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Memorandum

To: Steve Klein, Legislative Joint Fiscal Office

From: Nic Rockler and Tom Kavet

CC: Steve Kappel, Catherine Benham

Date: March 5, 2007

Re: Health Care Financing Analysis – Executive Summary and Technical Appendices

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EXECUTIVE SUMMARY

Background

This memo and attached technical appendices summarize analysis associated with the health care financing study mandated in Act 71 of the 2006 legislative session. This analysis was performed under the direction of the Legislative Joint Fiscal Office and the Commission on Health Care Reform. The purpose of this analysis is to review possible economic implications associated with various funding sources, and to develop a framework within which to examine funding options and associated economic impacts for various proposals that may be advanced during this and future legislative sessions. Although several hypothetical initiatives were tested with the model framework developed, funding configurations for specific initiatives often have unique economic impacts which can only be evaluated when these initiatives are fully detailed. The models developed herein are designed to provide an objective basis for evaluating some of the economic impacts associated with these proposals and various financing options.

Tax Financing Options

Although there are many options for generating revenue with which to fund various health care initiatives, at the direction of the Joint Fiscal Office, our review focused on payroll-based taxes and variants, income taxes and consumption taxes. We reviewed each tax in light of four essential benchmarks of optimal taxes:
1) Simplicity, 2) Equity, 3) Efficiency and 4) Capacity.

Another often-considered attribute, "Exportability" (the ability to export a tax to out-of-state residents, such as the property tax or lodging rooms tax) was not considered relevant. Although some consumption taxes can be exported, those with the highest exportability do not have the capacity to fund most of the proposals under consideration.

In this study, "Simplicity" refers to administrative ease in collection, ease of compliance by the taxpayer and ease of understanding by the general public. "Equity" is primarily defined as "fairness" or the extent to which a tax is based on one's ability to pay. "Efficiency" refers to "economic efficiency," or the extent to which a tax generates behavioral or other market distortions that result in excess (or "dead-weight") losses. In this analysis, "Capacity" refers to both potential current revenue generation and, importantly, the future growth potential of a revenue source relative to its need, including annual stability.

All tax sources and tax changes, of course, have pros and cons and can generate groups and sub-groups of "winners" and "losers", particularly as regards distributional effects. Although the econometric model employed in this analysis can measure aggregate economic impacts, it is limited when measuring the impacts on selected groups within the economy.[1] Even large changes that affect many taxpayers can be offsetting and have small aggregate economic impacts. In evaluating specific proposals, therefore, further analysis will often be required to attempt to identify all those significantly impacted by proposed changes. Tax Department cooperation and participation will be an important part of any such distributional and other more detailed analyses of specific proposals.

Economic Modeling Issues

The core economic model used in this analysis was the Vermont State economic model constructed by Regional Economic Models, Inc. (REMI). Although we reviewed the use of other economic models for this work, including IMPLAN and the new State REDYN model, prior REMI model use in this field[2] and ready access to REMI model architects rendered it the most practical for this application. Despite the use of REMI as the core model in this analysis, the model work herein could be adapted to function with IMPLAN or REDYN models if in later consensus work with the Administration this is deemed preferable.

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[1] The lastest version of REMI, Version 9, now contains undocumented features that are intended to capture distributional effects on income, consumption, and employment. Once documentation becomes available, we will assess whether it will be useful in our analysis of healthcare system changes and their impact on the State economy.

[2] See, for example, "*Analysis of the Economic Impact of Proposed Medicaid Budget Cuts in New York State*," Prepared for the Greater New York Hospital Association and Health care Association of New York State by Lewin-VHI, March 6, 1995; "*Rural Urban Spatial Disaggregation of the Impact of Health care Policies*" by Glenn Nelson, Rural Policy Research Institute, October 1994; and "*Federal Deficit Reduction Proposals for Medicare and Medicaid: Regional Economic Impacts on New York and the U.S.*," by Barents Group, LLC, October 27, 1995. These and other related publications are available upon request.

REMI model background information and model construct flow charts are provided in Appendix C.

It should be noted that econometric models such as REMI can be extremely difficult to specify when the magnitude and complexity of proposed changes is as extensive as some of the initiatives currently under consideration. Under such circumstances, the prospect of significant behavioral changes can create model discontinuities that bias output, and model tolerances can be exceeded with large scale sectoral changes, rendering output meaningless. We have attempted to note such model limitations and possible analytic implications, and adjust for them with alternative specification inputs, but not all economic impacts from all proposed plans may be measurable via the use of such models. When proposed changes are outside the realm of historical experience, model output should be interpreted with caution.

Still, we believe there are issues that can be informed by the use of such objective models and that they are a good starting point from which to test various assumptions and quantify plausible economic impacts. As health care proposals are developed, this model may be of value in evaluating such impacts. The core model was tested on several hypothetical initiatives, including one of the more complex examples, the single payer proposal as outlined to the Commission by Dr. Kenneth Thorpe in September of 2006[3]. Other hypothetical tests are currently being run on smaller-scale programs (circa $100 million in net revenue generation) and larger scale programs (circa $1 billion in net revenue generation), at the direction of the Joint Fiscal Office. Selected variants of these model hypotheticals are reviewed in Appendix D.

Non-Consensus Basis

It should be noted that both the Commission and study authors recommended and requested of the Administration that this analysis be performed on a consensus basis (see Appendix A). Such joint work has proven to be of value to the State in prior studies by identifying areas of both technical agreement and contention and relegating the latter to the political process while making meaningful progress on the former. This request for cooperative analysis, however, was not accepted. It is our hope and recommendation that follow-up work based on this study and future technical work in this area, to the extent possible, be performed on a consensus basis so as to separate the policy decisions from the technical or economic contexts in which those decisions must be made.

[3] "*Costs and Implications of a Single Payer Healthcare Model for the State of Vermont*," August 29, 2006, by Kenneth Thorpe: http://www.leg.state.vt.us/CommissionOnHealthCareReform/single_payer_report_by_Ken_Thorpe_draft_august_28__2006.DOC

Primary Findings

1) **The rapid escalation in health care costs, which is the primary cause of the growing number of uninsured residents, will create enormous future resourcing challenges to the public sector in financing any health care initiative.** *Regardless of how health care is financed, if health care costs continue to grow at or above historical rates, the public sector will confront the same affordability dilemma now facing private sector health care financing.*

2) **There is no revenue source available that meets the capacity requirements of past and likely future health care expenditure growth.** *Without a significant change in the way health care costs are managed, the growth in health care spending has and is likely to continue to exceed past and projected growth rates from any major tax revenue source. As a result, without policy intervention to control costs, tax rates would need to be frequently raised or new tax sources tapped in order to meet likely future expenditure growth (see charts 1 and 2)*[4]*.*

3) **If constant increases in tax rates over time are necessary to meet projected health care costs, it could create additional negative impacts associated with almost any tax source relied upon to fund universal health care.** *Some of the behavioral changes in response to tax rate increases (that could affect both tax yields and other aspects of the economy) may be exacerbated by the persistent projected gap between likely revenue growth and likely expenditure growth. These behavioral changes should be considered, and measured when possible, if expenditure growth continues to exceed tax base growth (see chart 1). Potential economic behavioral changes associated with any large scale tax change should also be evaluated with each proposal to identify and quantify, when possible, potential impacts.*

4) **Detailed macroeconomic impacts from various funding options can only be evaluated within the context of specific health care proposals.** *Because of the economic offsets that may occur in many of the health care delivery and payment proposals under consideration, the macroeconomic impacts of various funding options must be estimated on a case by case basis. Whereas there are general characteristics associated with each major financing option, the exact configuration of taxes, tax rates and program features will determine macroeconomic impacts. Optimally, the assumptions employed in analyzing each proposal would be developed on a consensus basis, or with ranges that encompass reasonable input parameters.*

[4] In these charts, data for each revenue source is normalized, to the extent possible, to account for tax rate and other definitional changes so as to provide consistent tax bases that are comparable over time. Actual collections fluctuate with rate changes and other compositional and statutory changes.

Chart 1 - Tax Capacity Gap for Healthcare Financing

(Source: Vermont Joint Fiscal Ofice)

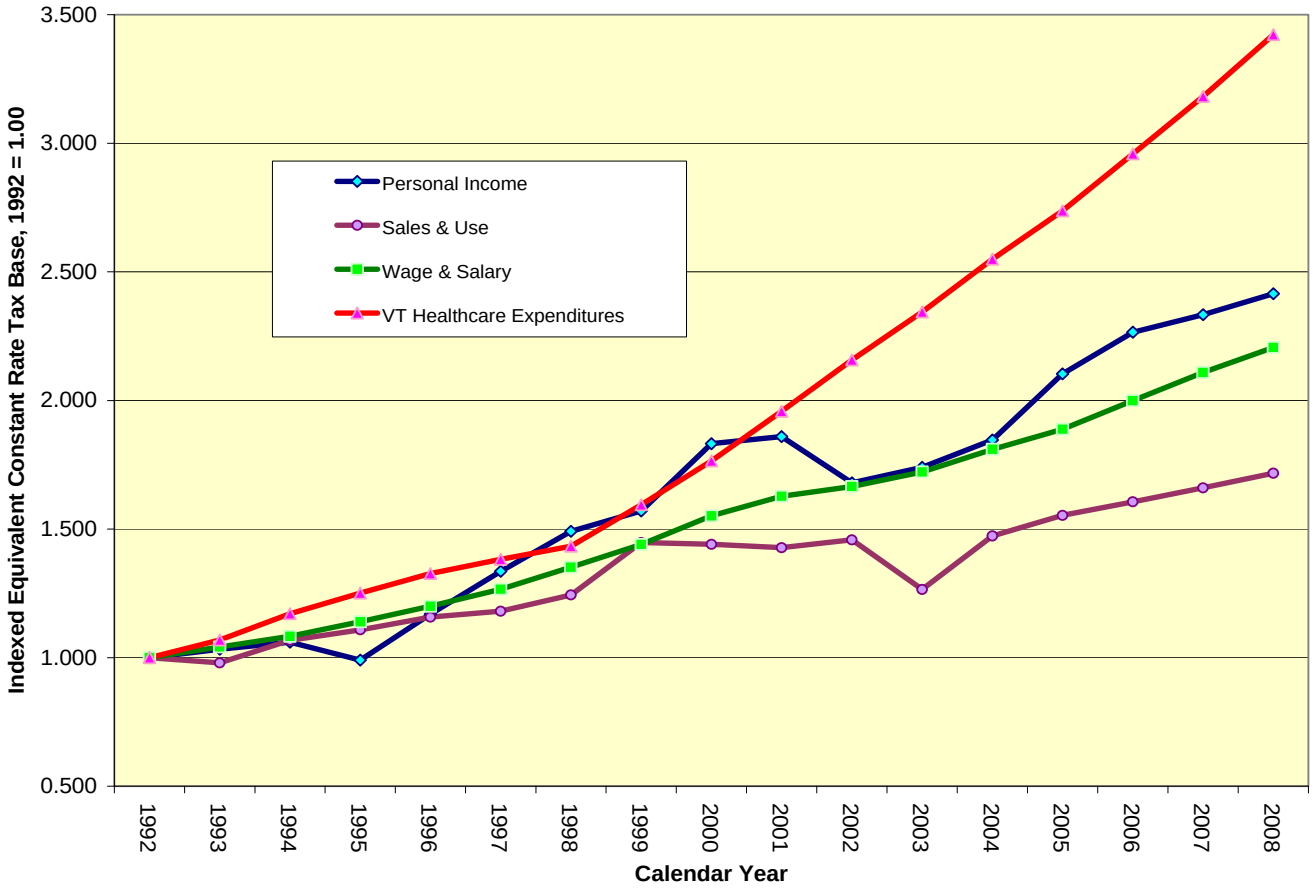
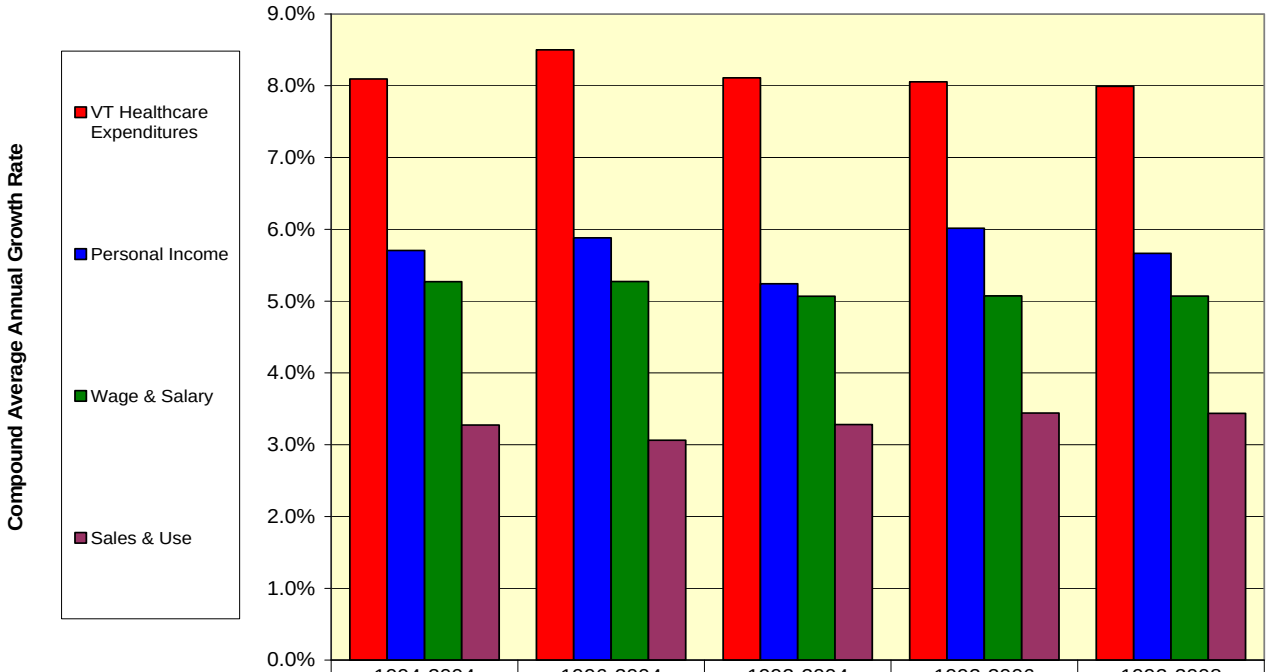


Chart 2 - Tax Capacity Gap for Healthcare Financing - Selected Time Periods

(Source: Vermont Joint Fiscal Office)



	1994-2004	1996-2004	1992-2004	1992-2006	1992-2008
VT Healthcare Expenditures	8.1%	8.5%	8.1%	8.1%	8.0%
Personal Income	5.7%	5.9%	5.2%	6.0%	5.7%
Wage & Salary	5.3%	5.3%	5.1%	5.1%	5.1%
Sales & Use	3.3%	3.1%	3.3%	3.4%	3.4%

5) **Despite large scale changes in the payment and delivery of medical services associated with some proposed health care delivery systems, *aggregate* economic impacts can be relatively small due to offsetting expenditures, transfers, tax changes and cost savings.** *Model tests that evaluated some of the more extensive proposed changes in health care delivery and payment did not result in enormous aggregate economic impacts, due to offsetting changes. There may, however, be negative impacts to segments of the economy associated with some proposals that would warrant mitigating actions or other policy measures to lessen such impacts. Further research specific to individual proposals would be required to identify such segments and attendant policy options.*

6) **Consumption taxes are probably the least attractive funding option for health care initiatives, due to equity, efficiency and capacity shortcomings.** *These taxes are among the more regressive, slowest growing, and, given Vermont's long border with New Hampshire (and other political jurisdictions), among the more sensitive to competitive loss. As a result, significant increases in broad consumption tax rates could accentuate tax base erosion and reduce yields. Unless the tax base were to be expanded to include higher growth services, likely future revenue growth is expected to be well below any of the other major tax sources available.*

7) **A flat payroll tax would suffer from both equity considerations and possible efficiency impacts that could disproportionately impact smaller firms and selected industry segments. Although this tax could be made progressive with wage and salary income, it would still be less progressive than the income tax (primarily due to the exclusion of non-wage income) and there would still be disproportionate industry segment impacts and significant capacity shortcomings.** *The industries most affected by payroll-based taxes would be firms employing a high percentage of workers at or near the minimum wage and that are sensitive to out-of-state competition. Such firms could not shift the incidence of mandated insurance payments to employees in the form of lower wage and salary compensation and also would not be in a position to pass such costs along in the form of higher prices. In such cases, businesses could fail or reduce employment.*

8) **Although the personal income tax scores better on equity and capacity considerations than most other major tax sources, large scale rate increases could generate behavioral changes that could affect yields and reliance on upper-income earnings would accentuate annual revenue volatility risk.** *The personal income tax has exhibited the strongest growth among the major State revenue sources over the past 10-15 years and is among the most progressive. With prospects for future growth better than most other revenue sources, this tax has a greater capacity for meeting*

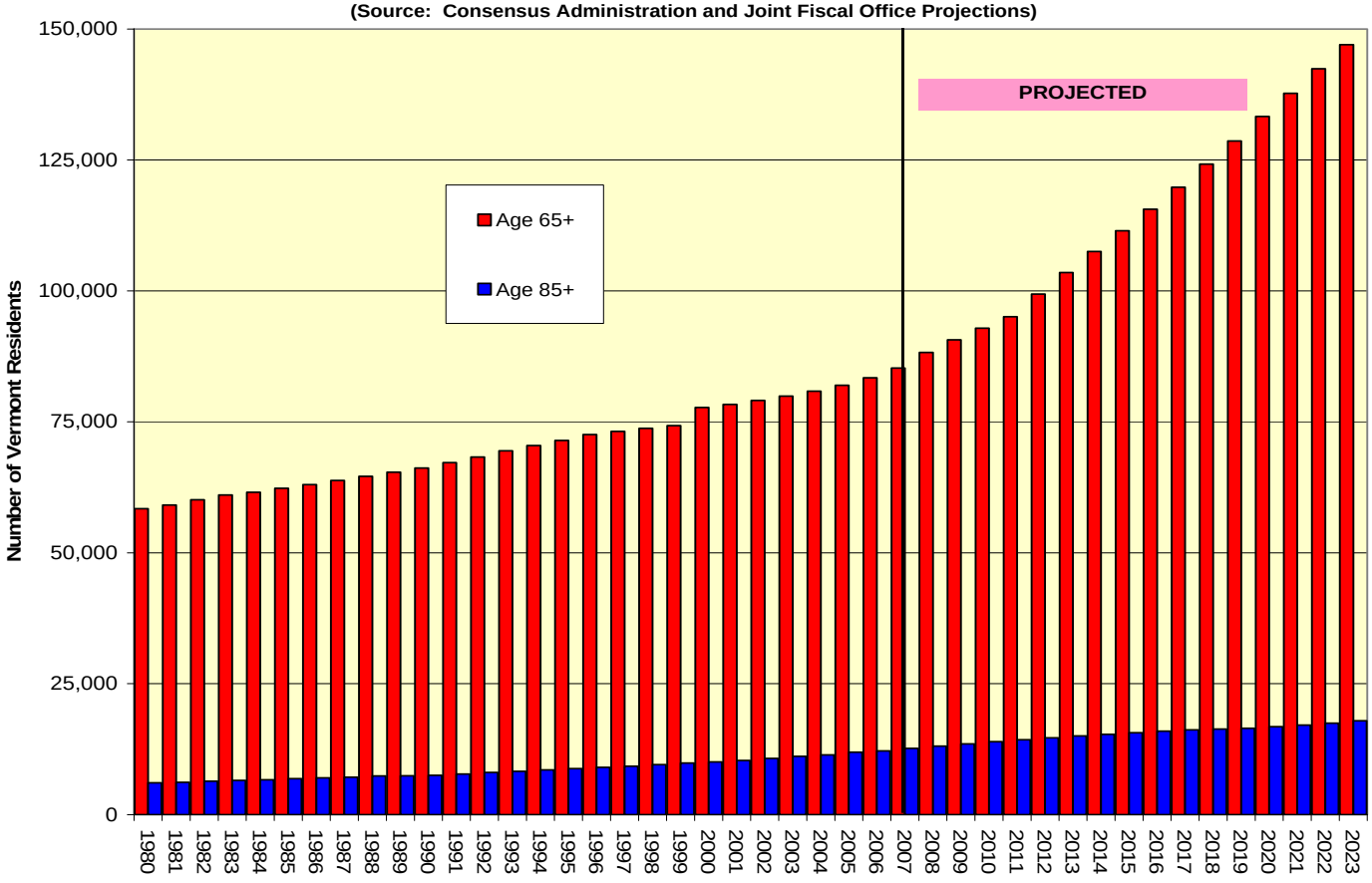
projected health care needs than most revenue sources. Year to year volatility in revenues, however, is expected to increase, as reliance on higher-income individuals and business-related income grows as a share of total personal income receipts.

9) **It is recommended that follow-up work based on this study and future technical work in this area be performed on a consensus basis with Administration experts so as to allow a common analytic basis for policy decisions.** *Consensus analytic processes have been used with many contentious and technically complex policy issues in the past and can provide policy makers with the best possible information at the lowest possible cost.*

SUMMARY PERSPECTIVES

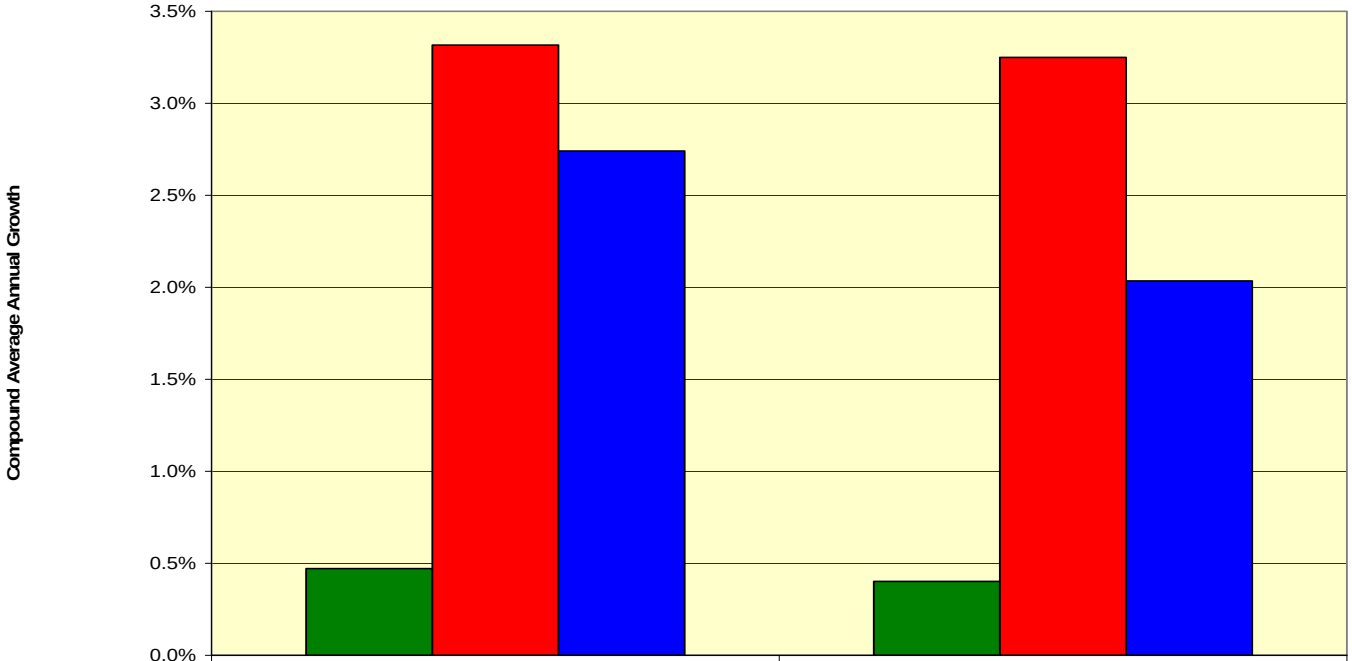
Health care expenditures in Vermont and the U.S. have grown at rates well above general inflation rates and above rates for virtually any major revenue source that could be used to fund a comprehensive universal coverage program. Demographic developments in the coming years will put even more pressure on Vermont health care expenditures, as population growth rates for those aged 65 and over accelerates.

CHART 3 - The Elderly Population in Vermont Will Grow Rapidly in Coming Years
(Source: Consensus Administration and Joint Fiscal Office Projections)



As illustrated in Charts 3 and 4, the growth rate for the 65 and over Vermont population is expected to grow at compound average annual rates that are more than 6 times the growth rate of the general population over the next 10 years. Of similar significance, growth in the population 85 years and older is expected to increase at rates that are more than 5 times the growth rate of the general population during this same period. As disproportionately intensive users of medical services, the projected growth rates in these age cohorts portend even greater expenditure escalation pressures in the years ahead, not less.

CHART 4
Elderly Population Growth Rates Will Greatly Exceed Total Population Growth
(Source: Consensus Administration and JFO Projections)



	2006-2016	2006-2021
Total Population	0.5%	0.4%
Age 65+	3.3%	3.2%
Age 85+	2.7%	2.0%

It is noteworthy that despite spending more on per capita health care than virtually any other country in the world (see Chart 5), and more as a percentage of GDP (see Chart 6), the United States does not achieve outcomes that are superior to many comparably developed countries.[5] While there may be many reasons for this, it does suggest that expenditure cost control could be achieved without necessarily sacrificing the quality of health care services provided. Unless such cost control can be achieved, no available revenue source will be able to keep pace with the projected growth in program expenditures.

[5] See OECD Health Care Quality Indicators Project, Initial Indicators Report, at http://www.oecd.org/dataoecd/1/34/36262514.pdf

CHART 5
Per Capita Health Care Expenditures for Selected Nations and Vermont - 2003
(Sources: OECD Health Data 2006 and Vermont Joint Fiscal Office)

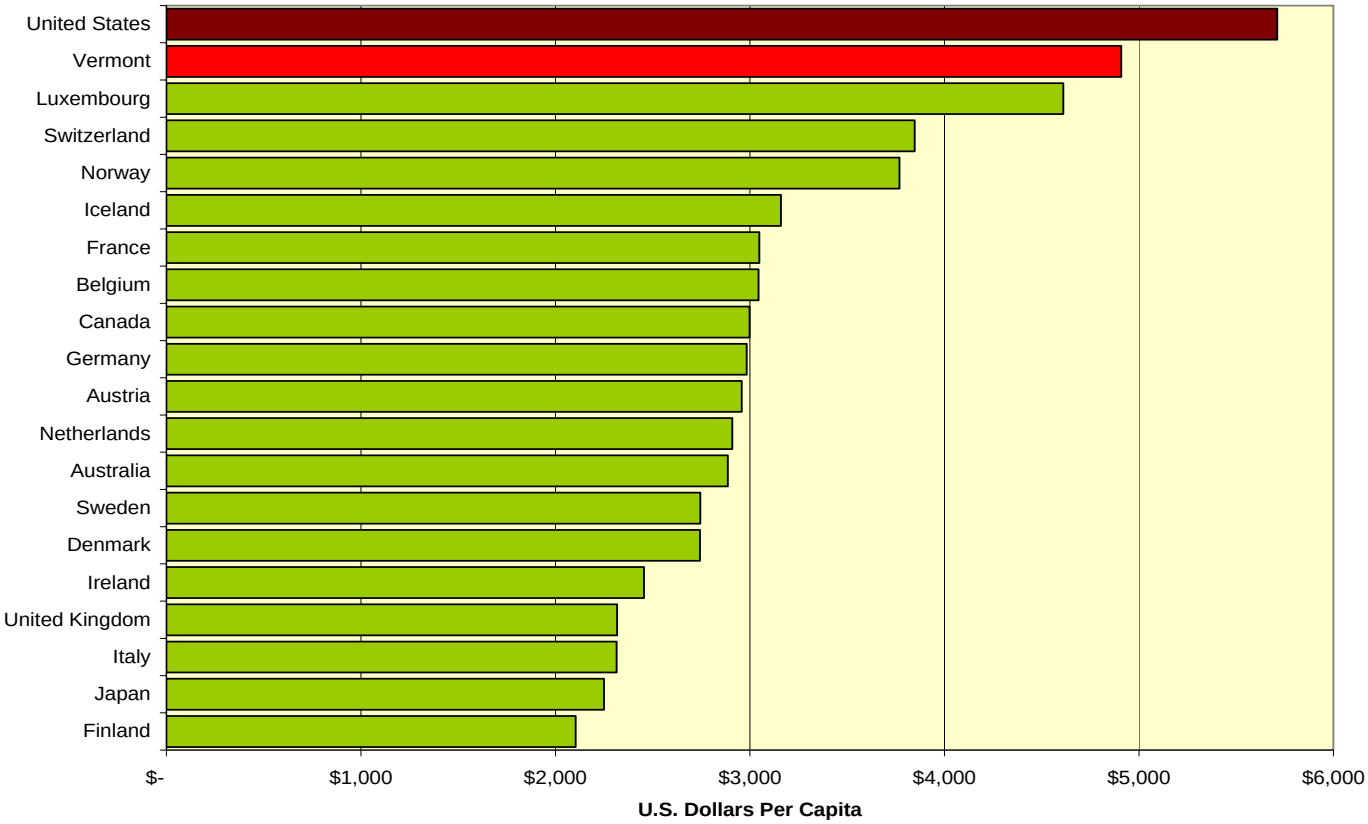
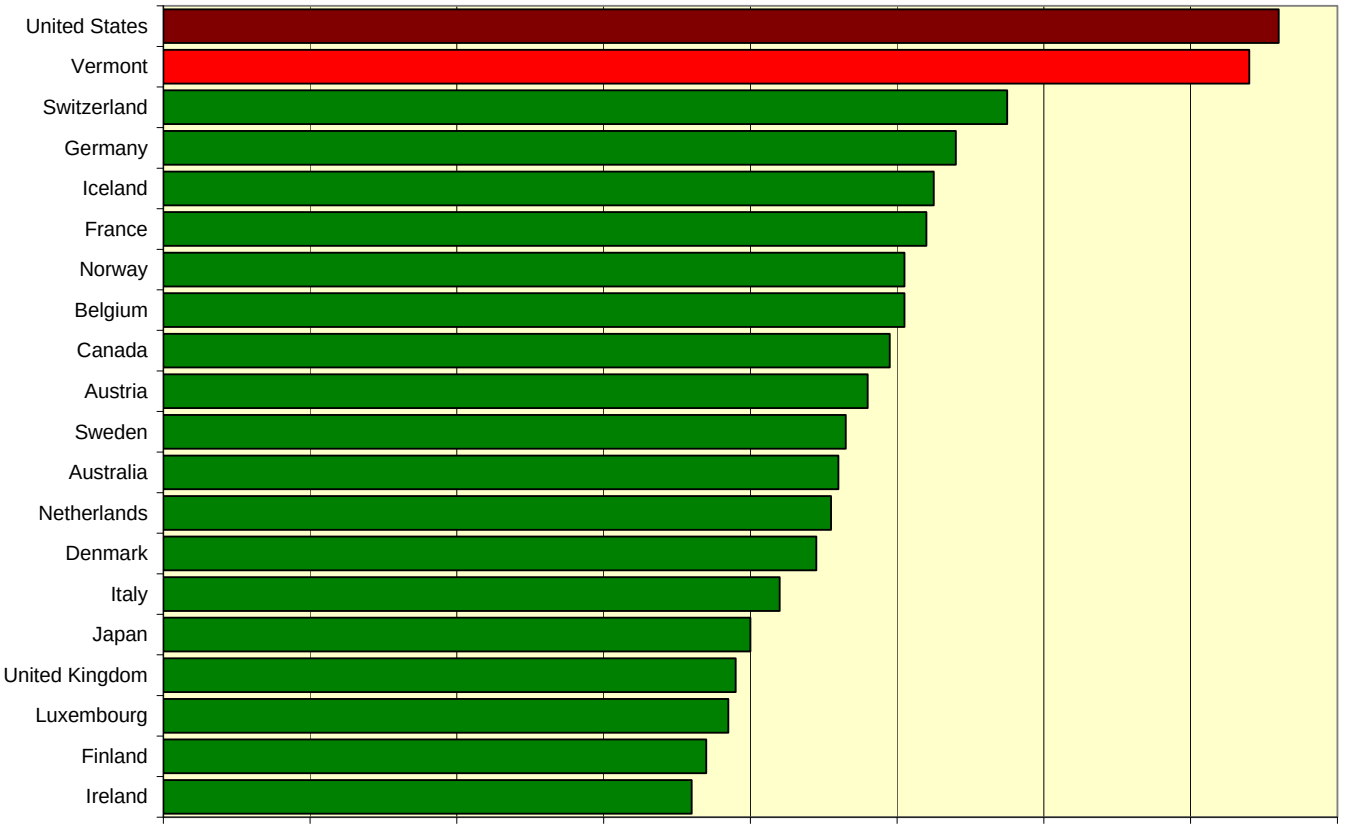


CHART 6
Health Care Expenditures as a Percent of Gross National/State Product - 2003
(Sources: OECD Health Data 2006 and Vermont Joint Fiscal Office)



APPENDIX A

CONSENSUS PROCESS REQUEST

STATE OF VERMONT
COMMISSION ON HEALTH CARE REFORM

September 26, 2006

Governor Douglas
Pavilion Office Building 5th Floor
109 State Street
Montpelier, VT 05609

Dear Governor:

As you are aware, the Health Care Reform Commission is undertaking the financing studies called for in section 295a of Act 215 2006 session (attached). The goal of these studies is to analyze health care financing options as well as the macroeconomic impacts of these options.

We want to work in a collaborative way on this study to maximize the usefulness of this analysis. To this end, we are hoping that legislative and administration consultants and staff can work on a consensus basis to develop economic data, analysis and modeling assumptions for this study, much as they now do for State revenue forecasts, tax changes during legislative sessions and other important State economic issues.

While you have not approved Jeff Carr's participation in this process, we are hoping that you will reconsider. Through such a process, the Administration and Legislature have successfully worked together on a wide range of financial and economic issues and have achieved consensus on many contentious and complex issues including revenue forecasts and recent changes to VEPC/VEGI economic impact modeling.

We believe that this current study is very similar to these other projects in its level of importance and technical complexity and that consensus on technical economic data and modeling issues will elevate and enhance our discussion of policy implications.

We also want to highlight the cooperation and leadership shown by Susan Besio towards our Commission and legislative staff and would like to expand this to other Commission work.

Tom Kavet, his partner, Nic Rockler and Ken Thorpe have started work on the Commission studies and are at a point in the process where if there is to be a consensus process, would require the active engagement and participation of Jeff Carr. We would welcome this participation and believe that it would best serve the people of the State of Vermont. We respectfully ask you to reconsider allowing Jeff Carr to collaborate on this important study through a consensus process.

Sincerely,

Senator James Leddy Representative John Tracy

Co-chairs of the Health Care Reform Commission

//attachment

APPENDIX B

TAX SOURCE ANALYSIS

TAX SOURCE ANALYSIS

The selected revenue sources evaluated in this analysis were specified by the Joint Fiscal Office. Although there are many other tax sources and combinations of revenue sources that could be used to finance health care initiatives, the magnitude of contemplated changes would almost certainly require use of one or more of the following major revenue sources: payroll-based taxes and variants, income taxes and consumption taxes. These tax sources were reviewed in light of four essential benchmarks of optimal taxes: 1) Simplicity, 2) Equity, 3) Efficiency and 4) Capacity.

As noted in the Executive Summary, in this study, "Simplicity" refers to administrative ease in collection, ease of compliance by the taxpayer and ease of understanding by the general public. "Equity" is primarily defined as "fairness" or the extent to which a tax is based on one's ability to pay. "Efficiency" refers to "economic efficiency," or the extent to which a tax generates behavioral or other market distortions that result in excess (or "dead-weight") losses. In this analysis, "Capacity" refers to both potential current revenue generation and, importantly, the future growth potential of a revenue source relative to its need, including annual stability[1].

Simplicity

With respect to simplicity, the personal income and consumption taxes rate highest, with existing administrative infrastructure in place, tested collection mechanisms, and only rate adjustments necessary to effect revenue changes. The payroll tax-based options are somewhat more cumbersome, especially if progressivity is introduced, adding administrative costs to businesses and State tax administrators. Tax avoidance is likely to increase with any of the options examined, especially if rate increases are substantial. In such cases, additional administrative effort and expense may be required to insure compliance.

Equity

With respect to equity considerations, the personal income tax rates highest due to its progressivity with income, followed by a progressive payroll tax (based only on wage and salary income), a flat payroll tax and consumption taxes. Consumption taxes may be made less regressive by exempting certain commodities. The incidence of the payroll tax, though levied on businesses, is assumed to fall on employees, except in cases where compensation cannot be reduced due to minimum wage or other such considerations.[2]

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[1] The recent JFO Tax Study also provides useful background information in evaluating tax capacity and competitive inter-state issues with respect to both personal income and various consumption taxes. It was published in January 2007, and is available at: http://www.leg.state.vt.us/jfo/Reports/2007-01%20Vermont%20Tax%20Study%20-%20Volume%201.pdf

[2] See, among others, "*The Incidence of Mandated Employer-Provided Insurance: Lessons from Workers Compensation Insurance*," by Jonathan Gruber and Alan Krueger, in Tax Policy and the Economy, 1991; "*Some Simple Economics of Mandated Benefits*," by Lawrence Summers, in the American Economic Review, 79, pp 177-184, 1989; "*The Incidence of Mandated Maternity Benefits*," by Jonathan Gruber, in the American Economic Review, 84(3), pp. 622-641, 1994.

Efficiency

Efficiency considerations are perhaps the most difficult to anticipate and accurately quantify. Often an effect can be identified, based on economic theory, but the quantification of this effect may be much more difficult to estimate. For example, during the debate on education financing and Act 60, the tax rate increases proposed for vacation properties were predicted by some to lead to the devastation of the second home real estate market and related tourism visitation in Vermont. Although these tax increases were very large as a percentage change, and there is no doubt that there was some negative economic impact as a result, these effects were swamped by larger economic currents in real estate markets and income distribution that made such dire predictions look foolish in retrospect.

It should be noted that some of the efficiency "scoring" may not be linear with tax rates, and should be evaluated within the context of the actual tax rate required as a part of any financing proposal. It should also be noted that some negative externalities associated with tax rates that are beyond the parameters of historical experience may be difficult or impossible to predict and quantify. The use of any one of these sources for some of the larger potential initiatives, which could require raising more than a billion dollars in new revenues, could create substantial externalities that should be examined carefully prior to enactment.

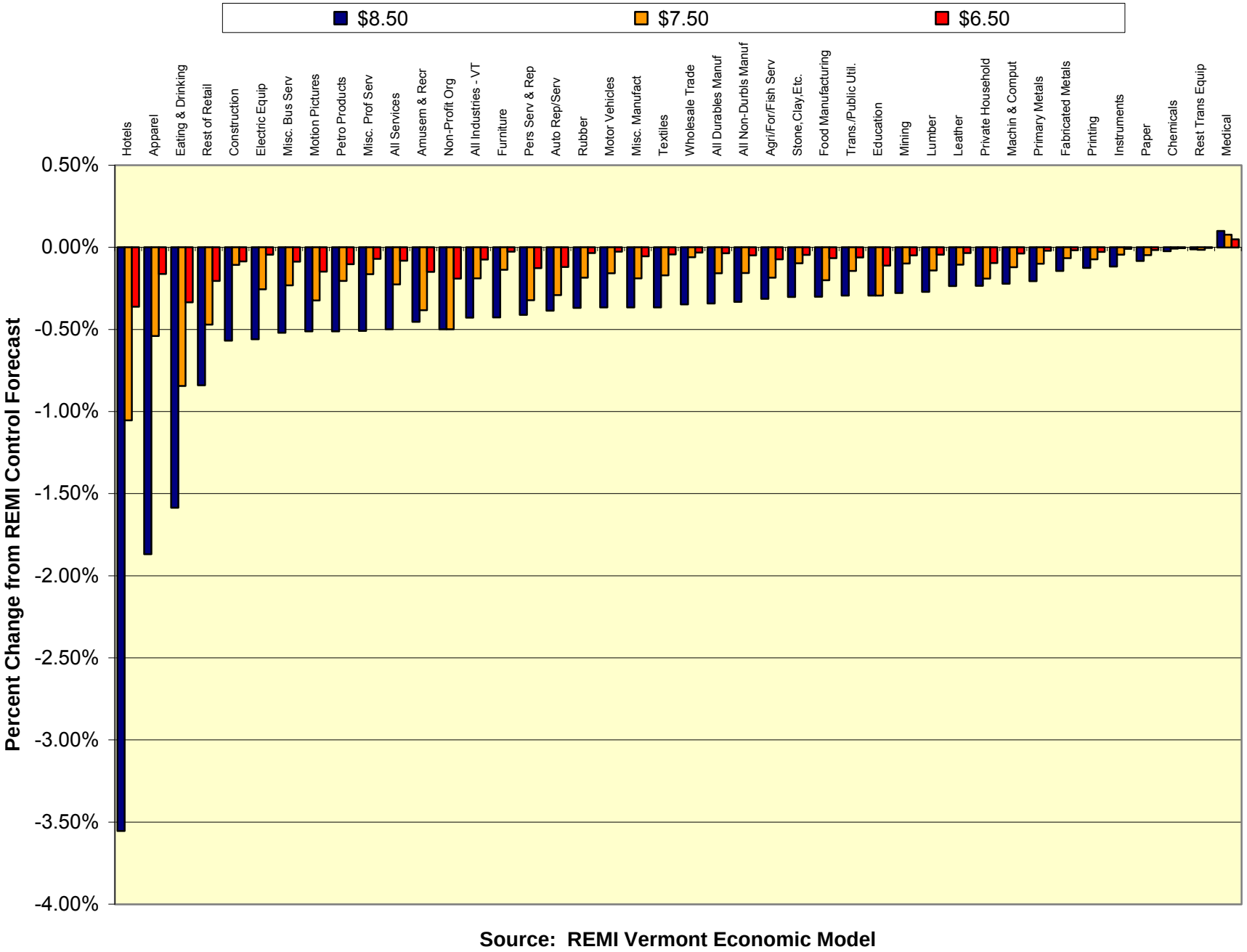
Negative efficiency considerations with respect to the personal income tax include potential out-migration of high-income taxpayers,[3] the out-migration of small businesses associated with these individuals, and further creative accounting and other measures to minimize taxable income. Negative effects associated with payroll-based taxes include potential employment and output losses in sectors characterized by low wages (see chart B1) and significant external competition (see chart B2).

Charts B1 and B2 are derived from minimum wage analyses performed for the legislature in 1999 as a part of Act 21, but are still relevant as general indicators of relative wage and competitive pressures by industry. Chart B1 illustrates potential sensitivity to minimum wage changes by industry and is useful in identifying those industries with the greatest vulnerability to added employee health insurance costs through State mandates. Because the minimum wage acts as a floor on costs that cannot be passed on to employees in the form of lower compensation, firms with a disproportionate number of workers at or near the minimum wage will need to absorb these added costs through higher prices or lower profits. Chart B2 shows the relative external competitive sensitivity of selected economic sectors in Vermont, which is a proxy for an industry's ability to pass cost increases along in the form of higher prices. If a firm has a relatively high number of low wage employees and little or no

[3] Although it should be noted that the oft-repeated assertion that Vermont's current personal income tax rates are causing widespread flight among high income taxpayers is not supported by aggregate IRS income tax data. IRS data on state in and out migration continue to consistently show higher average adjusted gross income among those entering Vermont than those leaving.

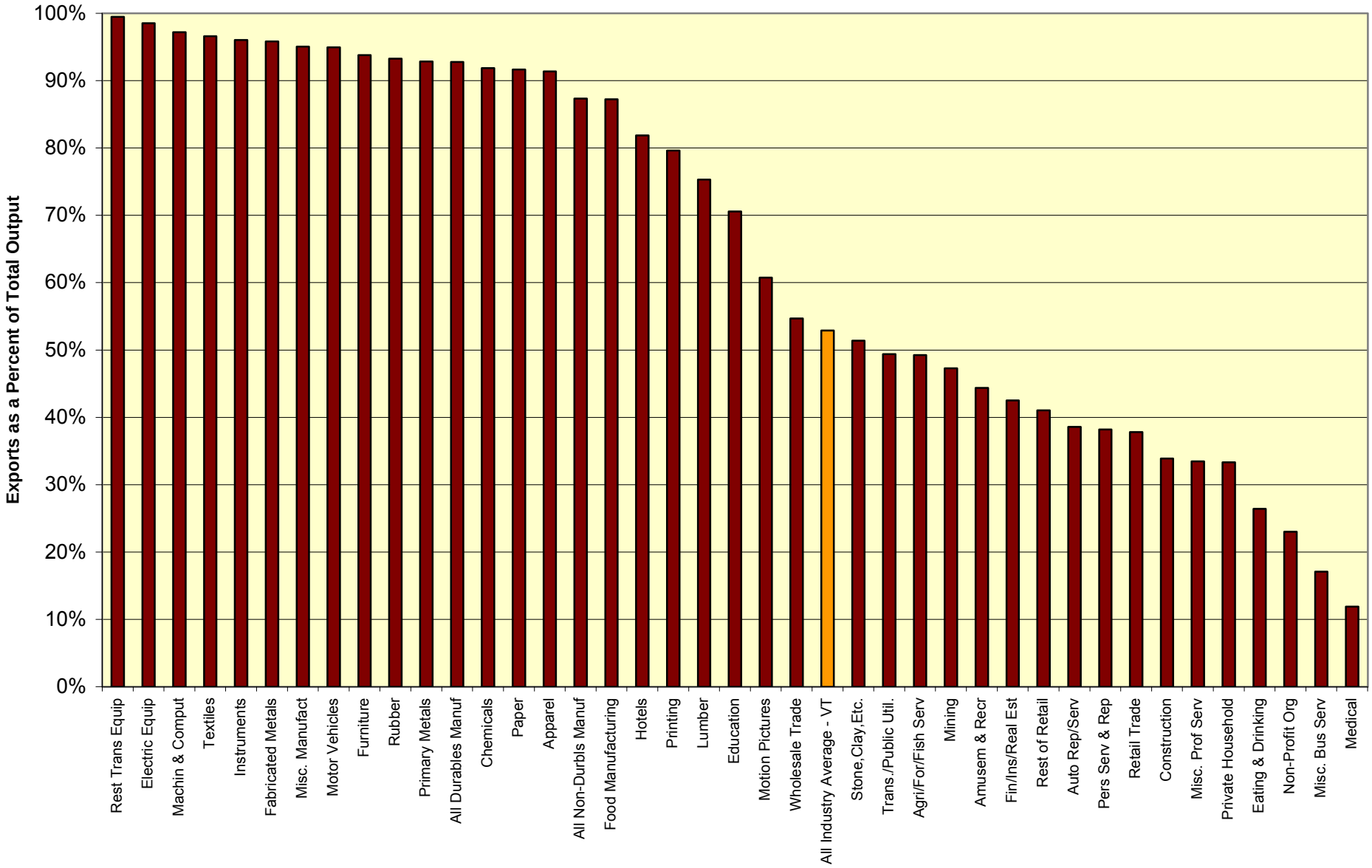
CHART B1

Maximum Potential Change in Output Following Selected Minimum Wage Changes



Source: REMI Vermont Economic Model

CHART B2
Relative External Competitive Sensitivity of Selected Vermont Economic Sectors



Sources: Bureau of Economic Analysis, Regional Economic Models, Inc.

competitive pressure, it will pass added costs on in the form of higher prices. If it is in a more highly competitive sector, however, it will be more difficult to raise prices and such cost increases will have to be borne by lower profitability. If profit margins are already low, it could drive firms out of business or cause them to reduce employment. Together, these two charts indicate that the greatest negative vulnerability to payroll-based health insurance funding to be in the hotel, restaurant and retailing sectors. Positive effects, if cost controls and other administrative savings can be realized, include competitive advantages to some businesses (those now providing comparable, but higher priced private insurance for employees) and aggregate State economic benefits.

Capacity

The most serious deficiency in all of the tax sources evaluated is capacity. As illustrated in Charts 1 and 2 in the Executive Summary, the growth in health care costs, both historical and projected, exceeds the growth rate in virtually every tax source over almost any recent period of time[4]. This implies a need to regularly raise tax rates in order to meet expenditure growth, regardless of the financing source selected. Given the magnitude of health care expenditures, this could result in serious negative economic consequences over time. It is clear that expenditure cost management and control must be a critical part of any program that is to avoid such consequences.

The tax source with the greatest capacity is the personal income tax, which exhibits the highest historical and projected growth rates. Per the table below Chart 2, however, the compound average annual growth rate for even this tax source is consistently two to three percentage points below that of Vermont health care expenditures. Payroll-based taxes, which are a function of total wage and salary income, grow at compound average annual rates closer to three percentage points below expenditures. And consumption taxes (as measured by a constant rate general sales and use tax), grow at rates four to five percentage points per year below expenditures. This capacity gap will haunt State fiscal balance sheets until and unless heath care expenditure growth can be controlled.

Health Care Cost Growth

Clearly, health care expenditure growth is a central topic in expanding public financing of health care services. While figures vary over time and among countries, there is a nearly constant tension between expenditure growth and revenue capacity. Health care costs typically grow at annual rates of six to 10 percent, sometimes higher. There are no revenue sources that can maintain this rate of growth over time.

[4] In these charts, data for each revenue source is normalized, to the extent possible, to account for tax rate and other definitional changes so as to provide consistent tax bases that are comparable over time. Actual collections fluctuate with rate changes and other compositional and statutory changes.

Examination of this tension leads to a critical question – why are health care costs growing so quickly and what, if anything, can be done to control such growth? Although this topic is beyond the scope of this analysis and deserves focused research, especially in the context of any Vermont-specific health care plan, some noted drivers of health care spending growth include:

- Demographics – the aging of the U.S. and Vermont population
- Technology – the increasing capacity of the health care system
- Demand – the increasing expectations and income of the population and the high priority placed on health care
- Systemic Incentives – aspects of the health care system that remove or reverse incentives to minimize expenditures by those making expenditure decisions
- Prescription Drugs – which have more than doubled as a share of total health care expenditures since 1980 and have tripled in total outlays since 1992.

In considering this issue, it is also necessary to distinguish between things that contribute to base costs and things that contribute to growth. For example, a great deal of attention is paid to administrative costs; costs such as claims processing or marketing. While the discussion of whether the U.S. spends too much on administration is a valuable one, and the possibility that substantial savings are possible through changes in administrative models, the contribution of administration to the *growth* of health care spending is relatively small.

Cost drivers and the efficacy of interventions are critical areas of discussion and evaluation. Further research to identify and forecast these critical factors, and associated public policy options, could yield valuable benefits for any proposed health care plan.

APPENDIX C

REMI MODEL CONSTRUCT AND OVERVIEW

I. Introduction

Since "all politics are local," the effects of policies on sub-national areas have always been of great interest in the policy-making process. If anything, the concern about regional economies is becoming greater. The reasons for this heightened concern have to do with a combination of economic realities, changing political structures, and the influence of economic research that has emerged over the last decade.

First, after decades of steadily expanding economic prosperity, evidence began to suggest that lagging economies may not inevitably catch up to more advanced areas. Coastal China has continued to develop more rapidly than the interior; much of the income growth in the U.S. in the past decade has been focused in leading metropolitan areas of the Northeast, Texas, and California; and regional disparities persist in almost every European country.

Second, national economies have become more open, through both globalization and regional blocks such as NAFTA and the EU. This changing political organization forces local economic regions to compete with each other, without the national protection of industries. Thus, regions within a country may have an economy that is much stronger or weaker than the national economy as a whole. For example, the states of Eastern Germany still lag far behind those of Western Germany, despite the overall strength of the German economy.

Finally, the "new economic geography" (see Fujita, et al.) has focused attention on the spatial dimension of the economy. In this emerging area of research, the geographic location of an economy may be even more significant than a national boundary. In fact, the new economic geography shows how economic disparities can surface even with equal resource endowments and in the absence of trade barriers. Since history plays an important role in the development of regional economies, these new research findings also suggest that economic policies may have a significant effect on local economic growth.

In light of this interest, regional policy analysis models can play an important role in evaluating the economic effects of alternative courses of action. Model users can answer "what if" questions about the economic effects of policies in areas such as economic development, energy, transportation, the environment, and taxation. Thus, simulation models for state, provincial, and local economies can help guide decision makers in formulating strategies for these geographical areas.

REMI Policy Insight is probably the most widely applied regional economic policy analysis model. Uses of the model to predict the regional economic and demographic effects of policies cover a range of issues; some examples include electric utility restructuring in Wyoming, the construction of a new baseball park for Boston, air pollution regulations in California, and the provision of tax incentives for business expansion in Michigan. The model is used by government agencies on the national, state, and local level, as well as by private consulting firms, utilities, and universities.

The original version of the model was developed as the Massachusetts Economic Policy Analysis (MEPA, Treyz, Friedlander, and Stevens) model in 1977. It was then extended into a model that could be generalized for all states and counties in the U.S. under a grant from the National Cooperative Highway Research Program. In 1980, Regional Economic Models, Inc. (REMI) was founded to build, maintain, and advise on the use of the REMI model for individual regions. REMI was also established to further the theoretical

framework, methodology, and estimation of the model through ongoing economic research and development.

Major extensions of the initial model include the incorporation of a dynamic capital stock adjustment process (Rickman, Shao, and Treyz, 1993), migration equations with detailed demographic structure (Greenwood, Hunt, Rickman, and Treyz, 1991; Treyz, Rickman, Hunt, and Greenwood, 1993), consumption equations (Treyz and Petraglia, 2001), and endogenous labor force participation rates (Treyz, Christopher, and Lou, 1996). A multi-regional national model has also been developed that has a central bank monetary response to economic changes that occur at the regional level (Treyz and Treyz, 1997).

Recently, the model structure has been developed to include "new economic geography" assumptions. Economic geography theory explains regional and urban economies in terms of competing factors of dispersion and agglomeration. Producers and consumers are assumed to benefit from access to variety, which tends to concentrate production and the location of households. However, land is a finite resource, and high land prices and congestion tend to disperse economic activity.

Economic geography is incorporated in the model in two basic indexes. The first is the commodity access index, which predicts how productivity will be enhanced and costs reduced when firms increase access to intermediate inputs. This index is also used in the migration equation to incorporate the beneficial effect for consumers of having more access to consumer goods, which is factored into their migration decisions. The second index is the labor access index, which captures the favorable effect on labor productivity and thus labor costs when local firms have access to a wide variety of potential employees and are able to select employees whose skills best suit their needs.

II. Overview of the Model

REMI Policy Insight is a structural economic forecasting and policy analysis model. It integrates input-output, computable general equilibrium, econometric, and economic geography methodologies. The model is dynamic, with forecasts and simulations generated on an annual basis and behavioral responses to wage, price, and other economic factors.

The REMI model consists of thousands of simultaneous equations at the same time that its structure is relatively straightforward. The exact number of equations varies depending on the extent of industry, demographic, demand, and other detail in the specific model being used. The overall structure of the model can be summarized in five major blocks: (1) output and demand, (2) labor and capital demand, (3) population and labor force, (4) wages, prices and costs, and (5) market shares. The blocks and their key interactions are shown in Figures 1 and 2.

REMI Model Linkages
(Excluding Economic Geography Linkages)

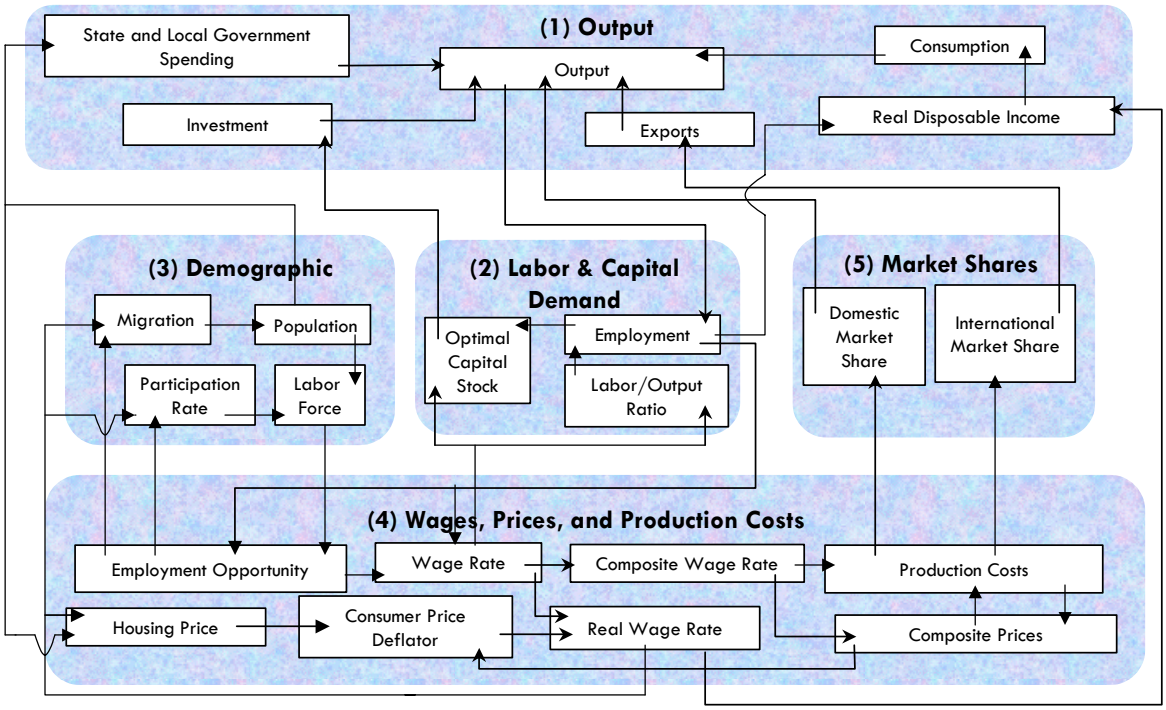


Figure 1: REMI Model Linkages

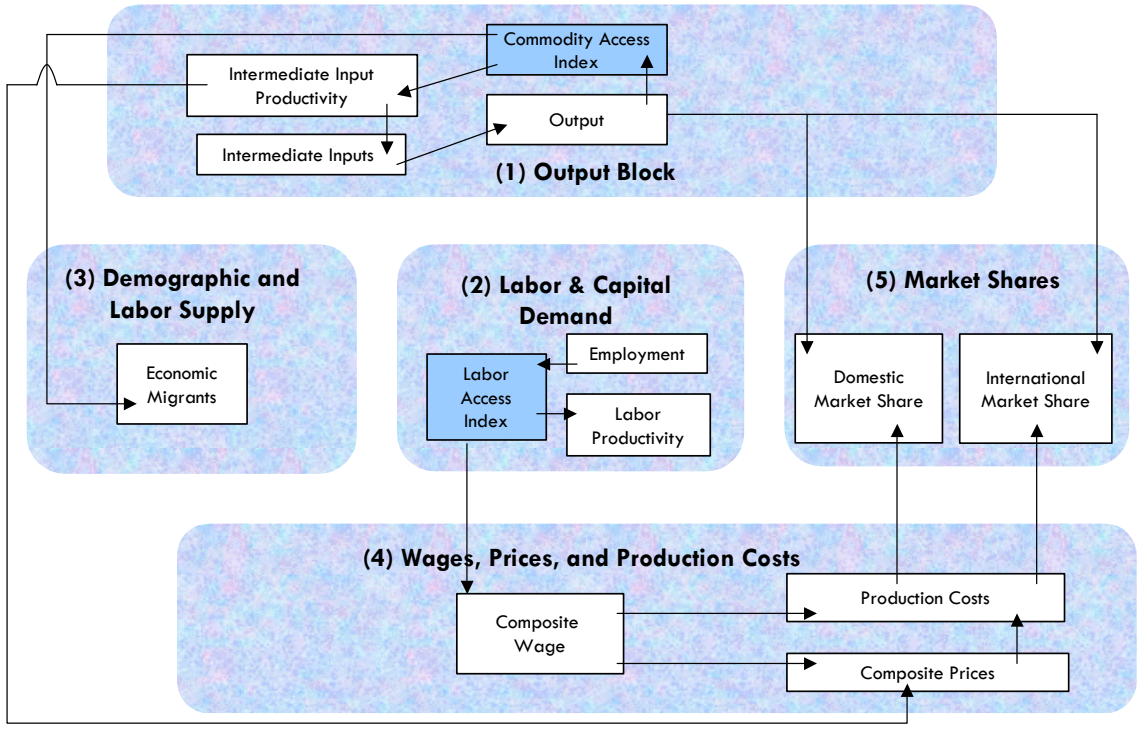


Figure 2: Economic Geography Linkages

The output and demand block consists of output, demand, consumption, investment, government spending, exports, and imports, as well as feedback from output change due to the change in the productivity of intermediate inputs. The labor and capital demand block includes labor intensity and productivity as well as demand for labor and capital. Labor force participation rate and migration equations are in the population and labor force block. The wages, prices, and costs block includes composite prices, determinants of production costs, the consumption price deflator, housing prices, and the wage equations. The proportion of local, inter-regional, and export markets captured by each region is included in the market shares block.

Models can be built as single region, multi-region, or multi-region national models. A region is defined broadly as a sub-national area, and could consist of a state, province, county, or city, or any combination of sub-national areas. Within a large, multinational currency zone such as the European Union, models of a national economy can be built using the same economic framework employed in regional models.

Single-region models consist of an individual region, called the home region. The rest of the nation is also represented in the model. However, since the home region is only a small part of the total nation, the changes in the region do not have an endogenous effect on the variables in the rest of the nation.

Multi-regional models have interactions among regions, such as trade and commuting flows. These interactions include trade flows from each region to each of the other regions. These flows are illustrated for

a three-region model in Figure 3. There are also multi-regional price and wage cost linkages as shown in the Figure at the end of Section III.

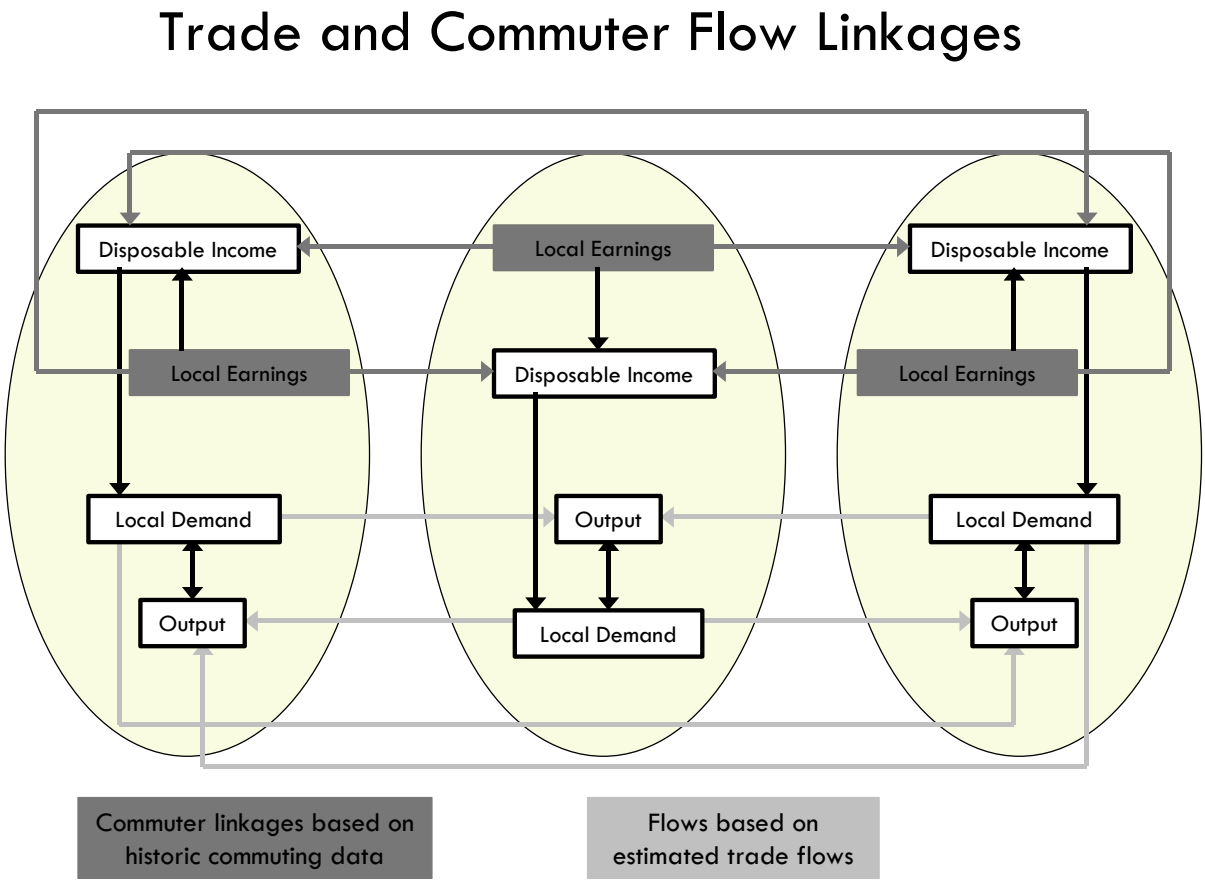


Figure 3: Trade and Commuter Flow Linkages

Multi-regional national models that encompass an entire currency union, such as the U.S. or E.U., also include a central bank monetary response that constrains labor markets. Models that only encompass a relatively small portion of a currency union are not endogenously constrained by changes in exchange rates or monetary responses.

Block 1. Output and Demand

This block includes output, demand, consumption, investment, government spending, import, product access and export concepts. Output for each industry in the home region is determined by industry demand in all regions in the nation, the home region's share of each market, and international exports from the region.

For each industry, demand is determined by the amount of output, consumption, investment, and capital demand on that industry. Consumption depends on real disposable income per capita, relative prices, differential income elasticities, and population. Input productivity depends on access to inputs because a larger choice set of inputs means it is more likely that the input with the specific characteristics required for the job will be found. In the capital stock adjustment process, investment occurs to fill the difference

between optimal and actual capital stock for residential, non-residential, and equipment investment. Government spending changes are determined by changes in the population.

Block 2. Labor and Capital Demand

The labor and capital demand block includes the determination of labor productivity, labor intensity and the optimal capital stocks. Industry-specific labor productivity depends on the availability of workers with differentiated skills for the occupations used in each industry. The occupational labor supply and commuting costs determine firms' access to a specialized labor force.

Labor intensity is determined by the cost of labor relative to the other factor inputs, capital and fuel. Demand for capital is driven by the optimal capital stock equation for both non-residential capital and equipment. Optimal capital stock for each industry depends on the relative cost of labor and capital, and the employment weighted by capital use for each industry. Employment in private industries is determined by the value added and employment per unit of value added in each industry.

Block 3. Population and Labor Force

The population and labor force block includes detailed demographic information about the region. Population data is given for age, gender, and ethnic category, with birth and survival rates for each group. The size and labor force participation rate of each group determines the labor supply. These participation rates respond to changes in employment relative to the potential labor force and to changes in the real after-tax wage rate. Migration includes retirement, military, international and economic migration. Economic migration is determined by the relative real after-tax wage rate, relative employment opportunity, and consumer access to variety.

Block 4. Wages, Prices and Costs

This block includes delivered prices, production costs, equipment cost, the consumption deflator, consumer prices, the price of housing, and the wage equation. Economic geography concepts account for the productivity and price effects of access to specialized labor, goods, and services.

These prices measure the price of the industry output, taking into account the access to production locations. This access is important due to the specialization of production that takes place within each industry, and because transportation and transaction costs of distance are significant. Composite prices for each industry are then calculated based on the production costs of supplying regions, the effective distance to these regions, and the index of access to the variety of outputs in the industry relative to the access by other uses of the product.

The cost of production for each industry is determined by the cost of labor, capital, fuel and intermediate inputs. Labor costs reflect a productivity adjustment to account for access to specialized labor, as well as underlying wage rates. Capital costs include costs of non-residential structures and equipment, while fuel costs incorporate electricity, natural gas, and residual fuels.

The consumption deflator converts industry prices to prices for consumption commodities. For potential migrants, the consumer price is additionally calculated to include housing prices. Housing price changes from their initial level depend on changes in income and population density.

Wage changes are due to changes in labor demand and supply conditions and changes in the national wage rate. Changes in employment opportunities relative to the labor force and occupational demand change determine wage rates by industry.

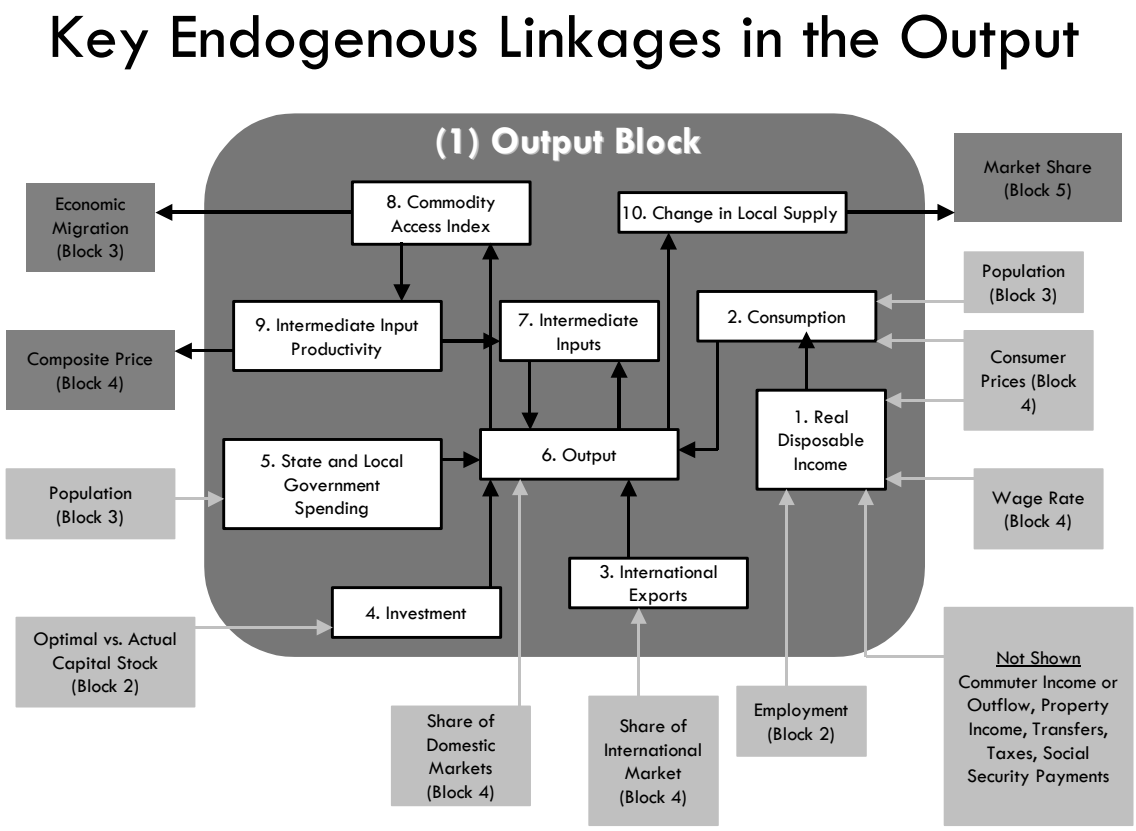
Block 5. Market Shares

The market shares equations measure the proportion of local and export markets that are captured by each industry. These depend on relative production costs, the estimated price elasticity of demand, and the effective distance between the home region and each of the other regions. The change in share of a specific area in any region depends on changes in its delivered price and the quantity it produces compared with the same factors for competitors in that market. The share of local and external markets then drives the exports from and imports to the home economy.

III. Detailed Diagrammatic and Verbal Description

The first task in this chapter is to examine the internal interactions within each of the blocks and to present the variables that are important for understanding how a regional (sub-national) economy works. The second objective is to examine the linkages between the blocks. Finally, the last goal is to tie it all together by looking at the key inter-block and intra-block linkages.

Block 1. Output and Demand



This block incorporates the regional product accounts. It includes output, demand, consumption, government spending, imports, and exports. The commodity access index, an economic geography concept, determines the productivity of intermediate inputs. Inter-industry transactions from the input-output table are also accounted for in this block.

Output for each industry in the home region is determined by industry demand in all regions in the nation, the home region's share of each market, and international exports from the region. The shares of home and other regions' markets are determined by economic geography methods, explained in block 5.

Consumption, investment, government spending, and intermediate inputs are the sources of demand. Consumption depends on real disposable income per capita, relative prices, the income elasticity of demand, and population. Consumption for all goods and services increases proportionally with population. The consumption response to per capita income is divided into high and low elasticity consumption components. For example, the demand for consumer goods such as vehicles, computers, and furniture is highly responsive

to income changes, while health services and tobacco have low income elasticities. Demand for individual consumption commodities are also affected by relative prices. Changes in demand by consumption components are converted into industry demand changes by taking the proportion of each commodity for each industry in a bridge matrix.

Real disposable income, which drives consumption, is determined by wages, employment, non-wage income and consumer prices. Labor income depends on employment and the wage rate, described in blocks 2 and 4, respectively. Non-wage income includes commuter income, property income, transfers, taxes, and social security payments. Disposable income is stated in real terms by dividing by the consumer price index.

Investment occurs through the capital stock adjustment process. The stock adjustment process assumes that investment occurs in order to fill the gap between the optimal and actual level of capital. The investment in new housing, commercial and industrial buildings, and equipment is an important engine of economic development. New investment provides a strong feedback mechanism for further growth, since investment represents immediate demand for buildings and equipment that are to be used over a long period of time. The need for new construction begets further economic expansion as inputs into construction, especially additional employment in this industry, create new demand in the economy.

Investment is separated into residential, nonresidential, and equipment investment categories. In each case, the level of existing capital is calculated by starting with a base year estimate of capital stock, to which investment is added and depreciation is subtracted for each year. The desired level of capital is calculated in the capital demand equations, in block 2. Investment occurs when the optimal level of capital is higher than the actual level of capital; the rate at which this investment occurs is determined by the speed of adjustment.

Government spending at the regional and local level is primarily for the purpose of providing people with services such as schooling and police protection. Thus, changes in government spending are driven by changes in population. The government spending equation takes into account regional differences in per capita government spending, as well as differential government spending levels across localities within a larger region.

The demand for intermediate inputs depends on the requirements of industries that use inputs from other sectors. These inter-industry relationships are based on the input-output table for the economy. For example, a region with a large automobile assembly plant would have a correspondingly large demand for primary metals, since this industry is a major supplier to the motor vehicles industry.

Thousands of specialized parts are needed to assemble an automobile, and the close proximity of the parts suppliers to the assembly plant is particularly significant under just-in-time inventory management procedures. More generally, the location of intermediate suppliers is important to at least some extent for every industry. Thus, the economic geography of the producer and input suppliers is a key aspect of regional productivity.

The agglomeration economies provided by the proximity of producers and suppliers is measured in the commodity access index. Intermediate input productivity is determined by this index. The commodity access index for each industry is determined by the use of intermediate inputs, the effective distance to the input suppliers, and a measure of the productivity advantage of specialization in intermediate inputs. This productivity advantage is the elasticity of substitution between varieties in the production function. Although

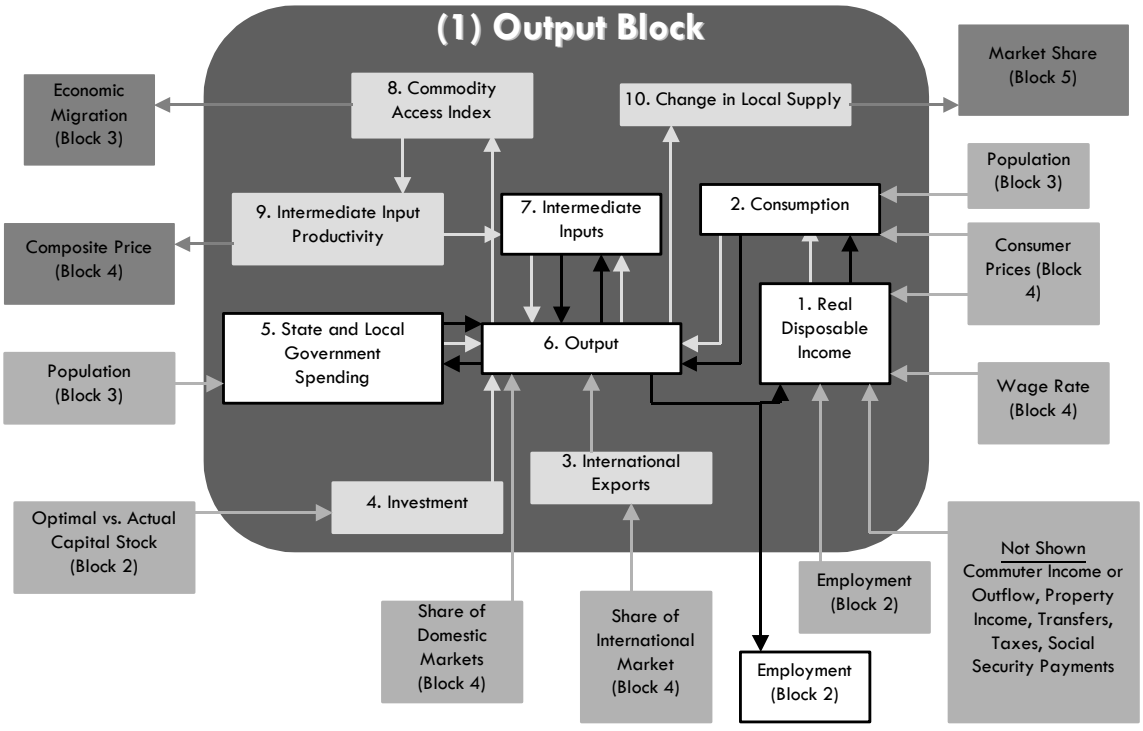
producers may be able to find a substitute for the precise component or service that they desire, access to the most favorable input provides a productivity advantage. When substitution between varieties is inelastic, then the productivity benefit of access to inputs is high. Thus, agglomeration economies are strong for the production of electrical equipment, computers and machinery, and other industries that require specialized types of inputs for which substitution is difficult.

An increase in the output of an industry provides a larger pool of goods and/or services from which to choose. Since firms incur some fixed cost to produce a new variety, this increased pool of goods and services represents an increased availability of varieties. Therefore, an increase in industry output leads to a greater supply of differentiated goods and services, which can in turn lead to higher productivity and increase output. This positive feedback between tightly related clusters of industries is one source of regional agglomeration.

Since standard input-output analysis is often used to predict the effect of a firm either moving into or out of an area, it is important to explain why the results of the input-output analysis is incomplete. The following diagrams and explanation give an overview of the differences and similarities between REMI Policy Insight and Standard Input-Output.

In the first diagram ("Factors Included in Standard Input-Output Models"), white boxes (▭) indicate the linkages that constitute most I-O models.

Factors Included in Standard Input-Output Models



Some input-output models differentiate consumption by average household spending rates based on average earnings by industry. REMI differentiates between changes in income per capita and income changes

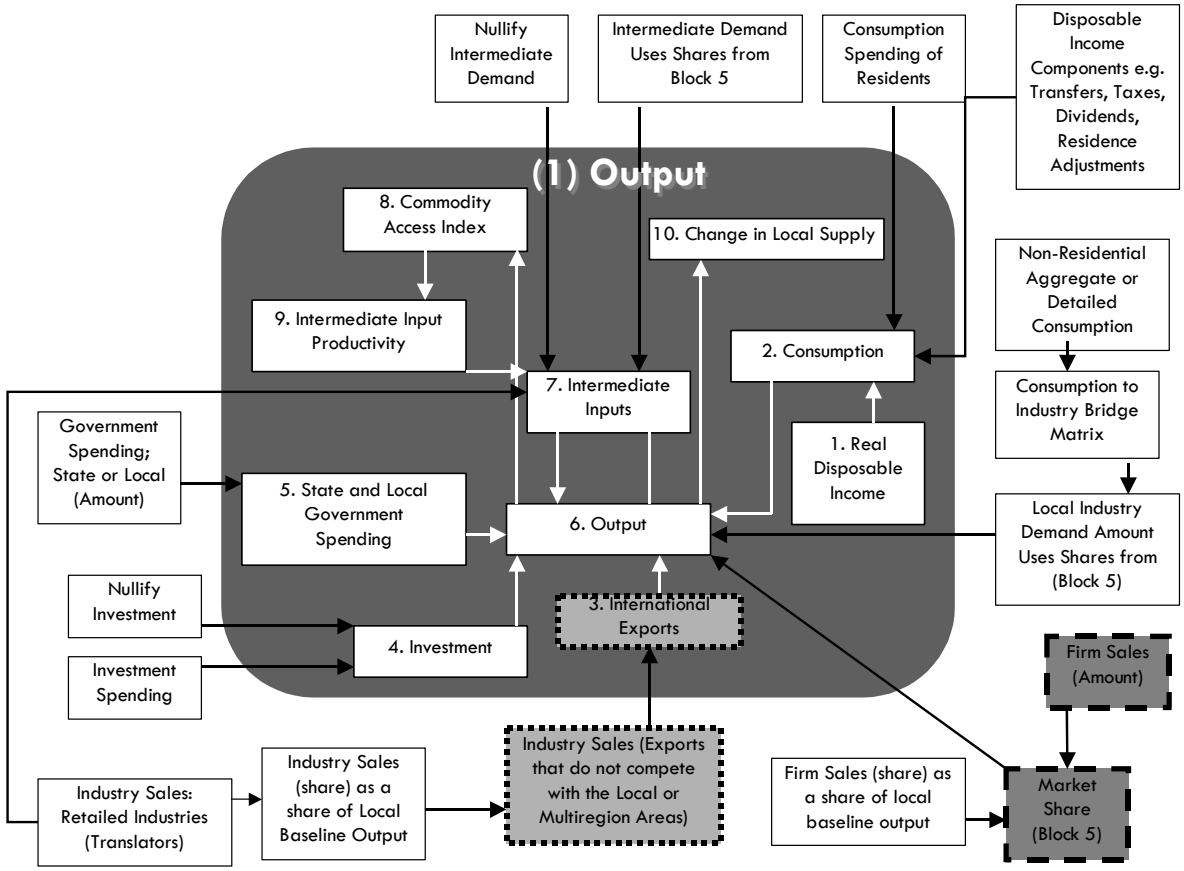
due to changes in population, and includes different income elasticities for purchases of different consumer products (e.g. the consumption type that includes cigarettes has a lower income elasticity than the type that includes motor vehicles). Also, most I-O models would not account for the inflow and outflow of commuters.

Thus, the I-O model captures the inter-industry flows that occur as output changes (each extra dollar of steel used 3 cents of coke) and it has feedbacks to consumer spending that are generated by changes in workers' income. Since population migration changes are not modeled, feedbacks to state and local governments in terms of new demands for per capita services are not included. Investment spending to construct new residential housing and commercial buildings cannot be modeled in static input-output models, because it is a transitory process that will occur when the need for housing and new stores occurs due to higher incomes and population but will return towards the baseline construction activity once the number of new houses and stores has risen enough to meet the one-time permanent increase in demand.

The change in the share of all markets as costs, the access to intermediate inputs, and the access to labor and feedback from other areas in a multi-region model are not included in standard I-O models. These all have effects in the short run, but the effects are even much larger in the long run. While an I-O analysis just gives a partial static picture, REMI catches all of the dynamic effects for each year in the future.

In addition to the difference in the extent of the important feedbacks in REMI compared to I-O, there is a major difference in the options for inputting policy variables in the two models. The following diagram, which will be explained in more detail in Chapter V, shows the way standard input for the I-O model is Export Sales (going into International Exports) in comparison to the large number of inputs in the REMI model for Block 1.

REMI's Two Input Options vs. The Standard I-O Single Option
Key Policy Variables for the Output Block
1. Output Block



Standard input-output models only account for the direct output changes entered into the model, neglecting the displacement effects or augmenting effects on similar businesses in the region (or regions) modeled. REMI also provides this option.

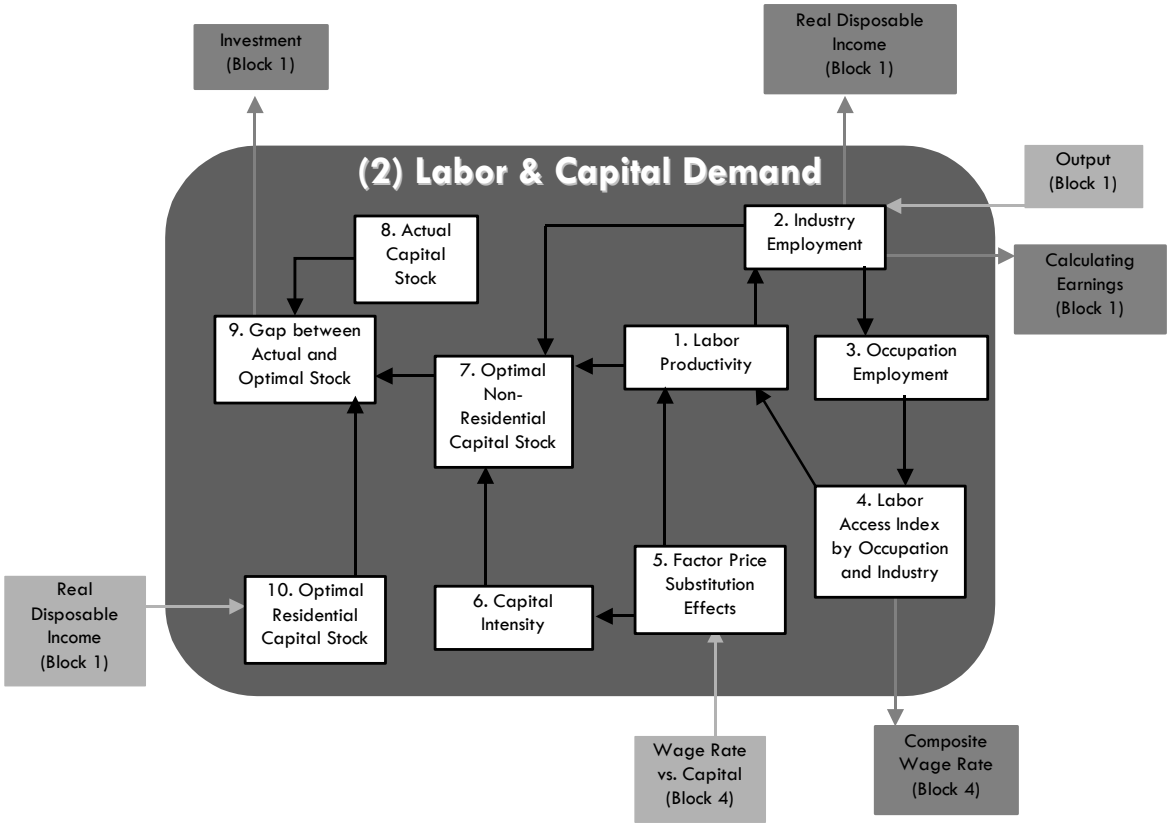
Only REMI provides for inputting the output of the new firm in a way that accounts for displacement of competing employers in the home region and other regions in the multi-region model.

The alternative way that REMI provides for the effect of a firm entering or leaving a region due to a policy change can have substantial effects on the predicted outcome. For example, if a new grocery store is subsidized to move in, but 95% of all groceries are bought in the home region in the baseline case, then most of the sales of the new firm would displace sales in the grocery stores that are currently in the home region. This would mean that the net increase in jobs would only be a fraction of the firm's employment. The gain would mainly have to come from the increasing share in other regions, and this may be small if the initial shares indicate that the geographic area served by this industry is always very close to its source. In addition to considering the initial displacement, the REMI policy variable for a new firm will show how the future will be different if this new firm maintains its initial gain in share in the multi-region, the rest of the monetary union, and the rest of the world markets. Thus, the long-term effects will capture the differential effects of gaining

share in an industry in which demand in the relevant markets is expanding rapidly versus those in which the demand is growing slowly. It will also capture the way that future projected changes in output per worker will mean that sales growth and employment growth may differ markedly.

The range of other policy variables for the output block can be seen in the diagrams. These other ways that policy can influence the economic and demographic future of an area are not available for standard I-O models, because the linkages to most of the key processes that influence the outcomes in the region are not included in the structure of I-O models.

Block 2. Labor and Capital Demand



The labor and capital demand block includes employment, capital demand, labor productivity, and the substitution among labor, capital, and fuel. Total employment is made up of farm, government, and private non-farm employment. Employment in private non-farm industries depends on employment demand and the number of workers needed to produce a unit of output. Employment demand is built up from the separate components of employment due to intermediate demand, consumer demand, local and regional government demand, local investment, and exports outside of the area. The employment per dollar of output depends on the national employment per dollar of output, the cost of other factors, and the access to specialized workers.

The availability of a large pool of workers within a region contributes to the labor force productivity. Each worker brings a set of unique characteristics and skills, even within the same occupational category. For

example, a surgeon may specialize in heart, brain, or knee surgery. Although a brain surgeon may be able to perform a heart operation, the brain surgeon is likely to be less effective than a surgeon who has specific experience with heart surgery. Hospitals in major medical centers such as Houston are in an excellent position to meet their staff requirements because the number of qualified job applicants in the region is so large.

More broadly, locations that can be easily reached by a large number of potential employees can better match jobs with workers. The equation for labor productivity due to labor access is calculated separately for each occupation. Occupational productivity in each location is based on the residential location of all potential workers and their actual or potential commuting costs to that location.

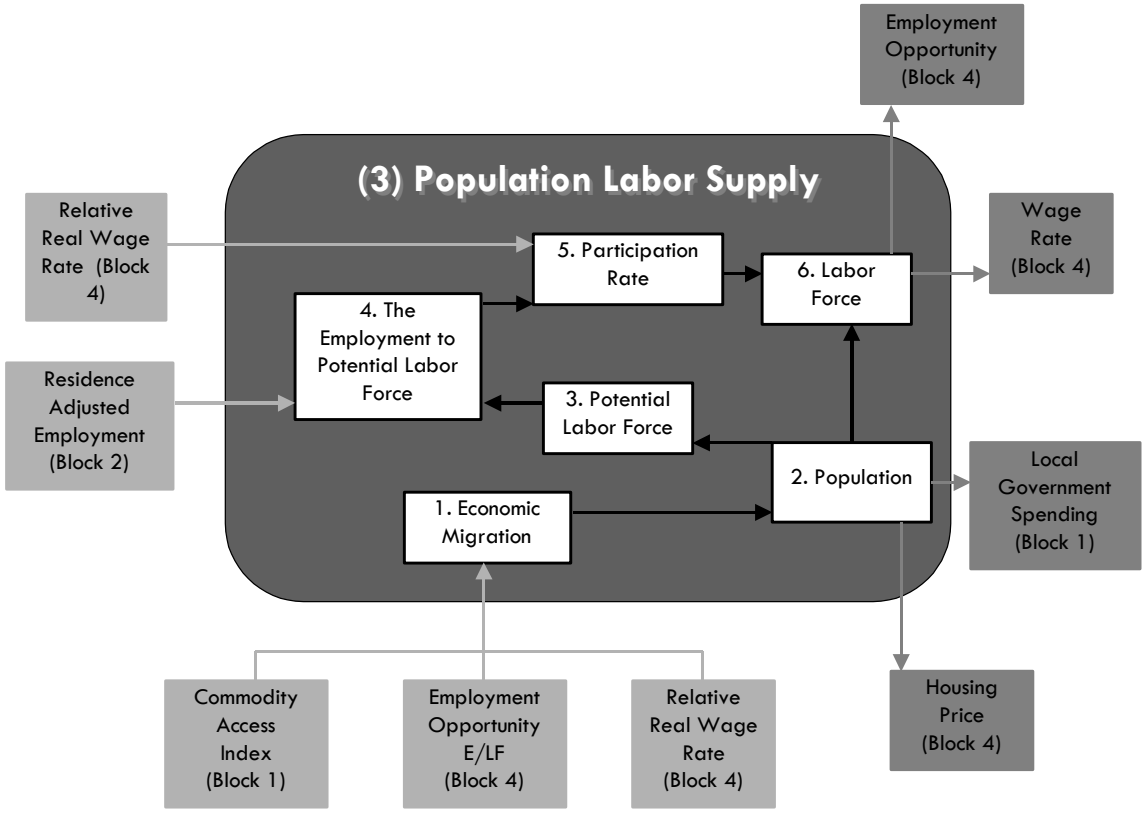
The contribution of labor variety to productivity is measured by an occupation-specific elasticity of substitution based on a study that considered wages and commuting patterns across a large metropolitan area. While the match of workers in specialized roles that are consistent with their training has a large impact on productivity for medical occupations, it is significantly less important for workers in the food service sector. Industry productivity due to specialization is built up from occupational productivity, using the proportionate number of workers in each occupation that are employed by a given industry.

The number of employees needed per unit of output depends on the use of other factors of production as well as labor access issues. Labor intensity, which measures the use of labor relative to other factors, is determined by the cost of labor relative to the cost of capital and fuel. The substitution between labor, capital, and fuel is based on a Cobb-Douglas production function, which implies constant factor shares. Labor intensity is calculated for each industry.

Demand for capital is driven by the optimal capital stock equation for industries and for housing. The optimal level of capital is determined for non-residential structures and equipment for each industry. The regional optimal capital stock is based on the industry size measured in capital-weighted employment terms, the cost of capital relative to labor, and a measure of the optimal capital stock on the national level. The variable for employment weighted by capital use is determined by the capital weight, employment, and labor productivity. The capital weight is the ratio of industry capital to employment in the region compared to the capital to employment ratio for the nation. The national optimal capital stock is based on the investment in the nation, the actual capital stock, the speed of adjustment, and the depreciation rate.

The optimal level of capital for residential housing is determined by the real disposable income in the region relative to the nation, the optimal residential capital stock for the nation, and the price of housing. To account for the cost of fuel, the fuel components of production (coal mining, petroleum refining, electric and natural gas utilities) are taken out of intermediate industry transactions and considered as a value-added factor of production. Then, firms substitute between labor, capital and fuel (electric, natural gas, and residual fuel) as the relative cost of factor inputs changes.

Block 3. Population and Labor Force



The population and labor force block includes detailed demographic information about the region. The population is central to the regional economy, both as a source of demand for consumer and government spending and as the determinant of labor supply. As the composition of the population changes through births, deaths, and migration, so goes the region.

The demographic block is based on the cohort-survival method. Population in any given year is determined by adding the net natural change and the migration change to the previous year's population. The natural change is caused by births and deaths, while migration occurs for economic and non-economic reasons. Population data is given for age, gender, and ethnic category.

Birth rates are the ratio of births to the number of women in each age group. The survival rate is equal to one minus the death rate, which is the ratio of deaths to population in each cohort. Since birth rates vary widely across age and ethnic groups, and survival rates vary widely for gender as well as age and ethnic category, the detailed demographic breakdown is needed to accurately capture the aggregate birth and survival rates.

Migration, economic or non-economic, also varies widely across population groups. Changes in retirement, international, and returning military migration are all assumed to occur for reasons that are not primarily due to with changing regional economic conditions. Retirement migration depends on the retirement-age population in the rest of the country for regions that have gained retirement population in the

past, and on the retirement age population within the regions for places that tend to have a net loss of retirees. The probability of losing or gaining a retiree is age and gender specific for each age group.

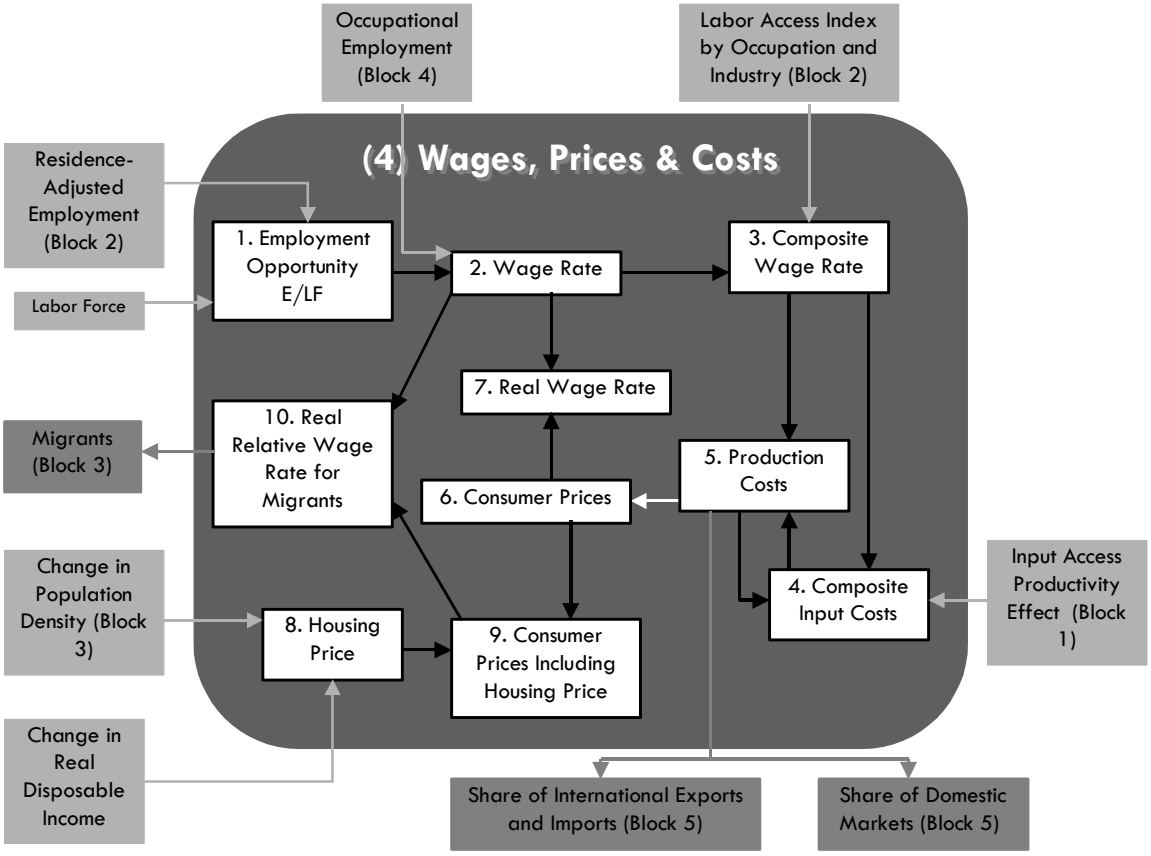
International migration is also based on previous patterns. Changes in political restrictions on immigration and the economy of the immigrants' country are more significant in determining international migration than are changes in the economy of the home region. Returning military migration patterns are also better explained by existing patterns than by regional economic conditions, so returning military is also an exogenous variable.

Economic migration is the movement of people to regions with better economic conditions. Economic migrants are attracted to places with relatively high wages and employment opportunities. Migrants are also attracted to places with high amenities. Potential migrants value access to consumer commodities, which depend on economic conditions. Thus, as the output of consumer goods and services increases, the amenity attraction of the region increases. Other amenities are due to non-economic factors. These amenities or compensating differentials are measured indirectly by looking at migration patterns over the last 20 years. In this way, the compensating differential is calculated as the expected wage rate that would result in no net in- or out-migration. For example, people may be willing to work in Florida even if paid only 85% of the average U.S. wage rate.

The labor force consists of unemployed individuals who are seeking work as well as employed workers. The labor force participation rate is thus the proportion of each population group that is working or looking for work. To predict the labor force, the model sums up the participation rate and cohort size for each demographic category. Participation rates vary widely across age, gender, and ethnic category; thus, the labor force depends in large part on the population structure of the region.

The willingness of individuals to participate in the labor force is also responsive to economic conditions. Higher wage rates and greater employment opportunities generally encourage higher labor force participation rates. The extent to which rates change in response to these economic factors, however, differs substantially for different population groups. For example, the willingness of men to enter the labor force is more influenced by wages, while women are more sensitive to employment opportunities.

Block 4. Wages, Prices, and Costs

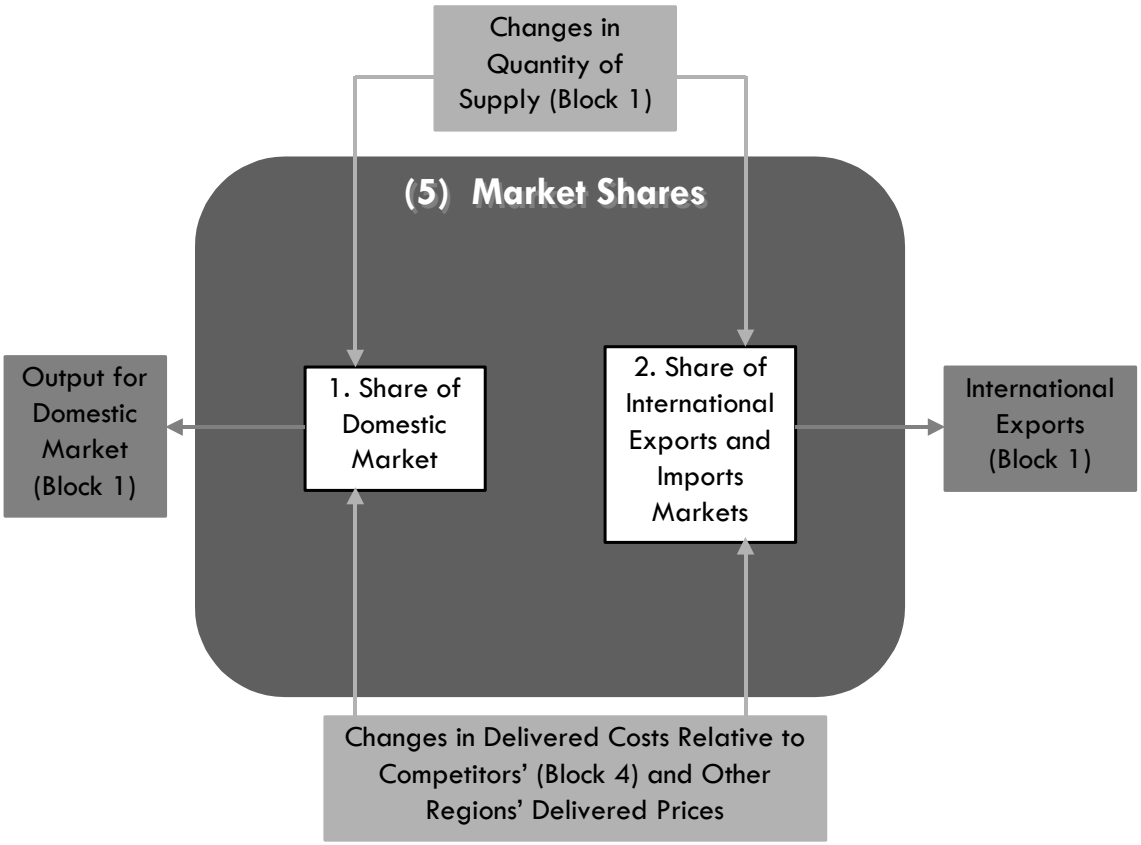


This block includes wages, consumer prices, production costs, housing prices, and composite wages and input costs. Wages, prices, and costs are determined by the labor and housing markets. The labor market is central to the regional economy, and wage differences are the primary source of price and cost differentials between regions. Demand for labor, from block 2, and labor force supply, from block 3, interact to determine wage rates. Housing prices depend on changes in population density and changes in real disposable income.

Economic geography concepts account for productivity and corresponding price effects due to access to specialized labor and inputs into production. The labor access index from block 2, as well as the nominal wage rate, determines the composite wage rate. The composite cost of production depends on the productivity-adjusted wage rate of the region, costs of structures, equipment, and fuel, and the delivered price of intermediate inputs.

The delivered price of a good or service is based on the cost of the commodity at the place of origin, and the distance cost of providing the commodity to the place of destination. This price measure is calculated relative to delivered prices in all other regions, and weights the delivered price from all locations that ship to the home region.

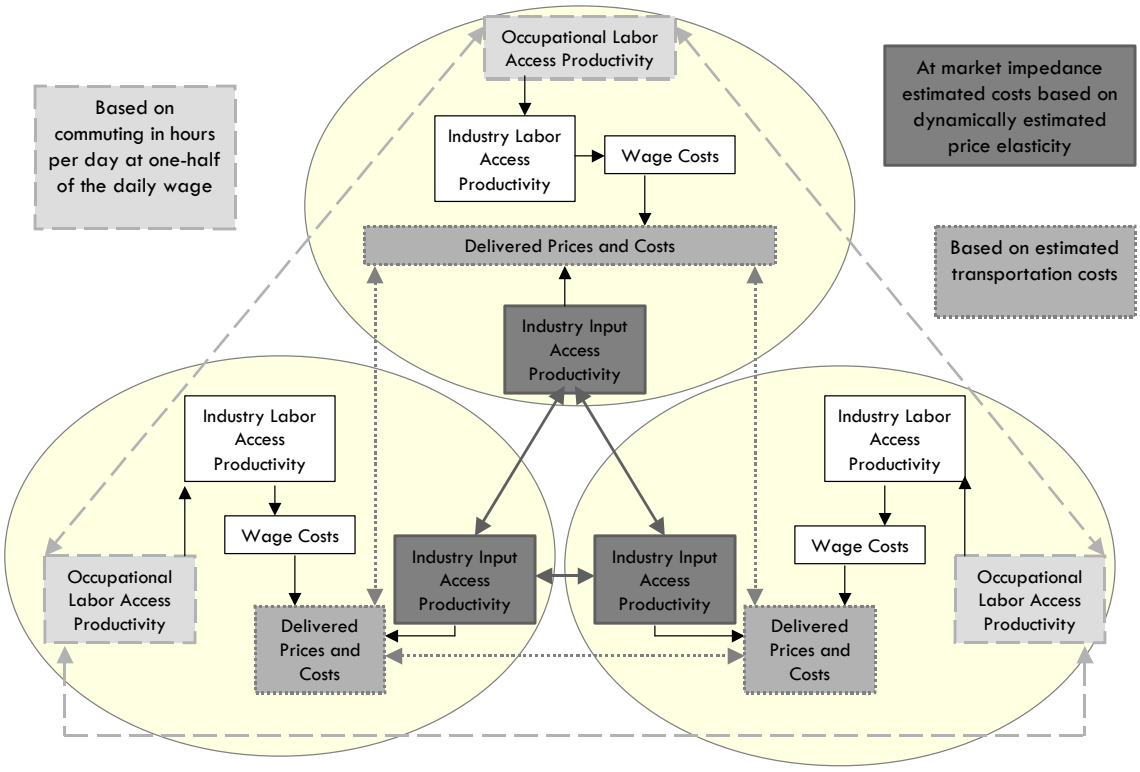
Block 5. Market Shares



The market shares block represents the ability of the region to sell its output within the local region, to other regions in the nation, and to other nations. Although the share of local markets is generally higher than any other market share, the equation for the market share of the home region is the same as for other regions within the nation. The share of international exports from the home region depends on national exports overall, and relative cost and output changes in the home region.

Changes in market shares within the nation depend on changes in industry production costs and output. Production cost increases lower market shares, but higher output raises market shares. Market shares rise with output increases, since higher output is better able to meet local and other regions' demand for goods and services by providing more choices.

Multi-Regional Price and Wage Linkages



APPENDIX D

REMI MODEL SPECIFICATION AND SAMPLE OUTPUT

MODEL SPECIFICATION AND SAMPLE OUTPUT

Model Scope and Design

There have been numerous reports exploring the economic consequences of different health care reform proposals. In general, these reports have looked at comprehensive reform proposals, often based on single payer models. Because of this comprehensive approach, a wide range of assumptions are required, such as changes in administrative structure and cost, efficacy of cost containment mechanisms, and behavioral changes on the part of patients and providers.

While the model built to support the analyses in this report has been designed to support analysis of specific comprehensive proposals, it may also be useful in testing more general funding option issues. The model tests described below include both a more comprehensive proposed plan (also single payer) and a more general funding shift (based on a hypothetical $100 million program). It examines how funds are currently generated (referred to as the "control" or base case model), and explores several alternatives, evaluating those alternatives in terms of their specific attributes, such as capacity and sustainability, ease of administration, equity, efficiency and other effects on the State's economy.

Components of a Health Care System

Although each is highly complex, there are only a small number of basic functions in any health care system. These include:

- Financing – raising of necessary funds
- Administration – the infrastructure and transactions necessary to support care
- Clinical – management and provision of care, including prevention and treatment
- Regulation – licensure, cost containment, etc.

Each of these components interact, making comprehensive economic analysis more appropriate to fully understand the implications of policy changes. However, comprehensive analyses require a combination of highly specified proposals and a very large number of assumptions.

Analysis of financing alternatives, the focus of this report, looks at ways to generate money. There are three broad ways to generate funds to support health care. Nearly every system in the world uses some combination of the three – where they differ is in the relative contributions.

The first main source is called "out of pocket spending." These are funds paid by patients directly to providers. Prior to the advent of third-party payers (insurance

companies, employers, government), this was the source of funding for nearly all health care. Under a system entirely funded by out of pocket spending, one's contribution to the costs of the health care system are directly proportional to one's use of health care services.

The second main source is health insurance. This source is characterized by its voluntary nature and by the nearly complete disconnection of use of care and contribution to costs. The disconnection is not complete for two reasons - most health insurance has a cost-sharing component, under which the beneficiary pays some amount tied to utilization, and for many people covered by group insurance, premiums are influenced by the amount of care used by the group in aggregate.

The third main source of health care funds is public taxation. Taxation differs from premiums in two ways – taxes are not voluntary and taxes are typically tied to income, payroll, or consumption, rather than health care utilization.

In 2005, $3.5 billion dollars were spent to provide health care to Vermont residents.[1] Of this, about $500 million, or about 14% was out of pocket spending, including cost sharing amounts, services not covered by insurance, and services provided to the uninsured. About $1.4 billion (40%) was paid for under premium-based financing, including both health insurance and self-insured employers. The remaining $1.6 billion (46%) was raised through various forms of taxation. This figure includes Medicare, Medicaid, and other government-funded health care.

Hypothetical Program Tests

The model revolves around making changes to these broad financing flows, incorporating more detailed financing and program features, if available, and then measuring broad economic impacts. To do this, we conducted a series of specification tests on the REMI model for various scenarios for revenue generation and health care service delivery options. Among others, we performed tests for a hypothetical single payer plan consistent with the initial specifications as outlined by Dr. Kenneth Thorpe[2], it being one plausible guide among many possibilities as to how direct spending and revenue requirements to achieve universal insurance access.[3] Our purpose herein is to demonstrate whether the types of changes to the State's health care system are

[1] 2005 Vermont Health Care Expenditure Analysis, BISHCA

[2] "*Costs and Implications of a Single Payer Healthcare Model for the State of Vermont*," August 29, 2006, by Kenneth Thorpe: http://www.leg.state.vt.us/CommissionOnHealthCareReform/single_payer_report_by_Ken_Thorpe_draft_august_28__2006.DOC

[3] The use of Dr. Thorpe's expenditure change estimates should not be construed as an endorsement of his assumptions regarding how administrative costs and healthcare utilization will change with universal access. In this case, we are testing the model's responses to a set of changes that appear to be of a reasonable order of magnitude to the changes we would anticipate, regardless of the number of insurance providers.

accommodated within the modeling framework and to note any particular deficiencies in using the model to guide policy with respect to analyzing alternative schemes for generating the requisite revenue. We also ran a series of comparative tests of alternative funding sources without any consequent changes in health care spending levels or composition. From these, the relative impacts of differing taxation schemes may be demonstrated.

Hypothetical Single Payer Program

The analysis of the Thorpe single payer estimates suggests that a payroll-tax funded program would require level expenditures on health care in total of approximately $1.6 billion, exclusive of certain administrative costs that further increase costs owing to complex accounting and reporting systems. Under this analysis, employer paid benefits would need to expand by $200 million to provide coverage for the presently uninsured and underinsured.[4] At the same time, employees now paying out-of-pocket for health care ($607 million) will shift a portion of current health care expenditures to pay a share of health care insurance premiums. This leaves approximately $201 million that can be presumed to shift to other consumption goods and/or services. In addition, overall administrative cost reductions will amount to $213 million, affecting hospitals, physicians, and insurance firms, and demand for medical care services will rise by $162 million as persons previously uninsured or underinsured now receive care. A system-wide net expenditure reduction of $51 million in this scenario could revert to workers, employers, or some blend thereof. We summarize the anticipated changes in system wide expenditures in Table D1 (next page), which shows expenditures by fund source and service for 2007.

For our single payer simulation, we incorporated each of the changes from the baseline expenditures into the model both separately and combined. The REMI model permits specification of input changes in a regional economy either on the demand side, the supply side, or among productive factors and/or their prices so as to dynamically force changes in demand or supply. For each of the items identified in Table D1, we generally face a choice as to how the direct effect is "entered" into the model. We describe our choices and decisions for each, below:

- $200 Million Increase in Employer Payroll Tax

  REMI has no provision for a single-purpose payroll tax.[5] Employee paid taxes for social security and unemployment compensation are destined for both State and federal treasuries, as are employee paid taxes. REMI does have a provision for changing employer paid benefits, but these are

[4] We are assuming that employer provided coverage presently in excess of the required level of care (approximately $183 million) will continue to be provided. We assume that multi-state employers that provide heath care coverage for all of their domestic employees will maintain their standard offering nationwide.

[5] Because of its generalized structure applicable to all regional economies, REMI does not model the specific tax structure for any specific region. It does model the general relationship between broad fiscal measures and the economy as a whole (and vice-versa.)

TABLE D1
HEALTH CARE BASELINE EXPENDITURES AND DIRECT CHANGES UNDER SAMPLE SINGLE PAYER PLAN

EXPENDITURES BY SOURCE OF FUNDS			
	2007 Baseline	**w/Single Payer**	Δ
Private Health Insurance	1,752	1,667	-84
Employer Paid	1,015	1,215	200
Out-of-Pocket	608	407	-201
Private Administration	129	45	-83
Medicaid	1,080	1,080	0
Acute Services	611	611	0
Long term Services	469	469	0
Medicare	667	667	0
Other Government	149	149	0
TOTAL	3,648	3,563	-84
EXPENDITURES BY TYPE OF SERVICE			
	2007 Baseline	**w/Single Payer**	Δ
Hospital	1,590	1,498	-92
Administration	333	241	-92
Medical Services	1,257	1,257	0
Physician	539	501	-38
Administration	145	107	-38
Medical Services	394	394	0
Prescription Drugs	582	582	0
Home Health	119	119	0
Nursing Care	245	245	0
Other Government	265	265	0
Dental	232	232	0
Other Professional	125	125	0
Private Insurance			
Administration	129	46	-83
Administration	129	46	-83
Other	0	0	0
Unspecified Medical Services	0	162	162
TOTAL	2,236	2,277	-51

Source: Adapted from Thorpe (Draft, August 29, 2006), " Costs and Implications of a Single Payer Healthcare Model for the State of Vermont, see Appendix C.

combined to include such things as life insurance, health insurance and retirement programs, and are not exclusively used to generate funds for health insurance premiums within the State. (Significant leakage of benefit purchases would result from using an employer-paid benefits approach.) In addition, we need to target the tax specifically to firms that either don't provide insurance or underinsure their workers relative to the proposed coverage of the State program.

If, as many argue, employer taxes for health care are really borne by employees who see reduced wages[6], we can simulate the effects of a payroll tax by estimating this as a reduction in wages. However, with different sized establishments showing significantly different levels of health insurance coverage (which is, in turn, a function of the type of industry in which different firms operate), it is important that the tax have the greatest effect on those industries which presently have the lowest insurance coverage, and the least effect on those that already cover their employees. To make our estimates sensitive to these characteristics, we estimate the proportion of establishments not offering insurance by using estimates for employment by establishment size for each industry and then applying establishment-size insurance coverage data from Vermont's Department of Labor Survey of Employee Benefits. By distributing the wage cuts proportionate to these figures and, in aggregate, equal to $200 million, we will approximate the effect a payroll tax on different sized firms and their propensity not to offer insurance.[7] The estimated industry proportion of employees offered health insurance is shown in Table D3. At the low end, important industries in Vermont such as forestry, real estate, professional/technical specialties all have less than 70 percent of their employment estimated to be covered by health care insurance. At the other extreme, hospitals, paper manufacturing, electrical equipment, and computer manufacturing all have 90 percent or more of their employees insured.

- <u>$201 Million Reduction in Out-of-Pocket Health care Expenditures</u>

With expanded health care insurance access, consumers will reduce their out-of-pocket expenditures for health care by $201 million. We assume that funds freed-up from use for health care will shift to some other form of consumption, and we assume that this will occur across the full range of consumer purchases of goods and services. This essentially reallocates consumer expenditures.

- <u>$83 Million in Private Insurance Administration Costs</u>

[6] See footnote number 3

[7] The Vermont Department of Labor Benefits Survey did not offer sufficient industry-specific detail from which to apply the survey-based coverage rates directly to the 70 sector REMI model.

TABLE D2
Estimated Sample Single Payer Plan Preliminary Impacts: 2007-2016

Variable	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Employment (000)	-0.793	-0.690	-0.599	-0.538	-0.494	-0.463	-0.434	-0.410	-0.382	-0.356
Total Gross Regional Product (Bil. 000$)	0.025	0.027	0.029	0.031	0.032	0.032	0.032	0.033	0.033	0.034
Personal Income (Bil. $)	0.123	0.123	0.125	0.126	0.127	0.128	0.129	0.130	0.131	0.133
Consumer Price Index (Fixed 2000$)	-0.007	-0.003	-0.006	-0.007	-0.008	-0.008	-0.008	-0.008	-0.008	-0.007
Disposable Personal Income (Bil. Fixed 2000$)	0.087	0.084	0.083	0.082	0.080	0.079	0.077	0.075	0.074	0.073
Demand (Bil.Fixed 2000$)	0.088	0.100	0.110	0.116	0.121	0.125	0.128	0.131	0.135	0.139
Output (Bil. Fixed 2000$)	0.053	0.058	0.063	0.066	0.068	0.069	0.070	0.071	0.073	0.074
Labor Productivity (Thous. Fixed 2000$)	0.334	0.318	0.308	0.299	0.293	0.288	0.285	0.281	0.276	0.271
Relative Delivered Price	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Relative Cost of Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Average Annual Compensation Rate (Thous. $)	-0.449	-0.472	-0.494	-0.515	-0.535	-0.555	-0.576	-0.597	-0.617	-0.638
Population (000)	-0.112	-0.210	-0.275	-0.320	-0.349	-0.369	-0.380	-0.385	-0.384	-0.379
Labor Force (000)	-0.138	-0.249	-0.307	-0.337	-0.351	-0.355	-0.352	-0.345	-0.335	-0.321

Source: Kavet, Rockler, and Associates, LLC and the REMI Model

TABLE D3
Estimated Percentage of Employees Covered by Health Insurance and Percentage of Employment by Establishment Size

Industry	Percentage of Establishments by Employee Size Class					Percent Insured Employment
	<10	10-19	20-49	50-249	250+	
Forestry et al.	79.8	11.7	8.5	0.0	0.0	55.2
Agriculture	45.5	15.2	5.8	0.0	33.5	67.2
Oil & Gas Extraction	100.0	0.0	0.0	0.0	0.0	51.0
Mining (except oil, gas)	27.2	14.4	23.2	13.0	22.2	74.9
Support activities for mining	100.0	0.0	0.0	0.0	0.0	51.0
Utilities	11.2	3.8	10.1	26.5	48.4	88.1
Construction	44.3	15.9	22.6	11.4	5.8	66.6
Wood product mfg	14.7	7.6	20.5	27.7	29.5	83.8
Nonmetallic mineral prod mfg	19.3	11.8	21.6	32.8	14.6	79.9
Primary metal mfg	23.2	11.5	30.7	34.6	0.0	76.9
Fabricated metal prod mfg	15.0	7.6	24.8	20.3	32.4	83.2
Machinery mfg	7.4	3.0	10.4	24.2	55.0	91.3
Computer, electronic prod mfg	9.1	5.0	10.0	18.7	57.3	89.6
Electrical equip, appliance mfg	3.7	1.5	4.0	11.1	79.7	95.6
Motor vehicle mfg	7.1	9.8	10.6	11.9	60.7	90.0
Transp equip mfg. exc. motor veh	6.6	4.9	13.1	0.0	75.4	91.3
Furniture, related prod mfg	16.6	11.3	15.9	22.8	33.3	82.3
Miscellaneous mfg	20.6	7.5	15.0	28.2	28.8	80.5
Food mfg	12.1	7.0	15.0	27.0	38.8	86.3
Beverage, tobacco prod mfg	13.4	4.6	12.3	34.5	35.3	86.1
Textile mills	15.5	4.6	24.6	55.3	0.0	83.3
Textile prod mills	34.2	27.6	27.8	10.4	0.0	69.2
Apparel mfg	20.4	7.7	31.1	40.8	0.0	79.1
Leather, allied prod mfg	31.0	17.2	0.0	51.9	0.0	74.0
Paper mfg	4.0	0.0	3.0	6.8	86.2	95.8
Printing, rel supp act	14.8	16.9	16.5	20.1	31.6	82.3
Petroleum, coal prod mfg	45.2	27.3	0.0	27.5	0.0	66.1
Chemical mfg	10.9	5.8	11.8	26.5	45.1	87.8
Plastics, rubber mfg	6.0	4.2	9.5	14.9	65.3	92.2
Wholesale trade	22.3	13.2	25.0	24.3	15.2	77.6
Retail trade	21.7	17.4	30.2	18.6	12.0	76.9
Air transportation	9.2	0.0	7.3	41.3	42.2	90.7
Rail transportation	12.2	1.4	5.7	36.6	44.0	88.3

Industry	Percentage of Establishments by Employee Size Class					Percent Insured Employment
	<10	10-19	20-49	50-249	250+	
Water transportation	25.2	18.6	0.0	56.2	0.0	76.9
Truck transp; Couriers, msngrs	28.1	9.2	25.3	24.7	12.6	75.0
Transit, ground pass transp	12.6	8.8	23.6	45.4	9.7	84.6
Pipeline transportation	100.0	0.0	0.0	0.0	0.0	51.0
Scenic, sightseeing transp; supp	38.2	23.4	25.9	12.5	0.0	68.0
Warehousing, storage	15.7	0.0	6.2	42.1	35.9	85.9
Publishing, exc Internet	17.5	7.7	27.4	20.2	27.1	81.3
Motion picture, sound rec	33.6	13.6	36.4	16.4	0.0	70.8
Internet serv, data proc, other	31.7	14.1	17.9	13.4	22.9	73.0
Broadcasting, exc. Internet, Telecomm	17.8	12.3	25.2	26.6	18.1	80.4
Monetary authorities, et al.	19.0	23.6	20.3	16.6	20.6	78.2
Sec, comm contracts, inv	43.2	15.5	14.9	16.8	9.5	67.5
Ins carriers, rel act	30.4	14.2	24.5	15.3	15.6	73.2
Real estate	53.5	13.4	17.7	12.0	3.4	63.4
Rental, leasing services	29.7	28.6	34.5	7.2	0.0	70.7
Prof, tech services	41.1	17.6	23.4	12.3	5.5	67.7
Mgmnt of companies, enterprises	9.7	5.8	15.6	24.1	44.8	88.3
Administrative, support services	36.2	12.8	17.0	20.5	13.5	71.0
Waste mgmnt, remed services	25.3	22.4	32.6	19.7	0.0	73.9
Educational services	14.5	4.7	15.9	22.1	42.8	85.0
Ambulatory health care services	22.7	16.8	26.0	17.7	16.8	76.8
Hospitals	1.8	0.0	0.0	0.0	98.2	98.3
Nursing, residential car facilities	6.7	4.1	17.4	25.0	46.8	90.7
Social assistance	21.7	15.9	30.0	22.5	9.9	77.1
Performing arts, spectator sports	58.0	16.7	10.5	14.8	0.0	61.7
Museums et al.	34.2	11.2	25.7	28.9	0.0	71.5
Amusement, gambling, recrecation	23.6	10.0	18.6	20.2	27.5	78.0
Accommodation	20.8	9.7	17.9	25.6	26.1	79.8
Food services, drinking places	17.3	11.0	33.6	35.0	3.0	80.2
Repair, maintenance	48.9	24.5	23.7	2.9	0.0	63.6
Personal, laundry services	43.9	20.1	26.7	9.3	0.0	66.0
Membership assoc, organ	37.7	23.0	24.7	14.6	0.0	68.4

Source: Kavet, Rockler, and Associates using Vermont Department of Labor Employee Benefits Survey and U.S. Department of Commerce, “County Business Patterns, 2004”.

Through simplification of reporting and accounting requirements, administration costs for insurers to handle reimbursements and claims will decline by $83 million. This represents a reduction in demand for business services that do the bookkeeping and processing, and as such is a reduction in intermediate services demand, i.e., purchases made by insurance firms for administrative services.

- $92 million reduction in hospital administration costs

REMI does not specifically permit us to adjust intermediate purchases of administration services made by hospitals. However, there are several ways in which this cost reduction can occur. One possibility is in the form of reduced general production costs, the other is in the form of increased proprietors' income, i.e., the portion of income that includes profits. We have selected this latter option. Entering the change as a production cost decrease applies to all factors of production, both labor and capital. Assuming an increase in profits, however, is less restrictive and creates less distortion with respect to factor prices and creates a higher return on both labor and capital, leading to business expansion.

- $38 million reduction in physician administration costs

As in the case of reduced hospital administration costs, we treat a reduction in physicians' administrative costs as generating greater profits within their practices.

- $162 million increased health care utilization by previously under- and uninsured persons.

We handle an increase in health care utilization as an exogenous increase in demand for health care services. Note that this is not the same thing as increased health care output, as Vermont residents routinely obtain some health care in neighboring states, either for reasons of proximity to large medical centers and physicians, or to obtain specialty services. Not all Vermont demand translates into output, with the REMI model estimating that 87 percent of the value of health care demand in Vermont is realized as output in Vermont.

- $51 million in decreased total costs

With overall "savings" of $51 million, expenditures no longer required to provide health care cover must be accounted for in the overall State economy (Nothing disappears without an impact). To the extent that these savings ultimately revert to all citizens of Vermont, we could hypothesize an increase of disposable income equal to $51 million. REMI, however, would interpret this as an exogenous decrease in effective tax rates, altering relative production costs in a way that might distort the level of aggregate taxation in the State. One alternative would be to reduce employer profitability, as we did in the case of administration costs,

and another would be to increase employee compensation rates, essentially having the incidence of the cost reductions benefit those presumed to bear the costs of insurance. For our estimates, we treated this reduction as an increase to employer profitability, since the general reduction in administration costs can be presumed to appear in the costs of intermediate purchases administrative services for all businesses have to process and provide health insurance.

Taking into account all of these changes simultaneously, we show in Table D2 the net impact of sample estimated changes in expenditures, and our assumptions as to where they should enter the State economy. We see that the overall impact of this sample, using the assumptions provided, will have relatively small aggregate effects if changes are of the anticipated magnitudes: Increased coverage comes at some cost, with the loss of employment of nearly 800 jobs in 2007, but with diminishing impact by 2016 of employment losses of approximately 360 jobs from the baseline forecast. The bulk of these come in the administrative services industry, which in aggregate sees a decline in demand of $213 million.

Gross regional product (GRP) grows by nearly $25 million in the early years, reaching $34 million by 2016. Overall, demand and output follow suit with GRP, both showing small gains, but the loss of jobs performing administrative functions for hospitals, physicians, and insurance companies forces some out-migration from the region and a small decline in the labor force. Comprehensive detail on employment, income, and demographic changes are shown in Tables D4 to D8 at the end of this appendix.

It is possible to do similar exercises using a sales tax or a personal income tax to generate the needed revenue to fund the system. Based on our analysis, substituting sales taxes for a payroll tax induced wage cuts (as we have shown here) may generate slightly lower job loss but also generates lower GRP and higher population loss. A system based on personal income tax produces relatively greater job loss and lower GRP for an equivalent quantity of revenue, but higher personal income and wage rates also result. Consideration of these general tendencies, however, would appear to be premature, pending analyses of direct expenditure changes by function and other behavioral changes that could be affected by tax rate levels.

Hypothetical “$100 Million” Program

We tested three alternative funding sources with respect to their economic impact on the State economy. These included a payroll tax, a sales tax, and a personal income tax. In all cases, we imposed a tax designed to raise $100 million in current (2007) dollars to replace an equivalent value of insurance now privately funded. In replacing privately funded insurance, we “return” $100 million to insured workers through increased wages, consistent with the previously stated proposition that workers have borne the cost of employer-

provided insurance through wage adjustments. For both the payroll tax (levied on uninsured workers), and the personal income tax (levied on all forms of income), the effects on the State economy of replacing wage-derived payments with the tax-derived ones are minimal. As shown in Tables D9 and D10, the substitution of payroll and personal income tax sources for wage-derived ones have no measurable effect on the State economy. This is as it should be, since we are simply exchanging one source of in-State personal income with another. [8]

The one case where there is some measurable effect concerns the use of a sales tax. To generate $100 million in $2007 revenue to the State, we impose an additional sales tax of approximately 1.7 percentage points, generating about $108 million in the absence of cross-border and other substitution, yielding a net $100 million, once this is factored-out. Taxable purchases of the following types were assumed to occur: computers, other durable goods, food and beverages, clothing and shoes, other nondurable goods, and household operations expenditures, including supplies and materials. As we show in Table D11, gross state product would decline by $11 million in 2007 with losses increasing thereafter, reaching $44 million by 2016. Annual job losses would amount to approximately 260 in the first year but increase so that losses reach nearly 860 by 2016. Personal income, by virtue of higher compensation, goes in the opposite direction, growing initially by about $75 million ($2000), and after a small drop, stabilizes at nearly $70 million above the baseline estimate over the remainder of the period.

Thus, without considering any effects related to changes in the way health care is delivered or those of having increased insurance coverage of the population, replacing the current funding approach for those already insured to a State administered income - or payroll tax scheme will have little effect on the State economy. A sales tax, however, absent some change in worker productivity or recovery of monies “lost” to a sales tax through lower out-of-pocket expenditures, would likely cause some job and state product losses, even after considering the offsetting changes in wage income.

[8] Note that we have not considered the cost or efficiency of collection methods. In the cases of payroll and personal income taxes, there are currently mechanisms in place for their collection, but costs of collection may differ depending on relative efficiency of each.

Appendix D-Table D4: Summary Economic Impact of Preliminary Single-Payer Insurance Plan with Payroll Tax Funding

Variable	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Emp (Thous)	-0.793	-0.690	-0.599	-0.538	-0.494	-0.463	-0.434	-0.410	-0.382	-0.356
Total GRP (Bil Chained 2000$)	0.025	0.027	0.029	0.031	0.032	0.032	0.032	0.033	0.033	0.034
Total GRP (Bil Fixed 2000$)	0.026	0.029	0.031	0.033	0.034	0.035	0.036	0.036	0.037	0.038
Personal Income (Bil Nom $)	0.123	0.123	0.125	0.126	0.127	0.128	0.129	0.130	0.131	0.133
PCE-Price Index (Fixed 2000$)	-0.007	-0.003	-0.006	-0.007	-0.008	-0.008	-0.008	-0.008	-0.008	-0.007
Real Disp Pers Inc (Bil Fixed 2000$)	0.087	0.084	0.083	0.082	0.080	0.079	0.077	0.075	0.074	0.073
Demand (Bil Fixed 2000$)	0.088	0.100	0.110	0.116	0.121	0.125	0.128	0.131	0.135	0.139
Output (Bil Fixed 2000$)	0.053	0.058	0.063	0.066	0.068	0.069	0.070	0.071	0.073	0.074
Labor Productivity (Thous Fixed 2000$)	0.334	0.318	0.308	0.299	0.293	0.288	0.285	0.281	0.276	0.271
Imports from Rest of Nation (Bil Fixed 2000$)	0.012	0.017	0.021	0.024	0.027	0.029	0.030	0.032	0.034	0.037
Imports from Rest of World (Bil Fixed 2000$)	0.024	0.026	0.027	0.028	0.028	0.029	0.030	0.030	0.031	0.031
Self Supply (Bil Fixed 2000$)	0.052	0.058	0.062	0.064	0.066	0.067	0.068	0.069	0.070	0.071
Exports to Multiregions (Bil Fixed 2000$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Exports to Rest of Nation (Bil Fixed 2000$)	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002
Exports to Rest of World (Bil Fixed 2000$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Exogenous Industry Sales (Bil Fixed 2000$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Exogenous Industry Demand (Bil Fixed 2000$)	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129
Ave Ann Comp Rate (Thous Nom $)	-0.449	-0.472	-0.494	-0.515	-0.535	-0.555	-0.576	-0.597	-0.617	-0.638
Population (Thous)	-0.112	-0.210	-0.275	-0.320	-0.349	-0.369	-0.380	-0.385	-0.384	-0.379
Labor Force	-0.138	-0.249	-0.307	-0.337	-0.351	-0.355	-0.352	-0.345	-0.335	-0.321

Source: Kavet, Rockler, and Associates, LLC and the REMI Model

Appendix D-Table D5: Gross Regional Product Impact of Preliminary Single-Payer Insurance Plan with Payroll Tax Funding ($2000, bil.)

Variable	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Consumption	0.114	0.114	0.117	0.119	0.122	0.124	0.126	0.128	0.131	0.133
Total Fixed Investment	0.017	0.024	0.028	0.029	0.030	0.030	0.029	0.029	0.029	0.029
Inventory change net Valuation Adjustment	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Exogenous Final Demand	0.122	0.121	0.120	0.120	0.119	0.118	0.117	0.116	0.115	0.114
Total Government	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Total Exports	0.000	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003	0.003
Total Imports	0.281	0.290	0.298	0.303	0.308	0.312	0.316	0.319	0.323	0.328

Source: Kavet, Rockler, and Associates, LLC and the REMI Model

Appendix D-Table D6: Employment Impact of Preliminary Single-Payer Insurance Plan with Payroll Tax Funding (000)*

Variable	2007.000	2008.000	2009.000	2010.000	2011.000	2012.000	2013.000	2014.000	2015.000	2016.000
By Sector (Total)	-0.793	-0.690	-0.599	-0.538	-0.494	-0.463	-0.434	-0.410	-0.382	-0.356
By Demand Source (Priv.	-0.785	-0.675	-0.580	-0.515	-0.469	-0.437	-0.408	-0.383	-0.355	-0.329
As % of Nation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Private Non-Farm	-0.785	-0.675	-0.580	-0.515	-0.469	-0.437	-0.408	-0.383	-0.355	-0.329
Nat Res, Mining, Util, Co	0.163	0.221	0.239	0.236	0.223	0.206	0.187	0.169	0.154	0.140
Mining	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Forestry, Fishing, Othe	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Utilities	0.011	0.011	0.011	0.011	0.010	0.010	0.010	0.010	0.010	0.009
Construction	0.150	0.207	0.226	0.223	0.210	0.193	0.174	0.157	0.141	0.128
Manufacturing	0.026	0.028	0.029	0.030	0.030	0.030	0.030	0.030	0.030	0.029
Trade	0.736	0.728	0.711	0.696	0.680	0.665	0.649	0.632	0.620	0.610
Wholesale Trade	0.049	0.049	0.048	0.048	0.047	0.047	0.046	0.045	0.045	0.044
Retail Trade	0.687	0.679	0.663	0.648	0.633	0.619	0.603	0.586	0.575	0.566
Transp, Inform, Fin Act	0.131	0.129	0.128	0.126	0.124	0.121	0.119	0.116	0.114	0.112
Transp, Warehousing	0.008	0.008	0.009	0.009	0.009	0.009	0.008	0.008	0.008	0.008
Information	0.025	0.025	0.026	0.026	0.026	0.026	0.026	0.025	0.025	0.025
Finance, Insurance	0.061	0.060	0.059	0.058	0.057	0.056	0.055	0.053	0.052	0.051
Real Estate, Rental, Lea	0.036	0.036	0.035	0.034	0.032	0.031	0.030	0.029	0.028	0.028
Services	-1.841	-1.781	-1.686	-1.603	-1.526	-1.460	-1.392	-1.329	-1.272	-1.221
Profess, Tech Services	0.057	0.060	0.062	0.063	0.064	0.064	0.064	0.063	0.064	0.064
Mngmt of Co, Enter	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Admin, Waste Services	-3.085	-3.014	-2.917	-2.824	-2.735	-2.652	-2.570	-2.492	-2.427	-2.364
Educational Services	0.058	0.059	0.059	0.060	0.060	0.061	0.061	0.061	0.062	0.062
Health Care, Social Ass	0.278	0.271	0.280	0.282	0.283	0.276	0.275	0.275	0.275	0.269
Arts, Enter, Rec	0.116	0.115	0.114	0.112	0.111	0.109	0.107	0.106	0.104	0.104
Accom, Food Services	0.402	0.400	0.392	0.385	0.379	0.373	0.366	0.359	0.354	0.351
Other Services (excl Go	0.333	0.328	0.323	0.319	0.314	0.309	0.304	0.298	0.295	0.293
Public Admin	-0.008	-0.015	-0.019	-0.022	-0.024	-0.026	-0.027	-0.027	-0.027	-0.027
Farm	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

***-Additional sectoral detail available for major sectors.**

Source: Kavet, Rockler, and Associates, LLC and the REMI Model

Appendix D-Table D7: Personal Income Impact of Preliminary Single-Payer Insurance Plan with Payroll Tax Funding ($, bil.)

Variable	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
As % of Nation	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Earnings by Place of Work	0.103	0.103	0.105	0.105	0.106	0.106	0.105	0.105	0.105	0.105
Contr for Gov Social Ins	-0.024	-0.025	-0.027	-0.028	-0.030	-0.031	-0.033	-0.035	-0.036	-0.038
Adj for Residence	-0.007	-0.007	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008	-0.008
Dividends, Interest, and Rent	0.000	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Personal Current Transfer Receipts	0.004	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000
Personal Income	0.123	0.123	0.125	0.126	0.127	0.128	0.129	0.130	0.131	0.133
Personal Taxes	0.016	0.016	0.017	0.017	0.017	0.017	0.017	0.018	0.018	0.018
Disposable Pers Inc	0.107	0.106	0.108	0.109	0.110	0.111	0.112	0.112	0.113	0.115

Source: Kavet, Rockler, and Associates, LLC and the REMI Model

Appendix D-Table D8: Population and Labor Force Impact of Preliminary Single-Payer Insurance Plan with Payroll Tax Funding

Variable	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Population (000)	-0.112	-0.210	-0.275	-0.320	-0.349	-0.369	-0.380	-0.385	-0.384	-0.379
Population As % of Nation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Labor Force (000)	-0.14	-0.25	-0.31	-0.34	-0.35	-0.35	-0.35	-0.35	-0.33	-0.32

Source: Kavet, Rockler, and Associates, LLC and the REMI Model

Table D9: Summary Economic Impact of $100 Million Payroll Tax Funding On Uninsured With $100 Million Offset on Insured Payroll

VARIABLE	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Employment (000)	-0.002	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
Total Gross State Product (Bil., 2000$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Personal Income (Bil, current $)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
PCE-Price Index (2000=100)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Real Disp Pers Inc (Bil., 2000$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Demand (Bil., 2000$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Output (Bil Fixed 2000$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Labor Productivity (Thous., 2000$)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Relative Delivered Price	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Relative Cost of Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Average Annual Compensation Rate (Thous., current $)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Population (Thous.)	0.000	-0.001	-0.001	-0.001	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002
Labor Force (Thous.)	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001

Source: Kavet, Rockler, and Associates, LLC and the REMI Model

Table D10: Summary Economic Impact of $100 Million Personal Income Tax Funding On Uninsured With $100 Million Offset on Insured Payroll

VARIABLE	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Employment (000)	-0.001	0.005	0.009	0.014	0.018	0.023	0.027	0.031	0.034	0.037
Total Gross State Product (Bil., 2000$)	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.002
Personal Income (Bil, current $)	0.000	0.001	0.001	0.002	0.003	0.003	0.004	0.005	0.006	0.007
PCE-Price Index (2000=100)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Real Disp Pers Inc (Bil., 2000$)	0.000	0.000	0.001	0.001	0.002	0.002	0.002	0.003	0.003	0.004
Demand (Bil., 2000$)	0.000	0.001	0.001	0.002	0.003	0.003	0.004	0.005	0.006	0.006
Output (Bil Fixed 2000$)	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.003
Labor Productivity (Thous., 2000$)	0.000	0.000	-0.001	-0.001	-0.002	-0.002	-0.003	-0.004	-0.004	-0.004
Relative Delivered Price	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Relative Cost of Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Average Annual Compensation Rate (Thous., current $)	0.093	0.096	0.099	0.102	0.106	0.109	0.113	0.116	0.120	0.123
Population (Thous.)	-0.009	-0.016	-0.021	-0.025	-0.027	-0.029	-0.029	-0.029	-0.029	-0.029
Labor Force (Thous.)	-0.010	-0.015	-0.019	-0.020	-0.021	-0.021	-0.020	-0.019	-0.017	-0.016

Source: Kavet, Rockler, and Associates, LLC and the REMI Model

Table D11: Summary Economic Impact of $100 Sales Tax Price Change On Uninsured With $100 Million Offset on Insured Payroll

VARIABLE	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Employment (000)	-0.256	-0.352	-0.429	-0.497	-0.561	-0.622	-0.682	-0.742	-0.802	-0.863
Total Gross State Product (Bil., 2000$)	-0.011	-0.015	-0.019	-0.023	-0.026	-0.030	-0.033	-0.037	-0.041	-0.044
Personal Income (Bil, current $)	0.075	0.073	0.071	0.070	0.070	0.069	0.069	0.069	0.068	0.067
PCE-Price Index (2000=100)	0.589	0.601	0.621	0.641	0.662	0.682	0.703	0.724	0.745	0.766
Real Disp Pers Inc (Bil., 2000$)	-0.028	-0.033	-0.038	-0.043	-0.047	-0.051	-0.055	-0.059	-0.063	-0.067
Demand (Bil., 2000$)	-0.041	-0.054	-0.064	-0.073	-0.082	-0.090	-0.099	-0.108	-0.117	-0.126
Output (Bil Fixed 2000$)	-0.015	-0.021	-0.025	-0.030	-0.034	-0.039	-0.044	-0.049	-0.055	-0.061
Labor Productivity (Thous., 2000$)	0.015	0.018	0.020	0.023	0.027	0.030	0.034	0.038	0.041	0.046
Relative Delivered Price	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Relative Cost of Production	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Average Annual Compensation Rate (Thous., current $)	0.271	0.284	0.298	0.313	0.328	0.344	0.360	0.377	0.392	0.408
Population (Thous.)	-0.518	-0.974	-1.380	-1.744	-2.073	-2.372	-2.644	-2.895	-3.127	-3.344
Labor Force (Thous.)	-0.485	-0.742	-0.953	-1.131	-1.281	-1.412	-1.527	-1.630	-1.724	-1.807

Source: Kavet, Rockler, and Associates, LLC and the REMI Model