil 92$)	0.05%	0.04%	0.04%	0.03%	0.04%	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%
Pers Inc (Bil Nom $)	0.05%	0.04%	0.04%	0.04%	0.04%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.03%
Disp Pers Inc (Bil Nom $)	0.04%	0.04%	0.04%	0.04%	0.04%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%
PCE-Price Index 92$	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Real Disp Pers Inc (Bil 92$)	0.04%	0.03%	0.03%	0.03%	0.03%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.02%	0.03%
Real Disp Pers Inc Per Cap (Thous 92$)	0.03%	0.02%	0.01%	0.00%	0.00%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.02%	-0.03%	-0.03%	-0.03%	-0.03%	-0.03%	-0.03%
Population (Thous)	0.01%	0.02%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.04%	0.04%	0.04%	0.04%	0.04%	0.04%	0.05%	0.05%