The FY 2006 Economic Impact of Continuing Operations of the University of Connecticut Health Center (Fourth Report)

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EXECUTIVE SUMMARY

The economic and fiscal analyses detailed in this report argue that the economies of Hartford County and the State of Connecticut continue to benefit greatly from the presence of the University of Connecticut Health Center (UCHC). These latest results emerge from an analysis of the myriad activities of the Health Center; key economic variables reported below substantiate these impacts. In addition, the activities of the Health Center generate local and state tax revenue. When the analysis properly accounts for the state government appropriation, it re-enforces the conclusion that the activities of the Health Center are a significant source of new state tax revenue. Finally, cost-benefit ratios demonstrate that the Health Center is an economically viable and vital venture.

This analysis shows that the $102 million state contribution in FY2006:

- ***Generates $707 million in new personal income (each $1 of state appropriation leverages $6.93 in new personal income statewide) on average each year;***
- ***Generates $938 million in new gross state product (each $1 of state appropriation leverages $9.20 in new GSP statewide) on average each year;***
- ***Generates $116 million in gross state and local tax revenue;***
- ***Generates $98 million in gross state and local expenditure; and,***
- ***Generates over $18 million in net state and local tax revenue on average each year.***

For Hartford County in FY2006, Health Center operations contributed $2.4 million in new net state and local tax revenue through multiplier effects.[1] In FY2006 Health Center operations through multiplier effects created 11,371 new jobs in Connecticut of which 6,675 were in Hartford County.

Consisting of John Dempsey Hospital, the School of Medicine, the School of Dental Medicine, the Graduate School, the UConn Medical Group, and University

[1] New net state and local tax revenue is the difference between all state and local tax revenues received as a result of ongoing UCHC activity and all state and local expenditure as a result of ongoing UCHC activity.

Dentists, the Health Center provides medical and dental treatment, trains qualified physicians, dentists, scientists, and public health professionals, performs medical research, and disseminates medical information. Through these activities, the Health Center directly impacts the Connecticut economy in a variety of ways, through employment and wages, through purchases from Connecticut businesses, by increasing state population through attracting both students and graduates, and by generating tourism revenue from visitors to the Health Center. The Health Center serves an important public health function. As the only public academic health center devoted to health care and research, the UConn Health Center has a mandate to serve the public through outreach, education, health professional supply and retention, stimulation and dissemination of research, and treatment without regard to ability to pay. Finally, the Health Center's research activities increase general medical knowledge affecting individuals' health prospects nationwide and worldwide, not just in Connecticut. These activities create significant improvements in Connecticut's quality of life that attract and retain businesses and families in the region.

Amenity Value

The University of Connecticut Health Center provides a substantial amount of public service and performs groundbreaking research. In each area, the Health Center makes a significant contribution to the well being of Connecticut residents, but measuring the economic impact of the Health Center's quality of life improvements through their measurable financial impact does not capture these benefits adequately or completely. The market does not directly value benefits of this type, called amenities, because there is no price at which they are available, or available prices understate their true worth. Further, the Health Center cannot capture the value of its research activity because knowledge floats in the air. Amenities in general make Connecticut a more attractive place to live by creating a higher "quality of life." Consequently, an increase in amenity value attracts people to a particular location; a lower quality of life motivates people to leave a region. Below we describe how our analysis captures these values. Our analysis is conservative to the extent that we have not captured quality-of-life improvements adequately. This report does not attempt to incorporate critically important health

outcomes from medical care on quality of life and productivity. It is also conservative in how certain financial issues were modeled. For example, approximately $50 million of federal payments flow to area hospitals in excess of the payroll costs of the UConn residents assigned to such hospitals.

Many of the Health Center's treatment facilities and research centers are unique. The Health Center's 24-hour dental emergency service is the only one in the area, and its renowned Neonatal Intensive Care Unit serves as a neonatal referral center for Connecticut as well as western Massachusetts. The Health Center operates the Connecticut Poison Control Center and the only emergency department in the Farmington Valley. The Health Center's research facilities include the Alcohol Research Center (one of 15 such federally supported centers nationwide), and the National Technology Center for Networks and Pathways (one of 5 nationwide). The Health Center's Academic Research Building has enabled faculty researchers to expand their biomedical research. The uniqueness of the Health Center's facilities compounds their value, extending its impact beyond the local area.

The University of Connecticut Health Center contracted with the Connecticut Center for Economic Analysis (CCEA) to analyze the economic and fiscal impacts of the continuing operations of the Health Center. Table 1 summarizes the direct effects of the Health Center's continuing operations for FY2006.

To estimate the Health Center's impact, CCEA counterfactually removes its FY2006 operations from the baseline economy (called 'counterfactual' because it models the absence of an activity that in fact did not occur) and assesses the resulting effects in the county and state economies.

Table 1: Direct Impacts	
	FY2006
Employment	4,274
Insurance demand	$109,886,705
Direct purchases	$207,874,558
Number of students	875
Student expenditures	$23,121,875
Occupational supply	109
Day trippers[2]	N/A
Hotel services	N/A
Amenity Value[1]	$23,252,737

1. We were unable to quantify all the benefits estimated in previous studies.
2. We have no recent data on visitors or on the amount of hotel services provided.

Because Connecticut appropriated $102 million to the Health Center in FY2006, removing the Health Center from the baseline economy creates a hypothetical annual government expenditure reduction of $102 million that we return to Connecticut residents in the form of increased compensation. Table 2 summarizes the impacts demonstrating the Health Center's significant contribution to the Hartford County and Connecticut economies.

Table 2: Economic Impact of the University of Connecticut Health Center 2006-2025		
	Hartford	Connecticut
Variable	Change	Change
Gross State Product (2006 $ Million)	$579	$938
Total Employment (Jobs)	6,675	11,371
Population (Individuals)	5,565	10,681
Personal Income (2006 $ Million)	$341	$707
New Gross State & Local Tax Revenue (2006 $ Million)	$51.6	$116.2
New Gross State & Local Expenditure (2006 $ Million)	$49.2	$98.2
New Net State and Local Tax Revenue (2006 $ Million)	$2.4	$18

Detailed analysis reveals that total FY 2006 state contribution leveraged $6.93 in new personal income and $9.20 of new gross state product for each $1 of state contribution. Continuing operations of the University of Connecticut Health Center not only provide a significant boost to the Connecticut economy, but make good fiscal sense and enhance Connecticut's quality of life and competitive position among the states.

TABLE OF CONTENTS

Introduction

The University of Connecticut Health Center (UCHC) includes John Dempsey Hospital, the School of Medicine, the School of Dental Medicine , the Graduate School, UConn Medical Group and University Dentists. The Health Center's original charter outlined a three-fold purpose: (1) to serve as the state's center for training qualified physicians, dentists, and scientists; (2) to serve as a center for research and (3) to serve as a center providing treatment of medical problems and dissemination of medical information. Today, the Health Center offers graduate, postgraduate, and continuing education courses for scientists and health professionals, supports research in a variety of medical fields, supplies valuable public services, and provides medical care.

As a teaching and clinical facility, the Health Center is able to offer cutting-edge health care in both its 224-bed hospital and its medical and dental practice groups. As the only public academic health center devoted to health care and research, the UConn Health Center is much more than just a hospital or medical school. The state mandated the Health Center to serve the public through outreach, education, health professional supply and retention, stimulation and dissemination of research, and treatment without regard to ability to pay. Throughout Connecticut, the Health Center serves an important public health function addressing the needs of special populations under the State government's care, physician support, and educational seminars.

The economic impact of the Health Center emerges in many different ways. The Health Center produces broad economic activity employing 4,274 workers and spending $109,886,705 in economic security (fringe benefits including life, medical, and dental insurances, and retirement) costs according to fiscal year FY2006 data. The Health Center spends $207,874,558 within the Connecticut economy on goods and services purchases for operations. In FY2006, 875 UCHC students had associated consumption expenditures of $23,121,875. Graduates numbered 109 in FY2006. Disaggregated data for FY2006 shows that for the Connecticut economy, the Health Center graduated 36 Doctors of Dental Medicine and 73 physicians. The resulting economic effects are in aggregate significant both in Hartford County where the main facility is located and throughout Connecticut.

In addition to these direct economic effects, the activities of the Health Center are important to the overall quality of life and labor productivity in Connecticut. The Health Center's research facilitates the growth of medical knowledge, and, because of the synergies between research and cutting-edge treatments, the Health Center is able to provide a high level of health care and unique services often unavailable at non-research institutions. The Health Center in addition provides a substantial amount of public service through its many education programs, screenings and other outreach activities. Finally, just by offering health care, the Health Center improves individual health outcomes that increase individuals' ability to enjoy life and to work productively. These services result in a significant amenity value for Connecticut residents and businesses. These benefits that flow from research and community outreach are difficult to quantify; for this third study, CCEA estimates an amenity value of $22,438,237. This should be regarded as a very conservative estimate of the amenity value of the Health Center because much of the benefit that accrues to these activities is uncompensated (and inestimable).

To estimate the economic and fiscal impact of the Health Center, CCEA uses the REMI model, a dynamic input-output model of Connecticut and its eight counties. The REMI model measures the economy in its present form as a baseline. Because the University of Connecticut Health Center already exists in the baseline model, to identify the Health Center's contribution to the state economy, the analysis removes it from the state economy counterfactually and then analyzes how this shock affects both the local and state economies. Although this method of *removing* the Health Center generates negative changes of key economic variables, this study reports these effects as positive numbers, because the correct interpretation is that they reveal the positive impact of continuing operations of the Health Center.

CCEA assesses the fiscal impact of the Health Center as well. Counterfactually removing the Health Center from the baseline economy reduces state expenditure because the FY2006 $102 million ($98.81 million in FY2001) Health Center contribution would be forgone. To offset the hypothetical state budget expenditure reduction, the FY2006 $102 million state appropriation is returned to taxpayers as an increase in consumption expenditure in each Connecticut County. The allocation of consumption expenditures in each county is based upon a population-weighted measure. This causes a cascade of

changes in other economic variables through the REMI model's inter-industry correlation matrices. Finally, to capture the local and statewide impact, this analysis considers two principal geographic regions: Hartford County and the entire state of Connecticut.

Methodology and Assumptions

I. Model

The REMI model is a dynamic, multi-sector, regional model developed specifically for the Connecticut Center for Economic Analysis. This model provides detail on all eight counties in the State of Connecticut and any combination of these counties. The REMI model includes all of the major inter-industry linkages among 466 private industries, aggregated into 69 major industrial sectors. With the addition of farming and three public sectors (state and local government, civilian federal government, and military), there are 72 sectors represented in the model for the eight counties.

The REMI model is based on a nationwide *input-output* (I/O) model that the U.S. Department of Commerce (DOC) developed and continues to maintain. Modern input-output models are largely the result of groundbreaking research by Nobel laureate Wassily Leontief. Such models focus on the inter-relationships between industries and provide information about how changes in specific variables—whether economic variable such as employment or prices in a certain industry or other variables like population affect factor markets, intermediate goods production, and final goods production and consumption.

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. Listed below are some salient structural characteristics of the REMI model:

- REMI determines consumption on an industry-by-industry basis, and models real disposable income in Keynesian fashion, i.e., with prices fixed in the short run and GDP (Gross Domestic Product) determined solely by aggregate demand.

- The demand for labor, capital, fuel, and intermediate inputs per unit of output depends on relative prices of inputs. Changes in relative prices causes producers to substitute cheaper inputs for relatively more expensive inputs.

- Supply and demand for labor in a sector determine the wage level, and these characteristics are factored by regional differences. The supply of labor depends on the size of the population and the size of the workforce.

- Migration—that affects population size—depends on real after-tax wages as well as employment opportunities and amenity value in a region relative to other areas.

- Wages and other measures of prices and productivity determine the cost of doing business. Changes in the cost of doing business will affect profits and/or prices in a given industry. When the change in cost of doing business is specific to a region, the share of local and U.S. market supplied by local firms will also be affected. Market share and demand determine local output.

- "Imports" and "exports between states are related to relative prices and relative production costs.

- 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 on unemployment details of the previous period, and total government expenditures are proportional to population size.

- 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.

Because the variables in the REMI model are all related, a change in one affects many others. For example, if wages in a certain sector rise, the relative prices of inputs change and may cause the producer to substitute capital for labor. This changes demand

for inputs, which affects employment, wages, and other variables in those industries. Changes in employment and wages affect migration and the population level, which in turn affect other employment variables. Such chain-reactions continue throughout the model. Depending on the analysis 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 extensive sectoral detail, it is possible for experienced economists in this field to discern the dominant causal linkages involved in the results. An expanded description of the REMI model appears in Appendix V.

Ia. The Counterfactual Approach and the Study Region

Most economic models, including the REMI model, measure the Connecticut economy in its present form as a baseline. Any changes in the economy are either added to or subtracted from that baseline depending on the nature of the change. Because the University of Connecticut Health Center already exists in the baseline model, the most accurate approach to measuring the Health Center's impact is to remove the activities of the Health Center from the economy. Intuitively, the results in this report measure the losses to the economy resulting from the closure of the Health Center (all physical assets remain intact). However, one can interpret these same results as the positive impact of the Health Center's continuing operations by reversing the signs of the economic variables; this study reports the results of the analysis as positive numbers.

This analysis assesses the economic impacts on two principal geographic regions. Most hospitals tend to have strong local effects. Therefore, CCEA assumes the primary market for the Health Center is Hartford County. As such, CCEA looks specifically at Hartford County to provide results that capture the local impact. In addition to spillover effects from Hartford County, the Health Center is unusual in that it has effects through its operations around the state. This statewide reach benefits the entire state. As a result, this analysis considers the statewide impact as well. Appendices II through IV provide a breakdown of the selected direct (payroll and procurement) and total effects (GSP, jobs, state and local revenue) of the Health Center by state assembly, senate and congressional districts. In this way, we account for the general economic improvement in each local area.

II. Assumptions and Inputs

The University of Connecticut Health Center makes a substantial contribution to the economies of Hartford County and to the entire state. The Health Center affects the economy directly through its employment, purchases, student population expenditures and labor supply consisting of medical and dental school graduates and professional- degreed individuals, tourism, and its general public service. General public service includes community outreach, services and basic research (please see http://www.connecticuthealth.org/projects/index.html for program details). This analysis quantifies each of these areas with available data from the Health Center, state government and local business. The state government supports this economic activity, in part, through an annual appropriation to the Health Center. The following section describes inputs to the REMI model.

Employment

One of the most important direct economic impacts of any service industry, such as health care, is its employment. During fiscal year 2006, the University of Connecticut Health Center employed an average of 4,274 full-time workers. CCEA derived this figure by averaging monthly employment levels.

The total wage bill (payroll) at the Health Center for fiscal year 2006 was $317 million. Of this amount, the Health Center paid approximately $301 million (95%) to Connecticut residents. In addition, the highly skilled nature of most positions means that these positions are both highly productive and pay higher than average wages. These jobs are desirable and have close links to the community, resulting in a boost for local employment and sales through multiplier effects.

To model employment, the analysis allocates all of the Health Center's employees to Connecticut's medical sector. While acknowledging the fact that employees may be engaged in both teaching and medical services, the CCEA allocates 4,274 jobs solely to the medical sector. Because wages for Health Center employees in this sector are higher than the state averages built into REMI, CCEA adjusts the wage bill in the sector in the REMI model to account for the difference. The total adjustment is $10,291,879 in the medical sector.

Employee security costs include medical and dental insurance and unemployment compensation expenditures that represent payments for insurance services to firms or the government within the Connecticut economy. For FY2006 we calculated a value of $109,886,705 as compared to $60,021,429 in FY2001.

Procurement

CCEA obtained information about Health Center purchases from UCHC Finance Corporation and from the Health Center's own purchasing department. The former accounted for $7,736,075 in capital and non-capital expenditures in CT in FY2006. The latter capital and non-capital expenditure amounted to $200,138,483 in CT in FY2006. In total, the Health Center in FY2006 purchased $207,874,558 of goods and services in Connecticut (compares to $173,406,595 in FY2001). CCEA staff coded each purchase in the appropriate sector within the 70 private sectors in the REMI model. Our analysis included only purchases from suppliers in Connecticut so that the report correctly captures the Health Center's impact on the state's economy. The analysis geographically allocates purchases to the Connecticut County in which they occurred.

Student Living Expenses

UCHC offers four primary education programs, culminating in degrees of: Medical Doctor (M.D.), Doctor of Dental Medicine (D.M.D), Doctorate in Biomedical Sciences (Ph.D.), Masters of Public Health (M.P.H.), and, Masters of Dental Science (M.D.S.). Table 3 presents the division of students by degree for FY2006.

Table 3: Student Data	
	Total Students
Dental	166
Medical	319
PhD/MA	390
Total	**875**

CCEA assumes that if the UConn Health Center did not exist, these students would leave Connecticut to attend university elsewhere. Thus, their basic living expenditures stimulate the state's economy. They contribute to the state economy through their expenditures on housing, utilities, food, transportation and miscellaneous purchases. Full time 3rd/4th year students spent an estimated $2000 per month ($1314/month in FY2001) each in Connecticut. The monthly purchases break down across consumer categories is as follows: $800 for rent and utilities, $300 for food and household operations, $500 on transportation, $100 on car insurance, $60 on DSL, and $240 on personal goods. Annual expenses also include $850 on books and supplies, $975 on boards and clinical skills exams, and $600 on computer accessories. We assume no students work for the Health Center, thus all employment is separately accounted.

CCEA calculates that the total economic stimulus produced by these students is $23,121,875 for FY2006. Our analysis allocates these values to Hartford County as the exact place of residence was not readily available.

Occupational Supply

An important function of a medical school is to train future medical personnel. As part of the education of these future doctors and dentists, the Health Center focuses attention on regional health needs by including the services of interns and residents to Connecticut's inner cities as part of their training. In addition, the increased availability of locally trained workers ensures a continuous supply of professionals in a sector important to long-term state growth. According to the most recent data available, 109 and 148 healthcare professionals graduated from the Health Center in FY2006 and FY2001 respectively. This injection of new human capital is a stimulus for the state's economy that we include in the impact analysis. We assume that 100% of these graduates remain in Connecticut (alumni relations reports that a very percentage do). This increased local supply of specialized labor reduces its wage rate due to the supply side effect and because such local supply is available at lower cost than that which would otherwise need to be imported.

Residency Services

Each year the University of Connecticut Health Center provides accredited residency program services to hospitals across Connecticut. The annual payroll and fringe benefit costs for the 580 residents were $31.8 million in FY2006. To provide the same service with physicians or physician extenders would cost between 2.3 and 2.5 times more than that of residents or approximately $77 million.[2] We therefore add this change in hospital sector sales to the economy for the counterfactual analysis. This amount reduces the reported economic impact of the Health Center in the counterfactual model even though in reality the Health Center is saving hospital budgets this amount.

The federal government pays area hospitals for a portion of the direct costs of residents (salary and fringe benefits) and for the additional costs required to create and maintain an academic environment. The federal subsidy for FY2004 was approximately $81 million, which represented approximately $50 million in excess of salaries and fringe benefits that flowed into the Connecticut economy. The $50 million was not captured in the REMI model and we modeled it as an amenity. This omission and the treatment of the $77 million discussed in the last paragraph renders our analysis conservative. Were it not for the Health Center's provision of residents, area hospitals would not receive these payments.

Amenity Value

The University of Connecticut Health Center provides a substantial amount of public service and performs groundbreaking research. In each area, the Health Center makes a significant contribution to the wellbeing of Connecticut residents, but measuring the economic impact of the Health Center's quality of life improvements through their measurable financial impact does not capture these benefits adequately or completely. The market does not directly value benefits of this type, called amenities, because there is no price at which they are available, or available prices understate their true worth. Further, the Health Center cannot capture the value of its research activity because knowledge floats in the air. Amenities in general make Connecticut a more attractive place to live by creating a higher "quality of life." Consequently, an increase in amenity value attracts

[2] This is equivalent to increasing employment by the specified number of employees in the medical sector.

people to a particular location; a lower quality of life motivates people to leave a region. Estimating amenity values is difficult and researchers often resort to the use of proxies. The following section describes how our analysis captures these values.

A. Public and Community Programs

The Health Center's John Dempsey Hospital, UConn Medical Group and University Dentists, together, provide a wide array of preventive and wellness services to thousands of Connecticut residents, including numerous support groups and special populations under the State government's care. In FY2006, the Heath Center benefited Hartford County and the entire state by providing a variety of (no cost and low cost) medical, dental services and educational programs to the community that improved the quality of life for underserved groups in many different ways.

An example of one of these programs is the Discovery Series. This series is a monthly program that educates the public on the latest developments in clinical research, disease, wellness and prevention. Each program focuses on a specific illnesses or diseases. These sessions provide free information to the public about managing their diseases and present new medical knowledge that is available at the Health Center. With the increase of chronic diseases, patient self-management has taken on increased importance. The availability of these programs provides a benefit to the state through increased health of its residents. In 2006, the Health Center developed the nation's first Patient School and enrolled its first class. School of Medicine students are responsible for teaching a significant proportion of the health class in the Hartford Public School System.

The School of Medicine provides community clinical services through clinical care time that students and faculty volunteer. The School of Medicine offers a community-care curricular component that requires upper level students to contribute time and health care services to the community. For eight years, student volunteers have run a free medical clinic at the Salvation Army Marshall House, a homeless shelter in Hartford. Supervised by a pediatrician, the students examine, diagnose, and determine treatment for the shelter's children and adolescents. In 1987, UConn Medical School students opened the South Park Inn Medical Clinic, which serves residents of the South

Park Inn homeless shelter in the south end of Hartford. Student volunteers and community physicians work together to provide medical and psychiatric care for minor problems and refer patients with more serious ailments. Students have also set up clinics for migrant and seasonal farm workers. These students travel around the state with volunteer physicians, diagnosing and treating minor ailments and distributing vouchers for care at local clinics to those whom they could not treat. The students also provide preventive care (including immunizations and screenings) at the Hartford YMCA. .

These public and community programs, organized out of the main facility in Farmington, represent a significant benefit to Connecticut and the region. The programs are usually offered for free or below cost and reach populations that are underserved. Because of this, such programs have an even larger impact on health status than medical services would have on an otherwise serviced population, but there is no direct way for CCEA to determine the value of this increased impact. Furthermore, the Health Center or other entities often subsidize these programs and they often rely on volunteer labor. The combination of these and other factors make estimating the economic value of the public and community programs that the Health Center provides difficult it not impossible. Because these programs certainly have a positive impact on the state economy—both by increasing the human capital available for production (gainful employment) and by their expenditures in the economy—the economic impact of the Health Center is once again understated in our analysis.

B. Area Health Education Center Programs

Another program that the Health Center maintains is the Connecticut Area Health Education Center Program. Established through federal and state funds, these four centers provide Connecticut with outreach programs. This program reaches underserved populations by:

- Developing health careers recruitment programs in underserved rural and urban areas for under-represented and disadvantaged populations.

- Supporting community-based training for primary care health professionals, students and residents in health professional shortage areas, including multidisciplinary and interdisciplinary training.

- Providing information dissemination, educational support, and technical assistance to reduce professional isolation, increase retention and enhance the practice environment.

- Engaging in health promotion and increasing disease prevention activities in a way that responds to community needs with an emphasis on underserved populations.

This program stimulates and retains physician supply for the underserved populations in Connecticut. These supply issues are critical public health issues; the Health Center is fulfilling a key governmental responsibility in offering this program. Recently, the AHECs have developed a Youth Services core in which hundreds of high school students throughout the state have been trained to be volunteers in community outreach activities. The training curriculum has now been exported to 11 other states and a similar program for college students is underway.

For FY2006, we have no acceptable way to properly measure the benefits from such programs so once again this results in an underestimate of the positive economic impact the Health Center has on Connecticut's economy.

C. Research

Another important aspect of the amenity value that the University of Connecticut Health Center creates is basic research. The Health Center's contributions to medical knowledge increase understanding, facilitate diagnosis and treatment, and improve the health of individuals everywhere, not just in Connecticut. The Health Center's major research areas include musculo-skeletal medicine, cancer, heart disease and public health.

The Health Center's research facilities include the Academic Research Building, which opened in early 1999 and expanded laboratory space at the Health Center by more than 40 percent. In accordance with the Health Center's plans to increase its biomedical research, a large part of the new facility is devoted to such research, focusing on genetic modeling of human disease, molecular genomics, structural biology and biomaterials, biomedical imaging, clinical epidemiology, and computational biology. The Health Center's other unique research capabilities include the Alcohol Research Center (one of

15 such centers in the country), and the National Technology Center for Networks and Pathways (one of 5 nationwide).

Health Center research output flows directly to two main audiences: the academic community and the general public. Faculty and researchers from the Health Center present their research at academic conferences and symposia and publish in academic journals distributed worldwide. The Health Center hosts academic conferences. . The general public benefits directly from Health Center research including the translation of basic science research to the bedside and from the bedside into the community. The Health Center's research enables it to provide unique services through specialized treatment centers and educational programs. Specialized facilities at the Health Center include the Neonatal Intensive Care Unit and the Alcohol and Drug Abuse Treatment Center, the. Educational programs include the Health Center's Diabetes Self-Management Program, which has received national attention.

The value of pure research is difficult to measure because it has such wide-ranging effects. The direct costs associated with the grants for FY2006 was $63,320,078, which we include in the expenditure side of the analysis and *not* as a measure of the amenity value. Instead, CCEA uses the sum of the annual value of grants and royalties. For FY2006, the annual value of grants was $21,242,798 while other research generated $814,500 in royalty revenue.

D. Improved Health and Saved Lives

In addition to these programs included in the study, CCEA excludes from this study one very significant benefit that the Health Center generates. When estimating the cost effectiveness of any health service, the procedure is to ascribe a dollar value to improved health outcomes. Whether this estimate is based on improvements in quality of life, fewer lost workdays (symbolizing increased productivity), or averted future costs, the health care offered at the Health Center creates a very substantial benefit that the cost of treatment by itself simply cannot fully capture. If the Health Center saves just one life a year (we know it saves many more) the value of this life is a benefit generated by the Health Center's operations. Because we cannot *accurately* measure these benefits we exclude them from the study. As such, the results of the analysis should be viewed as

very conservative since we have excluded potentially large benefits created by improved health and saved lives.

Summary of Inputs

In summary, this report considers the following direct effects of the University of Connecticut Health Center:

- 4,274 direct FTE employees.
- Wage adjustment of $10,291,879, in the medical sector.
- Economic security costs of $109,886,705 in life, medical, dental insurances purchases, plus financial sector purchases for retirement benefits.
- $207,874,558 of direct goods and services purchases in the Connecticut economy.
- 875 matriculating students in the student population (including full time and part time).
- $23,121,875 for student consumption expenditures.
- Occupational supply of 109 health professionals in the current project FY2006.
- Amenity value of $23,252,737 derived as explained above.

In addition, because we account separately and in detail for Health Center procurement, we suppress intermediate demand induced by employment changes in REMI. Because we leave all physical capital intact (in the counterfactual, everyone just walks away), we suppress investment induced by employment changes in REMI as well.

Analysis and Results

The University of Connecticut Health Center is an important economic engine not only for its immediate vicinity, Hartford County, but for the entire State of Connecticut. To measure the economic impact of the Health Center using the REMI model, CCEA analysis removes it from the baseline economy and analyzes how this affects the state and local economies. These effects show the significant economic and fiscal contribution the University of Connecticut Health Center makes to Connecticut. Although the Health Center is located in Hartford County, it impacts the entire state through goods and services purchases, student expenditures, health care, occupational supply and public services that occur in other counties. The total statewide impact includes spillovers from

Hartford County as well as independent impacts in different counties (through purchases of goods and services).

This section reports REMI results for Hartford County and Connecticut as a whole. While much of the economic impact occurs in Hartford County, the rest of the state experiences positive impacts.

Table 2 shows the combined direct and spillover effects on several key variables. Although CCEA generates these results by removing the Health Center from the baseline economy, the study reports these findings as positive values to show the economic impact of continuing operations of the Health Center on Connecticut during 2006-2025. The Health Center's economic impact we report is the long run value of each economic variable. These values reflect the state of the Connecticut economy when it ultimately adjusts (in the REMI model) to the counterfactual disappearance of the Health Center.

Table 2: Economic Impact of the University of Connecticut Health Center 2006-2025

Variable	Hartford Change	Connecticut Change
Gross State Product (2006 $ Million)	$579	$938
Total Employment (Jobs)	6,675	11,371
Population (Individuals)	5,565	10,681
Personal Income (2006 $ Million)	$341	$707
New Gross State & Local Tax Revenue (2006 $ Million)	$51.6	$116.2
New Gross State & Local Expenditure (2006 $ Million)	$49.2	$98.2
New Net State and Local Tax Revenue (2006 $ Million)	$2.4	$18

In calculating the results displayed in Table 2, CCEA removed the Health Center from the baseline economy but kept the government budget approximately balanced by distributing the Health Center's $102 million FY2006 state appropriation to state residents. As shown here, in Hartford County, Health Center operations generated an annual average of $579 million in new gross state product and $341 million in new personal income. Ongoing Health Center operations create almost 6,675 new jobs in Hartford County and attract around 5,565 new people to the region. The lion's share of the state's economic impact occurs in Hartford County. Increased government spending,

induced by Health Center operations, increases GRP, employment and personal income by stimulating further economic activities. That is, the state stimulates broad economic activity from the continuing operations of the UConn Health Center.

Fiscal Analysis

The University of Connecticut Health Center is an ongoing operation receiving an annual state appropriation. Because the baseline impact analysis already incorporates the Health Center operations, it is necessary to remove the Health Center from the economy to determine the true impact on the economy. The counterfactual disappearance of the Health Center would cause a decline in general economic activity. In particular, Gross State Product (GSP) and personal income would fall, resulting in a decline in income, sales, use and profits taxes in Connecticut. In addition, the reduction in employment and population leads to a decrease in the value of local property and, thus, local property taxes.

In addition to these basic tax changes, the Health Center's impact changes government spending. The first component of government spending change is in induced spending. As people (counterfactually) leave the state and there is less economic activity, the government needs to spend less to maintain the same level of services as in the past. This adjustment occurs endogenously or within the model based on current and projected levels of government spending.

Because this approach removes the Health Center from the state economy, the results appear in terms of differences from the baseline forecast as negative numbers. Conversely, this reflects the ongoing positive impact of the Health Center, so the study presents the impacts as positive numbers to make clear the Health Center's current economic impact. Table 2 includes the fiscal impacts.

New state tax revenue depends upon general economic activity. The increase in GSP and personal income that accompanies the operation of Health Center generates an increase in new tax collections through the channels discussed above, both in Hartford County and the state as a whole. However, because we approximate a balanced budget by refunding the state appropriation to taxpayers that directly increases their personal income in the counterfactual, personal income does not increase symmetrically with the

existence of the Health Center. The increase in personal income and the resulting new state tax revenue understates the full impact of the Health Center. Nevertheless, with these two key indicators increasing, new state tax revenues increase as well. New net state and local tax revenue is $2.4 million in Hartford County and $18 million in Connecticut as a whole on average annually.

The gain in new state tax revenue occurs primarily in Hartford County. Other counties fund the Health Center indirectly and to a lesser extent through their tax payments and receive correspondingly less direct impact from the Health Center. Therefore, the revenue gain of taxes from Health Center-generated economic activity in those areas is relatively low. The section above on economic variables discusses these results.

Local taxes rise due to the operations of the Health Center. The Health Center makes payments in lieu of property taxes (PILOT); the counterfactual effect on local taxes is indeterminate. Changes in local taxes come from changes in the population in the region and Connecticut. As people move in, they require housing and thus property taxes increase leading in this case to a positive net change in local tax revenue.

As individuals come to the state, they demand government services, so induced government spending rises that is, spending for public services, such as education and police. An additional cost to state government is the annual appropriation to support the Health Center; this study assumes that the appropriation grows by the projected annual inflation rate over the study period.

CCEA's analysis reveals that each dollar of the total state contribution ($102 million) for the Health Center on average generated $6.93 in new personal income and $9.20 in new GSP in FY 2006. Thus, the state appropriation has significant leverage. The economic and fiscal analyses suggest that Hartford County and the Connecticut economy benefit from the continuing operations of the University of Connecticut Health Center. All key economic variables show the Health Center is important to the continuing viability and competitiveness of Hartford County and Connecticut. In addition, the Health Center's derived economic activity is a source of new local and state tax revenue. When we properly account for government spending, the operations of the Health Center are still a significant source of new state tax revenue. The cost-benefit

ratios demonstrate the Health Center is an economically viable operation; indeed, as a public investment it delivers satisfying returns through enormous leverage. Overall, this impact analysis demonstrates a strong positive effect of the continuing operations of the University of Connecticut Health Center on the economy of Connecticut.

Conclusions

The economic impact of the University of Connecticut Health measures the value of its continuing operations in Hartford County and Connecticut. Continuing operations include employment, purchases, student expenditures, graduates, tourism, and general public service. The State of Connecticut currently supports the Health Center with an annual appropriation treated as a state expenditure. CCEA counterfactually removed the Health Center from the economy in order to measure the impacts of the Health Center accurately, because Health Center operations already exist in the Connecticut REMI baseline forecast. The reduction in state expenditure is returned to Connecticut taxpayers in the form of increased compensation.

Continuing operations at the Health Center generate higher Gross State Product (GSP), personal income, employment, and population in Hartford County and the state as a whole were it not there. The impact on population is particularly strong as the activities of the Health Center attract young people and professionals into Connecticut. The activities of the Health Center strongly and permanently affect GSP and employment. Not only does the Health Center generate significant economic activity, it creates significant amenity value in Connecticut. That is to say, the quality of life improves in the state because of the Health Center's many activities in public service and research. By providing patient education, free or low cost medical and dental treatment and stimulating and disseminating current medical research, the Health Center improves the general health of individuals in the state. These activities increase Connecticut's quality of life and labor productivity and represent a gain to Connecticut that is difficult to quantify. As a result, the economic gains presented in this report understate the full impact of the UConn Health Center. This report does not attempt to incorporate critically important health outcomes from medical care on quality of life and productivity. To this extent, the analysis is conservative. In addition, we do not capture federal payments to area hospitals that exceed the cost of the Health Center providing residents to them. This renders the analysis conservative as well.

In addition to these positive impacts, continuing operations at the Health Center present a positive fiscal picture for Connecticut. Fully accounting for the public cost (the

state's appropriation) of the Health Center generates a positive return in tax revenue because this investment leverages significant private and federal investments as well.

Additionally, our cost-benefit analysis of Health Center operations reveals that it is a worthwhile endeavor. For each $1 of total state contribution in FY 2006 ($102 million), Health Center operations generated $6.93 of new personal income ($3.82 in FY2001) and $9.20 of new GSP ($4.25 in FY2001). These cost-benefit ratios suggest that, fiscally speaking, Connecticut gains from continuing to fund the Health Center and that the state's investment has great leverage in turn generating tuition, grants, royalties and patient fees. State support for the Health Center is actually self-financing, returning more to Connecticut in new revenues than it provides in support through its enormous leverage effect.

The University of Connecticut Health Center fuels a considerable amount of economic activity within Hartford County and Connecticut. All major indicators show that the Health Center has a strong positive impact on the state. In addition, the Health Center makes Connecticut a more attractive place to live and do business by improving the health and, therefore, productivity of Connecticut's workforce.

This analysis shows that the $102 million state contribution in FY2006:

- ***Generates $707 million in new personal income (each $1 of state appropriation leveraged $6.93 in new personal income statewide) on average each year;***
- ***Generates $938 million in new gross state product (each $1 of state appropriation leverages $9.20 in new GSP statewide) on average each year;***
- ***Generates $116 million in new gross state and local tax revenue;***
- ***Generates $98 million in new gross state and local expenditure; and,***
- ***Generates over $18 million in new net state and local tax revenue on average each year.***

For Hartford County in FY2006 Health Center operations contributed $2.4 million in new net state and local tax revenue through multiplier effects. In FY2006 Health Center operations through multiplier effects created 11,371 new jobs in Connecticut of which 6,675 were in Hartford County.

Appendix I: Economic Impact Results at the Assembly District Level

UConn Health Center FY 2006 Economic Impact by Assembly District

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
1	Bloomfield					
1	Hartford					
District Total		237	$6,533,019	$5,620,999	$20,544,819	$1,829,164
2	Bethel					
2	Danbury					
2	Redding					
District Total		18	$492,403	$197,372	$2,107,886	$271,703
3	Hartford *					
District Total		159	$4,385,376	$3,773,170	$13,790,983	$1,227,851
4	Hartford *					
District Total		159	$4,385,376	$3,773,170	$13,790,983	$1,227,851
5	Hartford *					
District Total		159	$4,385,376	$3,773,170	$13,790,983	$1,227,851
6	Hartford *					
District Total		159	$4,385,376	$3,773,170	$13,790,983	$1,227,851
7	Hartford *					
District Total		159	$4,385,376	$3,773,170	$13,790,983	$1,227,851
8	Columbia					
8	Coventry					
8	Vernon					
District Total		189	$2,403,910	$1,980,042	$9,014,364	$2,560,997
9	East Hartford					
9	Glastonbury					
9	Manchester					
District Total		392	$10,819,013	$9,308,660	$34,023,265	$3,029,189
10	East Hartford					
District Total		126	$3,465,855	$2,982,015	$10,899,302	$970,396
11	East Hartford					
11	South Windsor					
District Total		223	$6,157,615	$5,298,002	$19,364,259	$1,724,056
12	Manchester *					
District Total		141	$3,896,982	$3,352,957	$12,255,098	$1,091,107
13	Manchester *					
District Total		141	$3,896,982	$3,352,957	$12,255,098	$1,091,107
14	South Windsor					
District Total		98	$2,691,760	$2,315,986	$8,464,957	$753,659
15	Bloomfield					
15	Windsor					
District Total		151	$4,157,188	$3,576,837	$13,073,384	$1,163,961
16	Simsbury					
District Total		179	$4,936,192	$4,247,091	$15,523,168	$1,382,072
17	Avon					
17	Canton					
District Total		138	$3,808,190	$3,276,560	$11,975,866	$1,066,246
18	West Hartford					

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
District Total		156	$4,305,807	$3,704,709	$13,540,755	$1,205,572
19	Avon					
19	Farmington					
19	West Hartford					
District Total		315	$8,690,096	$7,476,944	$27,328,320	$2,433,119
20	West Hartford					
District Total		156	$4,305,807	$3,704,709	$13,540,755	$1,205,572
21	Farmington					
District Total		94	$2,596,656	$2,234,158	$8,165,875	$727,031
22	Bristol					
22	New Britain					
22	Plainville					
District Total		386	$10,641,954	$9,156,319	$33,466,456	$2,979,615
23	Lyme					
23	Old Lyme					
23	Old Saybrook					
23	Westbrook					
District Total		68	$2,544,756	$957,552	$4,972,213	$1,046,082
24	New Britain					
24	Newington					
District Total		212	$5,857,782	$5,040,026	$18,421,356	$1,640,106
25	New Britain *					
District Total		137	$3,778,522	$3,251,034	$11,882,569	$1,057,939
26	New Britain *					
District Total		137	$3,778,522	$3,251,034	$11,882,569	$1,057,939
27	Newington					
District Total		75	$2,079,260	$1,788,992	$6,538,787	$582,167
28	Newington					
District Total		100	$2,772,978	$2,385,866	$8,720,368	$776,399
29	Newington					
29	Rocky Hill					
29	Wethersfield					
District Total		318	$8,770,051	$7,545,737	$27,579,761	$2,455,505
30	Berlin					
30	Southington					
District Total		180	$4,974,732	$4,280,251	$15,644,367	$1,392,863
31	Glastonbury					
District Total		125	$3,456,176	$2,973,688	$10,868,865	$967,686
32	Cromwell					
32	Middletown					
32	Portland					
District Total		120	$5,362,677	$1,608,314	$8,712,863	$1,451,717
33	Middletown					
District Total		41	$1,824,218	$547,099	$2,963,848	$493,829
34	East Hampton					
34	Middletown					
District Total		82	$3,670,377	$1,100,778	$5,963,345	$993,599

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
35	Clinton					
35	Killingworth					
35	Westbrook					
District Total		81	$3,609,274	$1,082,453	$5,864,070	$977,058
36	Chester					
36	Deep River					
36	Essex					
36	Haddam					
District Total		80	$3,549,758	$1,064,604	$5,767,373	$960,946
37	East Lyme					
37	Salem					
District Total		48	$954,065	$743,064	$3,519,488	$1,098,039
38	Montville					
38	Waterford					
District Total		54	$1,080,954	$841,890	$3,987,574	$1,244,077
39	New London					
District Total		28	$554,579	$431,928	$2,045,808	$638,268
40	Groton					
40	New London					
District Total		71	$1,406,622	$1,095,534	$5,188,944	$1,618,890
41	Groton					
District Total		43	$852,043	$663,606	$3,143,137	$980,622
42	Ledyard					
42	Montville					
District Total		56	$1,119,054	$871,565	$4,128,124	$1,287,927
43	North Stonington					
43	Stonington					
District Total		50	$991,702	$772,378	$3,658,331	$1,141,357
44	Killingly					
44	Plainfield					
44	Sterling					
District Total		97	$1,927,445	$1,501,173	$7,110,232	$2,218,310
45	Griswold					
45	Lisbon					
45	Voluntown					
45	Plainfield					
District Total		50	$915,974	$677,731	$3,474,199	$1,033,259
46	Norwich					
District Total		39	$772,121	$601,359	$2,848,307	$888,639
47	Canterbury					
47	Scotland					
47	Norwich					
47	Sprague					
District Total		55	$1,034,928	$775,029	$3,900,587	$1,172,895

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
48	Colchester					
48	East Haddam					
District Total		63	$2,005,280	$910,238	$4,589,127	$1,110,437
49	Windham					
District Total		34	$472,656	$260,483	$2,030,977	$480,781
50	Brooklyn					
50	Eastford					
50	Hampton					
50	Pomfret					
50	Woodstock					
District Total		35	$475,023	$261,787	$2,041,147	$483,189
51	Killingly					
51	Putnam					
51	Thompson					
District Total		40	$553,040	$304,783	$2,376,385	$562,548
52	Somers					
52	Stafford					
52	Union					
District Total		138	$1,754,263	$1,444,944	$6,578,269	$1,868,898
53	Tolland					
53	Willington					
53	Ashford					
District Total		127	$1,630,957	$1,319,195	$6,164,428	$1,733,262
54	Chaplin					
54	Mansfield					
District Total		146	$1,862,328	$1,520,508	$7,010,487	$1,981,649
55	Andover					
55	Bolton					
55	Hebron					
55	Marlborough					
District Total		149	$2,605,835	$2,194,153	$8,984,080	$1,754,068
56	Vernon					
District Total		86	$1,097,509	$903,991	$4,115,521	$1,169,227
57	East Windsor					
57	Ellington					
District Total		161	$3,217,010	$2,729,057	$10,756,953	$1,731,636
58	Enfield *					
District Total		174	$4,793,850	$4,124,620	$15,075,537	$1,342,218
59	Enfield *					
District Total		174	$4,793,850	$4,124,620	$15,075,537	$1,342,218
60	Windsor Locks					
60	Windsor					
District Total		167	$4,604,517	$3,961,718	$14,480,129	$1,289,208
61	East Granby					
61	Windsor					
District Total		203	$5,596,595	$4,815,301	$17,599,982	$1,566,977

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
62	Barkhamsted					
62	New Hartford					
62	East Granby					
62	Granby					
62	Cornwall					
District Total		130	$3,471,741	$2,747,208	$10,669,108	$1,055,539
63	Hartland					
63	Hartland					
63	Hartland					
63	Hartland					
63	Hartland					
63	Hartland					
63	Hartland					
District Total		82	$1,955,718	$1,106,038	$5,552,381	$748,300
64	Goshen					
64	Salisbury					
64	Sharon					
64	Torrington					
64	Cornwall					
District Total		96	$2,195,319	$1,055,158	$6,039,374	$904,853
65	Torrington					
District Total		58	$1,335,059	$641,683	$3,672,779	$550,276
66	Bethlehem					
66	Litchfield					
66	Morris					
66	Warren					
66	Woodbury					
District Total		53	$1,223,294	$587,964	$3,365,309	$504,210
67	New Milford					
District Total		46	$1,057,651	$508,349	$2,909,621	$435,936
68	Watertown					
68	Woodbury					
District Total		88	$2,013,078	$967,566	$5,538,025	$829,738
69	Bridgewater					
69	Roxbury					
69	Washington					
69	Southbury					
District Total		42	$855,484	$468,118	$3,121,049	$445,916
70	Naugatuck					
District Total		27	$437,952	$303,366	$2,456,789	$332,701
71	Middlebury					
71	Waterbury					
District Total		48	$786,155	$544,563	$4,410,108	$597,222
72	Waterbury *					
District Total		37	$597,599	$413,952	$3,352,364	$453,981
73	Waterbury *					
District Total		37	$597,599	$413,952	$3,352,364	$453,981

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
74	Waterbury *					
District Total		37	$597,599	$413,952	$3,352,364	$453,981
75	Waterbury *					
District Total		37	$597,599	$413,952	$3,352,364	$453,981
76	Burlington					
76	Thomaston					
76	Harwinton					
76	Litchfield					
District Total		160	$4,275,504	$3,401,609	$13,158,230	$1,293,516
77	Bristol					
District Total		116	$3,208,419	$2,760,519	$10,089,729	$898,318
78	Bristol					
78	Plymouth					
District Total		156	$4,108,261	$3,193,019	$12,565,215	$1,269,209
79	Bristol					
District Total		116	$3,208,419	$2,760,519	$10,089,729	$898,318
80	Southington					
80	Wolcott					
District Total		133	$3,371,079	$2,825,877	$11,697,624	$1,157,217
81	Southington					
District Total		106	$2,926,296	$2,517,780	$9,202,517	$819,327
82	Meriden					
District Total		33	$543,164	$376,245	$3,047,000	$412,628
83	Berlin					
83	Meriden					
District Total		108	$2,591,600	$2,138,716	$9,488,850	$986,165
84	Meriden					
District Total		33	$543,164	$376,245	$3,047,000	$412,628
85	Wallingford					
District Total		19	$307,146	$212,758	$1,723,005	$233,331
86	East Haven					
86	North Branford					
86	Wallingford					
District Total		67	$1,097,504	$760,232	$6,156,690	$833,746
87	North Haven					
District Total		40	$653,031	$452,349	$3,663,322	$496,091
88	Hamden					
District Total		25	$402,202	$278,602	$2,256,241	$305,543
89	Bethany					
89	Cheshire					
89	Prospect					
District Total		41	$671,751	$465,316	$3,768,334	$510,312
90	Cheshire					
90	Wallingford					
District Total		35	$576,172	$399,109	$3,232,162	$437,703
91	Hamden					
District Total		25	$402,202	$278,602	$2,256,241	$305,543

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
92	New Haven *					
District Total		35	$573,856	$397,505	$3,219,170	$435,944
93	New Haven *					
District Total		35	$573,856	$397,505	$3,219,170	$435,944
94	New Haven *					
District Total		35	$573,856	$397,505	$3,219,170	$435,944
95	New Haven *					
District Total		35	$573,856	$397,505	$3,219,170	$435,944
96	Hamden					
96	New Haven					
District Total		60	$976,058	$676,107	$5,475,412	$741,486
97	New Haven					
District Total		35	$573,856	$397,505	$3,219,170	$435,944
98	Branford					
98	Guilford					
District Total		43	$707,992	$490,420	$3,971,637	$537,844
99	East Haven					
District Total		24	$396,721	$274,805	$2,225,495	$301,379
100	Durham					
100	Middlefield					
100	Middletown					
District Total		81	$3,605,676	$1,081,374	$5,858,223	$976,083
101	Guilford					
101	Madison					
District Total		51	$823,533	$570,454	$4,619,787	$625,617
102	Branford					
District Total		25	$401,651	$278,220	$2,253,151	$305,124
103	Cheshire					
103	Hamden					
103	Wallingford					
District Total		60	$978,374	$677,711	$5,488,403	$743,246
104	Ansonia					
104	Derby					
District Total		27	$433,807	$300,494	$2,433,536	$329,552
105	Ansonia					
105	Beacon Falls					
105	Seymour					
District Total		53	$857,300	$593,844	$4,809,210	$651,269
106	Newtown					
District Total		7	$198,159	$79,429	$848,283	$109,342
107	Bethel					
107	Brookfield					
District Total		14	$378,696	$151,795	$1,621,127	$208,961

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
108	Kent					
108	New Milford					
108	New Fairfield					
108	Sherman					
District Total		62	$1,442,430	$680,036	$4,222,219	$617,719
109	Danbury *					
District Total		11	$289,594	$116,079	$1,239,697	$159,795
110	Danbury *					
District Total		11	$289,594	$116,079	$1,239,697	$159,795
111	Ridgefield					
District Total		13	$358,408	$143,662	$1,534,276	$197,766
112	Monroe					
112	Newtown					
District Total		18	$489,245	$196,107	$2,094,367	$269,961
113	Shelton					
District Total		11	$290,656	$116,505	$1,244,246	$160,381
114	Derby					
114	Orange					
114	Woodbridge					
District Total		38	$616,744	$427,213	$3,459,761	$468,525
115	West Haven *					
District Total		30	$487,721	$337,840	$2,735,981	$370,510
116	West Haven *					
District Total		30	$487,721	$337,840	$2,735,981	$370,510
117	Milford					
117	Orange					
117	West Haven					
District Total		72	$1,175,139	$814,009	$6,592,202	$892,723
118	Milford *					
District Total		31	$500,308	$346,559	$2,806,589	$380,072
119	Milford *					
District Total		31	$500,308	$346,559	$2,806,589	$380,072
120	Stratford *					
District Total		9	$248,342	$99,544	$1,063,106	$137,033
121	Stratford *					
District Total		9	$248,342	$99,544	$1,063,106	$137,033
122	Shelton					
122	Stratford					
District Total		20	$538,999	$216,049	$2,307,352	$297,414
123	Trumbull					
District Total		10	$261,327	$104,749	$1,118,693	$144,198
124	Bridgeport					
District Total		13	$345,869	$138,636	$1,480,602	$190,847
125	New Canaan					
125	Wilton					
District Total		10	$280,853	$112,576	$1,202,279	$154,972

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
126	Bridgeport *					
District Total		13	$345,869	$138,636	$1,480,602	$190,847
127	Bridgeport *					
District Total		13	$345,869	$138,636	$1,480,602	$190,847
128	Bridgeport *					
District Total		13	$345,869	$138,636	$1,480,602	$190,847
129	Bridgeport *					
District Total		13	$345,869	$138,636	$1,480,602	$190,847
130	Bridgeport *					
District Total		13	$345,869	$138,636	$1,480,602	$190,847
131	Naugatuck					
131	Oxford					
131	Southbury					
District Total		62	$1,012,515	$701,360	$5,679,925	$769,182
132	Fairfield					
District Total		11	$285,621	$114,487	$1,222,692	$157,603
133	Fairfield					
133	Westport					
District Total		18	$482,315	$193,329	$2,064,699	$266,136
134	Fairfield					
134	Trumbull					
District Total		20	$546,949	$219,236	$2,341,385	$301,801
135	Easton					
135	Redding					
135	Weston					
District Total		12	$326,909	$131,036	$1,399,436	$180,385
136	Westport					
District Total		7	$196,693	$78,842	$842,007	$108,533
137	Norwalk					
District Total		9	$250,012	$100,213	$1,070,253	$137,954
138	Danbury					
District Total		15	$394,953	$158,311	$1,690,718	$217,931
139	Bozrah					
139	Franklin					
139	Lebanon					
District Total		38	$765,890	$596,506	$2,825,322	$881,468
140	Norwalk *					
District Total		9	$250,012	$100,213	$1,070,253	$137,954
141	Darien					
141	Norwalk					
District Total		21	$554,292	$222,180	$2,372,822	$305,853
142	Norwalk *					
District Total		9	$250,012	$100,213	$1,070,253	$137,954
143	Norwalk					
143	Wilton					
District Total		14	$383,034	$153,533	$1,639,695	$211,354

Assembly District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
144	Stamford *					
District Total		11	$296,575	$118,878	$1,269,583	$163,647
145	Stamford *					
District Total		11	$296,575	$118,878	$1,269,583	$163,647
146	Stamford *					
District Total		11	$296,575	$118,878	$1,269,583	$163,647
147	New Canaan					
147	Stamford					
District Total		17	$444,406	$178,133	$1,902,419	$245,219
148	Stamford					
District Total		11	$296,575	$118,878	$1,269,583	$163,647
149	Greenwich					
149	Stamford					
District Total		22	$604,193	$242,182	$2,586,436	$333,388
150	Greenwich *					
District Total		11	$307,618	$123,304	$1,316,854	$169,740
151	Greenwich *					
District Total		11	$307,618	$123,304	$1,316,854	$169,740

Note: state totals do not necessarily sum to the results reported above because there is overlap across districts.

* In cases in which one city might contain several districts, (for example, Hartford, New Haven, Waterbury, and Bridgeport), specific breakdowns for each district were not possible. Instead, the aggregate impact for the whole city was averaged equally for each district. The city's total would be the sum of each of the individual values reported for each of these districts.

Appendix II: Economic Impact at the Senate District Level

UConn Health Center FY 2006 Economic Impact by Senate District

Senate District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
1	Hartford					
1	Wethersfield					
District Total		577	$15,929,107	$13,705,377	$50,093,317	$4,459,952
2	Hartford					
2	Bloomfield					
2	Windsor					
District Total		664	$18,318,089	$15,760,853	$57,606,107	$5,128,838
3	East Hartford					
3	South Windsor					
3	East Windsor					
3	Ellington					
District Total		692	$18,469,092	$15,871,349	$58,401,080	$5,586,573
4	Glastonbury					
4	Manchester					
4	Marlborough					
4	Bolton					
District Total		752	$20,291,712	$17,444,742	$64,046,888	$5,985,389
5	Burlington					
5	West Hartford					
5	Bloomfield					
5	Farmington					
District Total		708	$19,545,299	$16,816,742	$61,465,395	$5,472,441
6	Berlin					
6	New Britain					
6	Farmington					
District Total		790	$21,807,615	$18,763,235	$68,579,849	$6,105,861
7	East Granby					
7	Enfield					
7	Suffield					
7	Windsor Locks					
7	Windsor					
7	Granby					
7	Somers					
District Total		806	$21,282,668	$18,281,656	$67,421,949	$6,598,653

Senate District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
8	Avon					
8	Canton					
8	Hartland					
8	Simsbury					
8	Granby					
8	Barkhamsted					
8	Colebrook					
District Total		551	$14,673,032	$11,657,143	$45,140,118	$4,445,037
9	Cromwell					
9	Newington					
9	Rocky Hill					
9	Wethersfield					
9	Middletown					
District Total		698	$21,442,722	$15,231,415	$58,705,515	$5,950,417
10	New Haven					
10	West Haven					
District Total		150	$2,453,150	$1,699,275	$13,761,481	$1,863,595
11	New Haven					
11	Hamden					
District Total		155	$2,525,972	$1,749,719	$14,169,994	$1,918,917
12	Branford					
12	Durham					
12	Guilford					
12	Killingworth					
12	Madison					
12	North Branford					
District Total		190	$4,429,920	$2,242,503	$16,469,732	$2,336,947
13	Meriden					
13	Cheshire					
13	Middlefield					
13	Middletown					
District Total		303	$9,995,956	$3,796,414	$24,342,280	$3,700,065
14	Milford					
14	Orange					
14	West Haven					
District Total		160	$2,606,726	$1,805,657	$14,623,003	$1,980,264
15	Prospect					
15	Waterbury					
15	Naugatuck					
District Total		134	$2,185,478	$1,513,862	$12,259,921	$1,660,252

Senate District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
16	Southington					
16	Wolcott					
16	Cheshire					
16	Waterbury					
District Total		462	$11,121,207	$9,175,845	$40,747,303	$4,237,380
17	Ansonia					
17	Beacon Falls					
17	Bethany					
17	Derby					
17	Woodbridge					
17	Hamden					
17	Naugatuck					
District Total		164	$2,667,953	$1,848,068	$14,966,468	$2,026,776
18	Griswold					
18	Groton					
18	North Stonington					
18	Plainfield					
18	Preston					
18	Stonington					
18	Voluntown					
18	Sterling					
District Total		212	$4,195,695	$3,252,054	$15,519,647	$4,819,621
19	Bozrah					
19	Franklin					
19	Montville					
19	Andover					
19	Columbia					
19	Hebron					
19	Sprague					
19	Lebanon					
19	Ledyard					
19	Lisbon					
19	Norwich					
District Total		273	$4,704,430	$3,722,896	$17,434,408	$5,301,970
20	East Lyme					
20	New London					
20	Old Lyme					
20	Salem					
20	Waterford					
20	Montville					
20	Old Saybrook					
District Total		199	$4,414,332	$3,048,121	$14,603,552	$4,363,838

Senate District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
21	Shelton					
21	Monroe					
21	Stratford					
21	Seymour					
District Total		54	$1,321,540	$594,561	$5,952,511	$775,399
22	Trumbull					
22	Monroe					
22	Bridgeport					
District Total		63	$1,705,805	$683,746	$7,302,234	$941,246
23	Stratford					
23	Bridgeport					
District Total		52	$1,410,121	$565,226	$6,036,466	$778,091
24	Danbury					
24	New Fairfield					
24	Sherman					
24	Bethel					
District Total		58	$1,568,585	$628,744	$6,714,820	$865,530
25	Norwalk					
25	Darien					
District Total		52	$1,402,198	$562,050	$6,002,550	$773,719
26	Redding					
26	Ridgefield					
26	Westport					
26	Wilton					
26	Bethel					
26	New Canaan					
26	Weston					
District Total		56	$1,508,505	$604,661	$6,457,628	$832,378
27	Darien					
27	Stamford					
District Total		39	$1,041,866	$417,616	$4,460,032	$574,891
28	Easton					
28	Fairfield					
28	Newtown					
28	Weston					
District Total		54	$1,440,065	$577,228	$6,164,650	$794,614

Senate District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
29	Mansfield					
29	Brooklyn					
29	Canterbury					
29	Killingly					
29	Mansfield					
29	Putnam					
29	Scotland					
29	Thompson					
29	Windham					
District Total		287	$3,800,938	$2,588,884	$15,340,588	$3,953,585
30	Canaan					
30	Cornwall					
30	Goshen					
30	Kent					
30	Litchfield					
30	Morris					
30	North Canaan					
30	Salisbury					
30	Sharon					
30	Washington					
30	Winchester					
30	Torrington					
30	Brookfield					
District Total		212	$4,887,620	$2,330,038	$13,812,984	$2,048,046
31	Bristol					
31	Plainville					
31	Plymouth					
31	Harwinton					
District Total		646	$17,593,720	$14,717,962	$54,893,037	$5,072,093
32	Bethlehem					
32	Bridgewater					
32	Roxbury					
32	Thomaston					
32	Watertown					
32	Woodbury					
32	Middlebury					
32	Oxford					
32	Southbury					
32	Seymour					
District Total		231	$4,792,348	$2,569,264	$16,768,095	$2,410,977

Senate District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
33	Colchester					
33	Lyme					
33	Chester					
33	Clinton					
33	East Haddam					
33	East Hampton					
33	Essex					
33	Deep River					
33	Haddam					
33	Portland					
33	Westbrook					
33	Old Saybrook					
District Total		310	$12,882,188	$4,214,916	$22,444,684	$4,133,185
34	East Haven					
34	North Haven					
34	Wallingford					
District Total		164	$2,675,059	$1,852,990	$15,006,331	$2,032,174
35	Ashford					
35	Chaplin					
35	Eastford					
35	Hampton					
35	Pomfret					
35	Woodstock					
35	Coventry					
35	Tolland					
35	Stafford					
35	Union					
35	Vernon					
35	Willington					
35	Ellington					
District Total		513	$6,573,136	$5,289,566	$24,898,462	$6,980,661
36	Greenwich					
36	New Canaan					
36	Stamford					
District Total		73	$1,960,409	$785,800	$8,392,146	$1,081,734

Note: state totals do not necessarily sum to the results reported above because there is overlap across districts.

Appendix III: Economic Impact at the Congressional District Level

UConn Health Center FY 2006 Economic Impact by Congressional District

Congressional District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
1	Berlin					
1	Bloomfield					
1	Bristol					
1	East Granby					
1	East Hartford					
1	East Windsor					
1	Glastonbury					
1	Granby					
1	Hartford					
1	Hartland					
1	Manchester					
1	Newington					
1	Rocky Hill					
1	South Windsor					
1	Southington					
1	West Hartford					
1	Wethersfield					
1	Windsor Locks					
1	Windsor					
1	Barkhamsted					
1	Colebrook					
1	New Hartford					
1	Torrington					
1	Winchester					
1	Cromwell					
1	Portland					
1	Middletown					
District Total		5,020	$140,664,783	$115,850,461	$430,242,041	$39,717,676
2	Andover					
2	Bolton					
2	Columbia					
2	Coventry					
2	Ellington					
2	Hebron					
2	Mansfield					
2	Somers					
2	Stafford					
2	Tolland					
2	Union					
2	Vernon					
2	Willington					
2	Ashford					
2	Brooklyn					
2	Canterbury					
2	Chaplin					

2	Eastford					
2	Hampton					
2	Killingly					
2	Plainfield					
2	Pomfret					
2	Putnam					
2	Scotland					
2	Sterling					
2	Thompson					
2	Windham					
2	Woodstock					
2	Chester					
2	Clinton					
2	Deep River					
2	Durham					
2	East Hampton					
2	East Haddam					
2	Essex					
2	Haddam					
2	Killingworth					
2	Old Saybrook					
2	Westbrook					
2	Madison					
2	Bozrah					
2	Colchester					
2	Franklin					
2	East Lyme					
2	Lebanon					
2	Ledyard					
2	Lisbon					
2	Lyme					
2	Griswold					
2	Groton					
2	New London					
2	North Stonington					
2	Montville					
2	Norwich					
2	Old Lyme					
2	Preston					
2	Salem					
2	Sprague					
2	Stonington					
2	Voluntown					
2	Waterford					
2	Enfield					
2	Glastonbury					
2	Marlborough					
2	Suffield					
District Total		2,549	$55,495,845	$38,302,107	$171,366,945	$35,762,165

Congressional District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
3	Ansonia					
3	Beacon Falls					
3	Bethany					
3	Branford					
3	Derby					
3	East Haven					
3	Guilford					
3	Hamden					
3	Milford					
3	Naugatuck					
3	New Haven					
3	North Branford					
3	North Haven					
3	Orange					
3	Prospect					
3	Seymour					
3	Wallingford					
3	Waterbury					
3	West Haven					
3	Woodbridge					
3	Durham					
3	Middlefield					
3	Middletown					
3	Shelton					
3	Stratford					
District Total		1,213	$23,276,175	$13,907,222	$109,780,823	$15,084,675
4	Bridgeport					
4	Darien					
4	Easton					
4	Fairfield					
4	Greenwich					
4	Monroe					
4	New Canaan					
4	Norwalk					
4	Redding					
4	Ridgefield					
4	Shelton					
4	Stamford					
4	Trumbull					
4	Weston					
4	Westport					
4	Wilton					
4	Oxford					
District Total		390	$10,303,613	$4,219,370	$44,514,559	$5,749,055

Congressional District	Town(s) in District	Change in Jobs (FTEs)	Payroll (2004 $)	Procurement (2004 $)	Change in GSP (2004 $)	State & Local Tax Revenue (2004 $)
5	Avon					
5	Burlington					
5	Canton					
5	Farmington					
5	New Britain					
5	Plainville					
5	Simsbury					
5	Bethel					
5	Brookfield					
5	Danbury					
5	New Fairfield					
5	Newtown					
5	Sherman					
5	Bethlehem					
5	Bridgewater					
5	Canaan					
5	Cornwall					
5	Goshen					
5	Harwinton					
5	Kent					
5	Litchfield					
5	Morris					
5	New Milford					
5	Norfolk					
5	North Canaan					
5	Plymouth					
5	Roxbury					
5	Salisbury					
5	Sharon					
5	Torrington					
5	Warren					
5	Washington					
5	Watertown					
5	Cheshire					
5	Meriden					
5	Middlebury					
5	Southbury					
5	Waterbury					
5	Wolcott					
5	Woodbury					
5	Thomaston					
District Total		2,199	$54,850,594	$41,072,866	$183,386,063	$19,899,088

Note: state totals do not necessarily sum to the results reported above because there is overlap across districts.

Appendix III: The REMI Model

The Connecticut REMI model is a dynamic, multi-sector, regional model developed and maintained for the Connecticut Center for Economic Analysis by Regional Economic Models, Inc. of Amherst, Massachusetts. This model provides detail on all eight counties in the State of Connecticut and any combination of these counties. The REMI model includes all of the major inter-industry linkages among 466 private industries, aggregated into 67 major industrial sectors. With the addition of farming and three public sectors (state and local government, civilian federal government, and military), there are 70 sectors represented in the model for the eight counties.

The REMI model is based on a national *input-output* (I/O) model that the U.S. Department of Commerce (DoC) developed and continues to maintain. Modern input-output models are largely the result of groundbreaking research by Nobel laureate Wassily Leontief. Such models focus on the inter-relationships between industries and provide information about how changes in specific variables—whether economic variable such as employment or prices in a certain industry or other variables like population affect factor markets, intermediate goods production, and final goods production and consumption.

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. Listed below are some salient structural characteristics of the REMI model:

- REMI determines consumption on an industry-by-industry basis, and models real disposable income in Keynesian fashion, that is, with prices fixed in the short run and GDP (Gross Domestic Product) determined solely by aggregate demand.

- The demand for labor, capital, fuel, and intermediate inputs per unit of output depends on relative prices of inputs. Changes in relative prices cause producers to substitute cheaper inputs for relatively more expensive inputs.

- Supply of and demand for labor in a sector determine the wage level, and these characteristics are factored by regional differences. The supply of labor depends on the size of the population and the size of the workforce.

- Migration—that affects population size—depends on real after-tax wages as well as employment opportunities and amenity value in a region relative to other areas.

- Wages and other measures of prices and productivity determine the cost of doing business. Changes in the cost of doing business will affect profits and/or prices in a given industry. When the change in the cost of doing business is specific to a region, the share of the local and U.S. market supplied by local firms is also affected. Market shares and demand determine local output.

- "Imports" and "exports between states are related to relative prices and relative production costs.

- 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 on unemployment details of the previous period, and total government expenditures are proportional to population size.

- 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.

Because the each variable in the REMI model is related, a change in one variable affects many others. For example, if wages in a certain sector rise, the relative prices of inputs change and may cause the producer to substitute capital for labor. This changes demand for inputs, which affects employment, wages, and other variables in those industries. Changes in employment and wages affect migration and the population level that in turn affect other employment variables. Such chain-reactions continue in time

across all sectors in the model. Depending on the analysis 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 REMI generates extensive sectoral detail, it is possible for experienced economists in this field to discern the dominant causal linkages involved in the results.

The REMI model is a structural model, meaning that it clearly includes cause-and-effect relationships. The model shares two key underlying assumptions with mainstream economic theory: *households maximize utility* and *producers maximize profits*. In the model, businesses produce goods to sell to other firms, consumers, investors, governments and purchasers outside the region. The output is produced using labor, capital, fuel and intermediate inputs. The demand for labor, capital and fuel per unit output depends on their relative costs, because an increase in the price of one of these inputs leads to substitution away from that input to other inputs. The supply of labor in the model depends on the number of people in the population and the proportion of those people who participate in the labor force. Economic migration affects population size and its growth rate. People move into an area if the real after-tax wage rates or the likelihood of being employed increases in a region.

Supply of and demand for labor in the model determine the real wage rate. These wage rates, along with other prices and productivity, determine the cost of doing business for each industry in the model. An increase in the cost of doing business causes either an increase in price or a cut in profits, depending on the market supplied by local firms. This market share combined with the demand described above determines the amount of local output. The model has many other feedbacks. For example, changes in wages and employment impact income and consumption, while economic expansion changes investment and population growth impacts government spending.

Model Overview

Figure AV.1 is a pictorial representation of the model. The Output block shows a factory that sells to all the sectors of final demand as well as to other industries. The Labor and Capital Demand block shows how labor and capital requirements depend on both output and their relative costs. Population and Labor Supply are shown as contributing to demand and to wage determination in the product and labor market. The feedback from

this market shows that economic migrants respond to labor market conditions. Demand and supply interact in the Wage, Price and Profit block. Once prices and profits are established, they determine market shares, which along with components of demand, determine output.

The REMI model brings together the above elements to determine the value of each of the variables in the model for each year in the baseline forecasts. The model includes each inter-industry relationship that is in an input-output model in the Output block, but goes well beyond the input-output model by including the relationships in all of the other blocks shown in Figure AV.1. In order to broaden the model in this way, it is necessary to estimate key relationships econometrically. This is accomplished by using extensive data sets covering all areas of the country. These large data sets and two decades of research effort have enabled REMI to simultaneously maintain a theoretically sound model structure and build a model based on all the relevant data available. The model has strong dynamic properties, which means that it forecasts not only what will happen, but also when it will happen. This results in long-term predictions that have general equilibrium properties. This means that the long-term properties of general equilibrium models are preserved without sacrificing the accuracy of event timing predictions and without simply taking elasticity estimates from secondary sources.

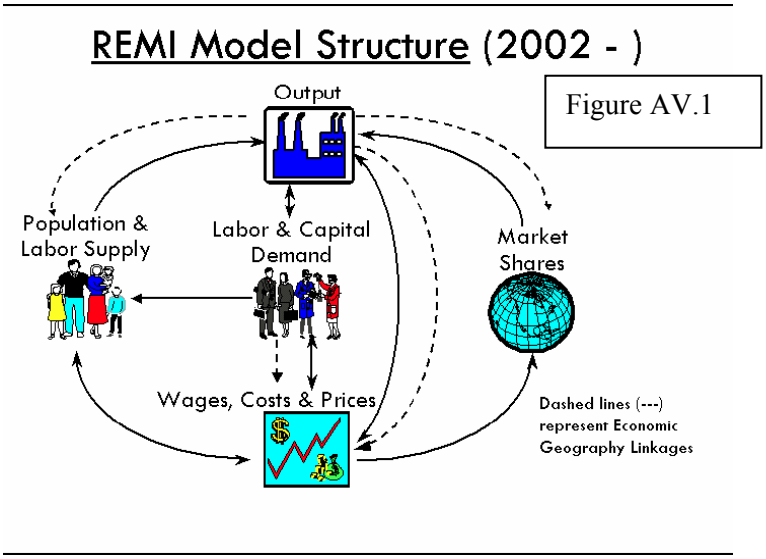

Figure AV.1

Understanding the Model

In order to understand how the model works, it is critical to know how the key variables in the model interact with one another and how policy changes are introduced into the model. To introduce a policy change, one begins by formulating a policy question. Next, select a baseline forecast that uses the baseline assumptions about the external policy variables and then generate an alternative forecast using an external variable set that includes changes in the external values, which are effected by the policy issue.

Figure AV.2

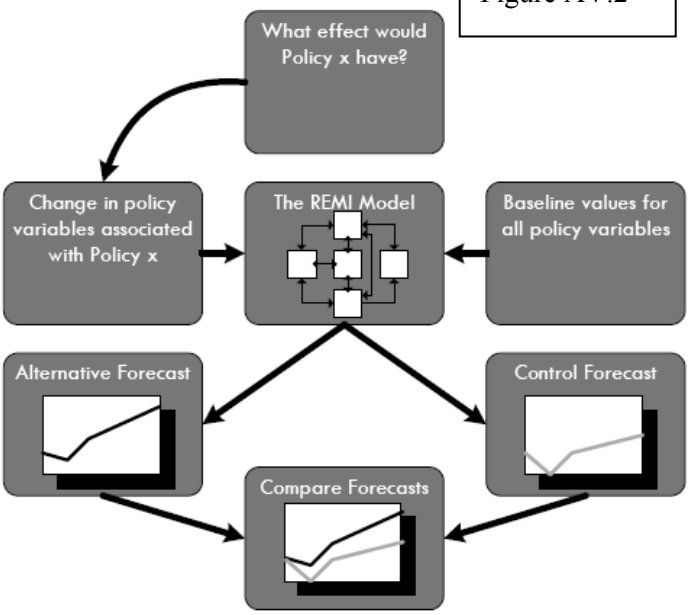

Figure AV.2 shows how this process would work for a policy change called Policy X. In order to understand the major elements in the model and their interactions, subsequent sections examine the various blocks and their important variable types, along with their relationships to each other and to other variables in the other blocks. The only variables discussed are those that interact with each other in the model. Variables determined outside of the model include:

- Variables determined in the U.S. and world economy (e.g., demand for computers).
- Variables that may change and affect the local area, but over which the local area has no control (e.g., an increase in international migration).
- Variables that are under control of local policy (e.g., local tax rates).

For simplicity, the last two categories are called policy variables. Changes in these variables are automatically entered directly into the appropriate place in the model structure. Therefore, the diagram showing the model structure also serves as a guide to the organization of the policy variables (see Figure 3).

Output Block

The Output Block variables are:

• State and Local Government Spending

• Investment

• Exports

• Consumption

• Real Disposable Income

These variables interact with each other to determine output and depend on variable values determined in other blocks as follows:

Variables in Output Block	**Variables Outside of the Output Block that are Included in its Determinants**
State and Local Government Spending	Population
Investment	Optimal Capital Stock (also the actual capital stock)
Output	Share of Local Market (The proportion of local demand supplied locally, called the Regional Purchase Coefficient)
Exports	The Regional Share of Interregional and International Trade
Real Disposable Income	Employment, Wage Rates and the Consumer Expenditure Price Index

Labor and Capital Demand Block

The Labor and Capital Demand block has only three types of key variables:

● Employment - determined by the labor/output ratio and the output in each industry, determined in the Output block.

● Optimal Capital Stock - depends on relative labor, capital and fuel costs and the amount of employment.

● Labor/Output Ratio - depends on relative labor, capital and fuel costs.

Simply put, if the cost of labor increases relative to the cost of capital, the labor per unit of output falls and the capital per unit of labor increases.

Population and Labor Supply Block

The model predicts population for 600 cohorts segmented by age, ethnicity and gender. This block also calculates the demographic processes - births, deaths and aging. The models deal with different population sectors as follows:

● Retired Migrants are based on past patterns for each age cohort 65 and over.

● International migrants follow past regional distributions by country of origin.

● Military and college populations are treated as special populations that do not follow normal demographic processes.

● Economic migrants are those who are sensitive to changes in quality of life and relative economic conditions in the regional economies. The economic variables that change economic migration are employment opportunity and real after-tax wage rates.

This block allows the determination of the size of the labor force by predicting the labor force participation rates for age, ethnicity and gender cohorts, which are then applied to their respective cohorts and summed. The key variables that change participation rates within the model are the ratio of employment to the relevant population (labor market tightness) and the real after-tax wage rates.

Wage, Price and Profit Block

Variables contained within the Wage, Price and Profit block are:

• Employment Opportunity
• Wage Rate
• Production Costs
• Housing Price
• Consumer Price Deflator
• Real Wage Rate
• Industry Sales Price
• Profitability

The wage rate is determined by employment opportunity and changes in employment demand by occupation for occupations that require lengthy training. The housing price increases when population density increases. The Consumer Expenditure Price Index is based on relative commodity prices, weighted by their share of U.S. nominal personal consumption expenditures. The model uses the price index to calculate the real after-tax wage rate for potential migrants that includes housing price directly, while the price index used to deflate local income uses the local sales price of construction. Wage rates affect production costs, as well as other costs, and they in turn determine profitability or sales prices, depending on whether the type of industry involved serves mainly local or external markets. For example, a cost increase for all local grocery stores results in an increase in their prices, while an increase in costs for a motor vehicle factory reduces its profitability of production at that facility but may not increase their prices worldwide.

Market Shares Block

The Market Shares Block consists of:

- Share of Local Market
- Share of External Market

An increase in prices leads to some substitution away from local suppliers toward external suppliers. In addition, a reduction in profitability for local factories leads to less expansion of these factories relative to those located in areas where profits have not decreased. These responses occur because the U.S. is a relatively open economy where firms can move to the area that is most advantageous for their business.

The Complete Model

Figure AV.3 illustrates the entire model and its components and linkages. This diagram is helpful in understanding the complex relationships shared by variables within the various blocks discussed above, as well as their relationships to variables in other blocks.

REMI Model Linkages
(Excluding Economic Geography Linkages)

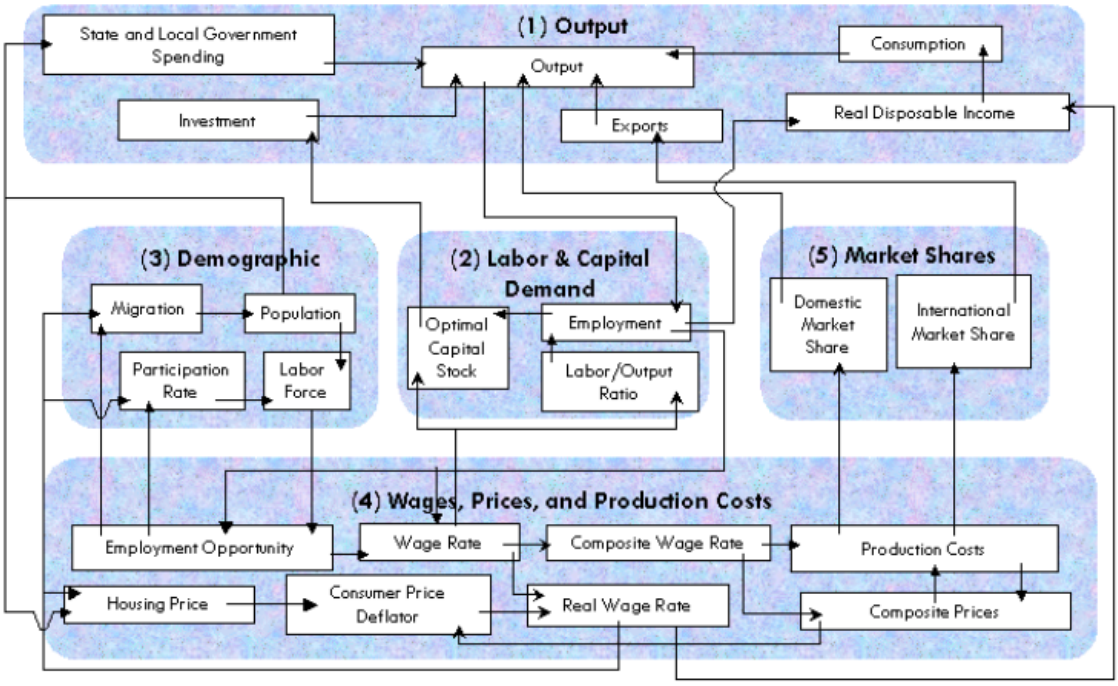

Figure AV.3