Economic Impact Analysis: Placing Treasury Managed Funds in Virginia Banks

Aaron Hugeback

Matt Michenfelder

Rui Pereira

The Thomas Jefferson Program in Public Policy
The College of William and Mary
Policy Research

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EXECUTIVE SUMMARY

1. Introduction

The General Assembly of the Commonwealth of Virginia commissioned the Joint Legislative Audit and Review Commission to evaluate the impact of legislation that would require the Virginia Treasury to invest funds in financial institutions qualified to receive deposits in the Commonwealth of Virginia. The objective of this legislation is to promote economic growth in Virginia and create jobs by supporting state banks.

Local governments in Virginia may place their short term deposits in the Local Government Investment Pool (LGIP) which is managed by the Virginia State Treasurer. The proposed legislation would require the Treasury to invest at least 10% of the LGIP in banks in the Virginia, as stated:

> *…no less than 10 percent of local government investment pool assets shall be invested in time, savings, or demand deposits at financial institutions qualified to accept public deposits under Chapter 44 (§ 2.2-4400 et seq.) of this title.*

The objective of this study is to evaluate the economic impact of the proposed legislation in order to inform the policy process. In this respect, our goal is to assess the extent to which the proposed policy will have a positive impact on economic output, employment, earnings, value added and tax revenue in Virginia as a result of increasing the amount of funds available for extending loans to businesses and individuals in Virginia and as a result of supporting banking operations in Virginia. As such the proposed legislation has two primary forces driving its economic impact, an increase in the demand for banking services and an increase in loans to businesses and individuals in the Commonwealth.

2. Literature Review

The literature provides a wide range of experiences in evaluating and supporting loan programs and the banking industry. Two key questions immediately arise. The first concerns the choice of methodology for economic impact analysis and the second, the assumptions underlying the application of that methodology.

Input-output modeling is overwhelmingly the most common method used to evaluate the economic impact of a policy or a program, as reflected by its use in the studies evaluated in this paper. The flexibility of such analysis lends it to broad application, while the comprehensive catalog of inter-industry relationships allows for the quick projection of the economic impact of a given program or policy. Input-output analysis is the best tool for economic impact analysis in virtue of its wide use, its reliable predictions of inter-industry spending, and its ability to analyze a wide variety of policies and programs. As a result, we use the Regional Input-Output Modeling System developed by the Department of Commerce, Bureau of Economic Analysis to evaluate the economic impact of the proposed legislation. In addition, we compare these estimates to those obtained by the IMPLAN model, a commonly used input-output modeling system used in economic impact analysis.

Beyond the larger methodological question, the issue of correct use of input-output models arises. The underlying assumptions that determine the direct impact of a policy are crucial to accurately modeling the impact of a policy. The primary assumptions driving the direct impacts of policies and the proper use of input-output models can be roughly divided into three broad categories:

1) Scale Effects
2) Proportionality
3) Causality and the Business as Usual Scenario

First, the scale of the particular policy under evaluation often generates issues with respect to the adequacy of the input-output modeling framework. The scale assumption is typically violated when a policy has a large and significant impact on regional or national markets, affecting prices and inducing nonlinearities in the economic impact of the policy through various feedback mechanisms. Another source of error arises when a large policy change is subject to appreciable diminishing marginal returns to scale due to significantly increased input volumes. The reason why this framework is adequate for evaluating the impact of the proposed legislation on economic activity in Virginia is that the volume of deposits under consideration constitutes less than 0.15% of total deposits in Virginia. As a result, the proposed legislation is not expected to have an impact on the rates offered by banks on loans nor on the rates offered by banks for savings accounts and certificates of deposit.

Second, the model works by assuming that all inputs are used in fixed proportions. This does not allow for the fact that an important component of output is tied to variable costs that may adjust more rapidly than employment levels. In addition, the fixed input production technology does not allow for price-induced substitution. Again, due to the relatively low levels of deposits under consideration this study should not be unduly influenced by this assumption.

Third, various studies attribute a significant degree of causality between the policy under consideration and the resulting loan volumes. These studies do not adequately distinguish between the direct effect of the policy under evaluation on loan volumes and the level of loans that would exist in the absence of the policy. The true impact of the policy is a function of the funds available in-state for loans and those loans that will be displaced. This effect can be fully captured by considering the appropriate percentage of the investment that result in new loans in Virginia.

3. Methodology

This study follows the flow of Treasury funds from the banks to the loans that those funds would originate. The key steps are summarized as follows:

1. Determine the reserve ratio for banks;
2. Determine the percent of resulting loans issued in the state by industry sector.

To evaluate the impact of the proposed legislation on loan volumes and the resulting impact on the Virginia economy, we consider three primary factors. First, we adjust the total volume of funds invested for the current loan-to-deposit ratio observed in Virginia in order to more fully capture the recent economic climate. Second, we adjust the volume of loans by the percentage of loans that are issued in state versus those that go out of state. Finally, we allocate those loans to particular sectors of the economy in a fashion consistent with the available investment data. We exclude loans to individuals from the analysis because these do not provide a stimulus to economic activity in Virginia but rather shift spending by households forward through time. The premium families must pay for these loans reflects their time preference for consumption and effectively reduces overall consumption levels.

To evaluate the expected economic impact of increased lending within Virginia, the amount of loans resulting from the Treasury depositing money into Virginia banks must be established. The loan-to-deposit ratio measures the total amount of loans held by banks, or the bank's assets, and the total amount of deposits held by banks, or the banks liabilities, and provides an estimate for the amount of money available for loans as a result of an increase in deposits in banks. Banks are required by law to hold a specific level of reserves for deposits and negotiable certificates of deposit. Beyond what is required by law, banks may choose to hold a greater volume of funds, and do so typically when macroeconomic growth is less pronounced. This allows the bank to improve its financial position. In addition, during times of recession,

investor and consumer confidence can play an important role in defining the amount of deposits held by banks. To most fully reflect the current macroeconomic environment we consider the most recent 2008 observed loan-to-deposit ratio reported by the FDIC of 0.73.

To determine the volume of those funds that originate loans in Virginia, we consider three scenarios. The first is a pessimistic scenario in which all banks in Virginia issue loans in Virginia in a manner consistent with the percentage of the national loan market accounted for by loans in Virginia. In this respect, in 2008, 3.1% of the loans issued in the United States were for households and companies in Virginia. Our second scenario accounts for the fact that state chartered banks may have limited access to information about credit markets outside of their region of operation and therefore loan 85% of the loanable funds they have available to customers in Virginia while national, federally chartered banks issue only 3.1% of their loanable funds to customers in Virginia. Our third scenario is our most optimistic scenario which assumes that 85% of all loanable funds are designated for customers in Virginia.

We consider three levels of economic impacts that result from the proposed legislation. First, the increase in the demand for banking services provides a positive stimulus to the banking industry. Second, once reserve requirements have been satisfied and banks have offered loans to businesses and individuals across the United States, banks in Virginia can take advantage of their knowledge of local markets and issue loans to companies in Virginia. Finally, recognizing that institutions in Virginia are best situated to evaluate local credit markets, banks can issue loans and sell these loans out of state which generates a money multiplier effect. Note that this effect results in a geographic redistribution of funds, not an increase in the money supply.

3. Results

All of the scenarios we employ consider the most recent loan-to-deposit ratio of 0.73. Our central scenario assumes that federally charted banks loan 3.1% of their deposits in Virginia and State chartered banks loan 85.0% of their deposits in Virginia. Our pessimistic scenario assumes that both state chartered and federally chartered banks would loan 3.1% of funds within Virginia. Our optimistic scenario assumes both state chartered and federally chartered banks would loan 85% of funds within Virginia

Our results can then be summarized as follows:

- In our central scenario, using the RIMS II model, this policy would increase economic output by $663 million, increase employment by 3,074 jobs, increase earnings by $330 million, and increase value added by $413 million. The IMPLAN model estimates indicates that indirect business taxes increase by $22 million.
- In our pessimistic scenario, the RIMS II model estimates indicate that this policy would increase output by $621 billion, increase employment by 2,917 jobs, increase earnings by $325 million, and increase value added by $389 million. The IMPLAN estimates $19 million increase indirect business tax revenue.
- In our optimistic scenario, the RIMS II model estimates that this policy would increase output by $1.5 billion, increase employment by 6,238 jobs, increase earnings by $437 million, and increase value added by $905 million. The IMPLAN model adds to this analysis an assessment that the policy increases indirect business tax revenue by $83 million.

4. Conclusion

This paper examines the economic impact of proposed legislation in the Commonwealth of Virginia that would require the State Treasurer to invest at least 10% of the Local Government Investment Pool in financial institutions in Virginia. The proposed legislation generates two important stimuli for economic activity, the first in increasing loan volumes by increasing deposits in banks and the second by directly increasing the demand for bank services and operations in Virginia. This policy would increase economic output by $663 million, increase employment by 3,074 jobs, increase earnings by $330 million, and increase value added by $414 million. The IMPLAN model estimates indicates that indirect business taxes increase by $22 million. The lion's share of these benefits, with respect to increases output, occurs in the banking industry and in the real estate sector.

While this study provides a clear, comprehensive assessment of the economic impact of the proposed legislation in terms of the impact of increases in bank operations and increases in lending activity, it is a principal component of a larger ongoing policy evaluation process that necessarily considers the impact of this policy on yields in the Local Government Investment Pool as well as the distributional implications of this policy.

Further research on the economic impact of the proposed legislation would also include a survey component designed to better assess the impact of bank structure and type on the loan-to-deposit ratio and the client base for lending operations at the bank. The survey could provide robust estimates for these key parameters and allow for a finer analysis of the impact of deposits in community banks relative to larger national banks.

The Economic Impact of Placing Treasury Managed Funds in Virginia Banks

1 INTRODUCTION

The General Assembly of the Commonwealth of Virginia commissioned the Joint Legislative Audit and Review Commission to evaluate the economic impact of legislation that would require the Virginia Treasury to invest funds in financial institutions qualified to receive deposits in the Commonwealth of Virginia. The objective of this legislation is to promote economic growth and create jobs by supporting state banks.

Local governments in Virginia may place their short term deposits in the Local Government Investment Pool (LGIP) which is managed by the Virginia State Treasurer. The proposed legislation would require the Treasury to invest at least 10% of the LGIP in banks in Virginia, as stated:

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The objective of this study is to evaluate the economic impact of the proposed legislation in order to inform the policy process. In this respect, our goal is to assess the extent to which the proposed policy will have a positive impact on employment, output and state tax revenue in Virginia as a result of increasing the amount of funds available for extending loans to businesses and individuals in Virginia and increasing banking operations in Virginia.

Financial and credit markets provide a much needed source of capital to businesses and individuals, encouraging investment to stimulate economic growth and financing the purchase of homes. Failures in financial and credit markets drove the Great Depression and the Savings and Loan crisis, two of the most significant economic events of the 20th century. The financial crisis of October 2008 demonstrated how intertwined Main Street and Wall Street really are, with double digit unemployment in many parts of the country and the stock market losing more than 30 percent of its value.

The failure of several large investment banks, including Bear Sterns and Lehman Brothers, which precipitated the loss in value of the stock market, is often attributed to default – and the risk of default – on mortgages which served as collateral for exchange traded securities. These mortgage backed securities, together with the widespread use of complex financial instruments, particularly credit default swaps, which function as insurance against the failure of bonds and loans, led to a particularly difficult and tumultuous period of economic decline with losses in economic output, high levels of unemployment and a crisis of confidence. These demanded federal response and led to the Troubled Asset Relief Program (TARP) and the Economic Recovery Act, both designed to provide specific support to financial markets and encourage an increase in lending and government spending.

Lending had plummeted due to the uncertainty surrounding the risk associated with existing loan policies. In addition, the decline in value and the loss of liquidity reflected in bank balance sheets due to their inability to sell mortgage-backed securities generated a powerful credit constraint with far reaching economic consequences.

The Commonwealth of Virginia is not insulated from the larger economic and financial environment in the United States. Financial markets in the US are very closely connected. As subprime loans are sold across the US and used as collateral for securities, the resulting liquidity constraints played a real and important role in finance in the Commonwealth of Virginia. The presence of liquidity constraints in credit markets in Virginia is the primary factor for considering public sector intervention to assist in providing support to loan markets, particularly for small businesses and consumer finance because bank loans are the primary source of financing for investment and large expenditure items.

State level public policies to improve access to credit come in many shapes and sizes. Policies may require minimum returns on Treasury investments (Arrowhead Center, 2009) and provide affirmative government guaranteed loans to market segments with more limited access to credit (see for example, RESI Research and Consulting, 2005; Sage Policy Group, 2005; Economic Impact Group, 2006; Applied Development Economics, Inc. 2008; Barrera, 2009). In addition, various states have implemented linked deposit programs that tie public deposits in banks to the loans they provide. Also, the very existence of the local government investment pool is an important state and local government program with an impact on deposits in banks (Hattery, 2005).

The proposal presently under discussion in the Commonwealth would provide funds to community and national banks with operations in Virginia by investing a portion of the Local

Government Investment Pool in qualifying institutions in Virginia. The objective of this report is to describe the economics that can provide some insight into the impact of a capital infusion in banks in Virginia and the potential for a capital infusion to stimulate investment through loans to local businesses and families. This report will motivate and justify our methodological approach and provide a rigorous and systematic evaluation of methodologies, and particularly, the use of input-output models, for economic impact analysis. Finally, we determine the economic impact of having 10% of the Local Government Investment Pool, $420 million dollars in deposits in Virginia banks.

The remainder of this report is organized as follows. Chapter 2 reviews studies analyzing the importance of the banking industry and the impact of loan programs on the economy, focusing on the type of methodology and indicators used, important assumptions underlying these results and a careful review of the economic theory driving regional economic models. Chapter 3 outlines stylized data important for our analysis. Chapter 4 describes the methodology for studying the impact of requiring the Treasury to invest in local financial institutions. Chapter 5 presents the results of our analysis. Chapter 6 provides conclusions.

2 THE ECONOMIC IMPACT OF BANKING AND LOAN POLICIES: EXPERIENCES ACROSS THE UNITED STATES

Policies affecting the banking sector typically have two primary forces driving their economic impact, an increase in the demand for banking services and an increase in loans to businesses and individuals. Economic impacts from loan programs and municipal deposits can be analyzed in both economic and non-economic terms. Economic impacts are often stated in terms of their impact on economic output, employment, income, value added and tax revenue and are commonly restricted by area to a state, region, or city. Non-economic or non-quantified impacts, such as charitable contributions, sponsoring athletic events, employee volunteering, or services provided to municipalities like tax and fee collection, may also accrue.

2.1 INCREASED DEMAND FOR CREDIT INTERMEDIATION SERVICES

One of the more direct and important impacts of investing Treasury managed funds in financial institutions operating in the Commonwealth is to increase the demand for the services offered by the banking industry and increase output in that industry. In this respect, the proposed legislation would provide support for community banking and strengthen the banking industry in the Commonwealth.

The economic value of the financial services industry and its contribution to economic output and employment can be studied using an input-output accounting framework (Britton, 2007). The input-output modeling methodology, which will be discussed later, provides a framework for accounting for business expenditures and the ripple effect that demand in one industry drives through the economy.

The contribution of the banking industry to economic activity is evaluated in terms of the direct, indirect and induced effects of the industry on economic activity in Virginia. The direct contribution of the banking industry to economic output can be measured in terms of number of workers and the total value of output in the banking industry. In addition to the direct contribution of the banking sector, an indirect effect occurs through business expenditure on intermediate goods and services. In addition, workers in the banking industry spend their wages and salaries which increases demand for consumer goods creating an additional effect induced by the banking industry (Britton, 2007). These together give a fairly strong accounting framework for assessing the economic importance of the financial services industry in terms of its direct impact on output, the indirect impact measured through its effect on local industries and the induced impact through wages and salaries in the industry.

The very existence of the Local Government Investment Pool has important implications for the Banking Industry. In this respect, the economic impact of municipal bank deposits in New York was computed within this same methodological accounting framework using the IMPLAN model (Hattery, 2005). The study's purpose is to inform state and local decision makers of the benefits provided by New York banks and the economic impact of removing municipal deposits from New York banks to seek a greater rate of return elsewhere as is done with the adoption of local government investment pools across the United States.

The impact of banks on the economy has also been addressed using the REMI model (Boston Redevelopment Authority, 2008; Booz Allen Hamilton, 2009; New York Department of Labor, 2009). In one instance the direct impact of the dramatic volatility in financial markets during October of 2008 was measured in terms of a temporary loss in jobs in the finance and insurance sectors which are forecasted to recover the majority of those job losses by 2010 as the economy rebounds (Boston Redevelopment Authority, 2008). Similarly, the primary direct effect of the financial turmoil of October 2008 is measured in terms of jobs lost in the financial services industry, particularly in security and commodities trading. These generate various dynamic feedback effects within the model to determine the economic and fiscal impact of the financial market disruptions of October 2008 in Massachusetts, in the first study, and in the second study on New York and surrounding regions.

In the other instance, Booz Allen Hamilton studied the economic impact of a scenario involving the disruption of seven major banks, including Deutsche Bank, Barclays, and PNB Paribas. The direct impact of the failure of these banks on the US economy is felt as an increase in production costs resulting from the need to resort to higher interest short-term loans to satisfy current expenses. This cost increase was estimated to determine the percentage change in

production costs for a percentage change in loan volumes from these various banks. Booz Allen Hamilton then analyzed various scenarios considering the possibility of cascading failures among the banks (Booz Allen Hamilton, 2009).

2.2 INCREASED DEMAND BY SECTORS RECEIVING LOANS

In addition to their direct impact on depository credit intermediation, a capital infusion to banks is designed to increase loan volumes in the Commonwealth. This should result because an increase in bank capital will allow banks, once they have satisfied their reserve requirements, to increase loan volumes in order to maximize profits.

Various studies in the literature proceed from these foundations to determine the economic impact of loan programs. These studies range from specific Community Development Companies (see for example, RESI Research and Consulting, 2005; Sage Policy Group, 2005; Economic Impact Group, 2006) to loan programs administered by the Small Business Administration (Craig, 2004; Applied Development Economics, Inc., 2008) and loan programs to support small and minority owned businesses (Barrera, 2009). Typically, surveys are administered to determine the volume of funds loaned out and the sectors that are most directly affected by these loans. Alternatively, Federal Deposit Insurance Corporation (FDIC) Data is used to determine the incidence of loans by sector. The indirect and induced effects can then be determined by modeling systems such as RIMS II and IMPLAN.

A study of a policy in New Mexico to require Treasury managed funds to invest in products with money market rates equal to the London Interbank Offered Rates (LIBOR) for the CD program determined that the economic impact of these policies would most accurately be reflected in the impact of loans generated by banks on local communities. The direct impact of the policy requiring the Treasury to seek out minimum rates for CDs is computed by adjusting

the volume of funds in the CD program for the *loan-to-deposit ratio*, the *percent of non-replaceable funds*, *the loans not made by other institutions*, and *the percent of loans made to in-state customers*. The volume of funds was then further refined to determine the amount of money loaned to customers for real estate, commercial, industrial and consumer finance (Arrowhead Center, 2009).

The Independent Community Bankers Association (ICBA/NM) commissioned the Arrowhead Center at New Mexico State University to analyze the impacts of the policy changes the State Treasurer's Office (STO) were making to their Certificate of Deposit (CD) Program. The STO is concerned with the safety, liquidity, and yield of state funds. In addition, participating institutions can negotiate discounts or premiums depending on their risk profile. The ICBA/NM believes that these policy changes will either directly or indirectly increase the cost of participating in the program, resulting in fewer loans and leading to a decrease in economic activity (Arrowhead Center, 2009).

The ICBA/NM study is similar to a 1986 study that looked at the effects of increasing the cost of participation, increasing the collateralization requirements, and instituting a bidding process in the CD program in New Mexico. Data for the analysis was collected from FDIC reports and ICBA/NM member surveys which had a 63 percent response rate. IMPLAN Pro II (2006) was used to calculate the local economic impacts. Two important assumptions were made: that if the State did not invest the funds in local banks, they would be investing in financial institutions outside the state, so any money invested locally is considered new money; and second, local financial institutions would only participate if they could loan the funds out (Arrowhead Center, 2009).

Three-fourths of the institutions surveyed held state deposits. According to the survey respondents, if the STO charged rates consistent with the LIBOR instead of U.S. Treasury rate, which would cause institutions would to pay approximately 100 basis points over the traditional rate charged, many members would decrease participation in the CD program. This would shift participation to larger non-member institutions, many of whom would not meet the minimum performance criteria for collateralization. 71 percent of the ICBA/NM membership did not favor an in-state bidding process as it would increase the cost of state funds, redistribute funds from small institutions to large ones, and shift funds from less risky to more risky institutions and from rural to urban institutions. An increase in rates over the T-bill rate would cause 70 percent of the members to decrease their participation in the program (Arrowhead Center, 2009).

ICBA/NM member survey results indicate that they feel the STO is trying to maximize the rate of the return of the state's portfolio at the expense of the state's economic development, and if applied the new policies will have only adverse effects on state institutions. By increasing the rates institutions must pay to participate in the CD Program and/or increasing the collateralization requirements, the State is increasing the cost to the institutions. This will lead to a decrease in the number of institutions participating, which will lead to fewer business and individual loans, resulting in less economic activity and tax revenue. The initial decrease in economic activity would have a multiplier effect on local economies, decreasing economic activity by a greater amount than the initial direct effect on banks. A decrease in participation in the CD Program of 25 percent would lead to: a $17.5 million decrease in value added, a decrease in $12.2 million in personal income, a loss of 320 state jobs, and a loss of $746,000 in tax revenues. A decrease in participation in the CD Program of 100 percent would lead to: a

decrease in $70.2 value added, a decrease in $48.8 million in personal income, a loss of 1280 state jobs, and a loss of $2.985 million in tax revenues (Arrowhead Center, 2009).

Similarly, to determine the impact of Community Development Companies funded by the Small Business Administration in Maryland and Oklahoma, studies look that the economic impacts of providing loans and investments to underserved markets such as minority owned businesses. These direct effects on commercial and industrial sectors, real estate and households were then used to determine the indirect and induced effects of the policies (RESI, 2005; Economic Impact Group, 2006).

Another Community Development Company that evaluated the impact of its loan program on the economy is Community Development Ventures Inc. (CDV). CDV is a non-profit corporation operated by Meridian Management Group. CDV provides capital to businesses within Baltimore's Empowerment Zones and Enterprise Zones and the state of Maryland**.** In 2001, CDV received $4 million in funding from the state of Maryland and the Community Development Financial Institutions Fund from a program titled the "Maryland Emerging Business Initiative" (RESI, 2005).

The study uses IMPLAN to measure the effects of the contributions of CDV's clients firms to the Maryland economy. The direct effects are based on the initial output generated by the firms in the form of the sales of goods and services. The indirect effects occur when local vendors increase their spending on materials, goods and services, and employees, in order to meet their higher demand for output brought about by the operation of the CDV firms. The induced effects result from the increase in consumer spending by local resident employees of the companies in the CDV portfolio and the local businesses supplying goods and services in Maryland. The impacts are measured in the form of full-time equivalent jobs, the sales generated

in the form of goods and services, and the income produced from the cumulative annual operations of the CDV firms for the period. The total economic impact generated $177,903,010 in gross sales, $62,625,613 in income, and 544 jobs (RESI, 2005).

CDV's loan program was further examined by the Empower Baltimore Management Corporation (EMBC). EMBC provides funding for loans that CDV administers. EBMC commissioned Sage Policy Group Inc. (SPG) to study the economic impact of the funds EMBC makes available to local business entities through CDV. EBMC's mission is to foster sustained economic opportunities and build communities for minority owned business in the Baltimore area. A previous study conducted by SPG determined that minority-owned firms are underrepresented in the Baltimore area, and that a contributing factor is a lack of access to capital. Information asymmetries make it difficult for small businesses and minority run businesses to acquire loans. Because the CDV is serving a market with unmet demand for capital, the expected returns on investment would be high, provided proper screening and support of loan applicants. SPG surveyed firms that received funds through CDV. The survey results indicated that no alternatives to CDV loans existed when CDV extended financing. Firms responded that the financing was critical to both continued operation and expansion. It was also noted that the thorough application process improved firms' information organization practices, supporting subsequent business expansion (Sage Policy Group, 2005).

The EMBC study uses IMPLAN to determine the total multiplicative effect of loans and investments to firms provided by CDV. The general findings are that increasing financing availability to early-stage minority owned companies generates disproportionately large economic impacts, assuming effective asset management and screening of financial applicants. Looking specifically at the Maryland impacts, the loans and/or investments created or retained

834 jobs, generated $29.1 million in income, and produced $66.4 million in sales of goods and services (Sage Policy Group, 2005).

The Economic Impact Group, LLC (EIG) conducted a study to estimate the impacts of the Federal New Markets Tax Credit program, which provided tax incentives for private individuals to invest in Rural Enterprises of Oklahoma Inc (REI). REI is a Certified Development Company of the US Small Business Administration. REI administers a variety of lending programs designed to facilitate the expansion of business ventures, attracting capital to underserved areas by offering federal tax credits. The study looks at allocations and investments by REI during the period 2003-2005 and the economic impact within Oklahoma. In addition to their lending activities, REI also oversees a Women's Business Center, manages business incubators designed to help young businesses mature, offers affordable housing options through the administration of the Employer-Assisted Housing (EAH) incentive, and offers international trade assistance to Oklahoman businesses. By the end of 2005 REI, had secured nearly $65 million in investments for projects within the state of Oklahoma. EIG estimated the economic and fiscal impacts in terms of economic output and employment in Oklahoma (Economic Impact Group, 2006).

The study uses expenditure data classified according to the North American Industry Classification System (NAICS) and made projections using the RIMS II input-output multipliers provided by Bureau of Economic Analysis. Only about 75% of the $65 million in invested funds are considered in the analysis, under the assumption that some funds are spend outside the state, while others such a real estate and land purchases represent a transfer of assets and do not increase demand for goods or services. The funds acquired by REI generated $116,466,792 in

goods and services, created 970 jobs**,** and added $36,143,708 payroll income to the state of Oklahoma (Economic Impact Group, 2006).

ACCION Texas provides loans to businesses that do not have access to support from the commercial banking sector. From 1994 to 2008 ACCION Texas distributed $76.8 million in loans to 6300 clients, with the average loan amount increasing over time ($3,000 to $8,000). The ACCION Texas study focuses of the economic impacts on micro-lending in the creation of jobs, promoting income stability, and generated public revenues (ACCION Texas, 2009).

2.3 ANALYSIS

The literature provides a wide range of experiences in evaluating and supporting loan programs and the banking industry. In the second appendix, each study analyzed is reviewed concisely in terms of assumptions made and economic impacts found. Each of these studies employs an input-output model for economic impact analysis. Two key issues immediately emerge. The first issue involves the choice of methodology for economic impact analysis and the second, the assumptions underlying and the application of that methodology.

Two important alternatives to input-output models not observed in the literature are the use of econometric methods and the use of structural economic models. Econometric models can tease out the relationship between a loan program and economic conditions by studying empirical data either for a particular state through time or through comparisons between states. Good practices in regression analysis are fundamental to conducting a robust analysis and these must be done with great care to ensure that the model accurately reflects the underlying facts. In many instances, however, either the program has not yet been implemented or data is otherwise unavailable, making regression analysis infeasible.

A second approach involves the construction of structural economic models to determine the economic impact of loan policies and support of local industries. Input-output models are one type of structural model, however, these do not account for standard economic considerations such as price effects, diminishing marginal returns and technological change, each of which can be studied with a partial or general equilibrium model. These models are not as often used due to their high cost, although they can account for a greater degree of realism than a simple input-output accounting framework permits and be used to study policies whose impacts are large and structural in nature.

In addition to the larger methodological question, the issue of correct use of input-output models arises. In this respect the underlying assumptions that determine the direct impact of a policy or program are crucial to determining the actual impact of a policy and can be roughly divided into three broad categories:

1) Scale effects
2) Proportionality
3) Causality and the Business as Usual Scenario

2.3.1 THE SCALE OF POLICY IMPACTS

First, the scale of the particular policy under evaluation often generates issues with respect to the adequacy of the input-output modeling framework. Assumptions concerning scale effects address the marginal effect of increases in demand of different magnitudes. For example, a scale assumption that impacts will be linear drives the projection that the same intensity of impact will occur for differing magnitudes of increased demand. The scale assumption is typically violated when a policy may have a large and significant impact on regional or national markets, where it

may affect prices, which can induce nonlinearities in the economic impact of the policy through various feedback mechanisms.

Another source of error when we are looking at large policy changes results from the fact that as input volumes increase significantly, diminishing marginal returns to scale imply that the impact of the policy may be non-linear for large direct policy impacts. As such, a constant returns to scale production technology is required or the direct effect of the policy must be small enough to obviate these considerations.

2.3.2 THE PROPORTIONALITY OF POLICY IMPACTS

Second, models used to determine the economic impact of policies affecting the banking industry and loan markets works by assuming that all inputs are used in fixed proportions. This does not allow for the fact that an important component of output is tied to variable costs that may adjust more rapidly than employment levels. In addition, the fixed input production technology does not allow for price-induced substitution.

The proportionality of employment to output is often used in evaluating the impact of changes in output on employment levels (Hattery, 2005). In the study conducted to evaluate the impact of municipal deposits on banks in New York, the direct contribution of municipal bank deposits is measured in terms of the number of jobs that municipal deposits support as a proportion of total deposited funds. The volume of municipal deposits in local banks is then used to forecast employment losses on a proportional basis (Hattery, 2005). The direct job losses resulting from lower levels of municipal deposits generate additional economic losses through their indirect and induced effects as the effects ripple throughout the state economy. The model assumes that a one percent decrease in deposits statewide would lead to a one percent decrease in total jobs in the depository credit intermediation sector. While the author states that it is not

within the scope of the study to rigorously establish the actual relationship between output and employment, this assumption brings the quality of the results into question.

2.3.3 THE CAUSES OF POLICY IMPACTS

Third, various studies attribute a significant degree of causality between the policy under consideration and the resulting loan volumes (RESI Research and Consulting, 2005; Sage Policy Group, 2005; Economic Impact Group, 2006; Applied Development Economics, Inc. 2008; Barrera, 2009). That is to say that these studies do not adequately distinguish between the direct effect of the policy under evaluation on loan volumes and the level of loans that would exist in the absence of the policy. This is particularly important for programs that issue subsidized loans to underserved communities but also important in our case. It can be very difficult to identify a baseline level of lending in order to evaluate the direct effect of policies to promote lending. Without a reasonably accurate scenario of baseline lending, attributing an economic impact of specific loans to a given lending program is troublesome. The true impact of the policy is a function of the funds available in-state for loans and those loans that will be displaced. This effect can be fully captured by considering the appropriate percentage of the investment that increases the supply of new loans in Virginia.

Perhaps the most important assumption driving the results of these economic impact analyses, and perhaps the most difficult to untangle, is the link between bank lending and a particular policy. The New York study hypothesizes that a decrease in municipal deposits will cause New York banks to curtail local lending, causing a negative economic impact (Hattery, 2005). It is possible, however, that as local banks have less funds available to lend, and national banks may be willing to replace a large part of those loans. Alternatively, local banks losing municipal deposits may offer more competitive rates on CD's to seek out new capital. To assume

a decrease in municipal deposits will result in a decrease in local lending, it must be shown that lenders have a capital constraint that inhibits lending.

The New York study cites many positive non-economic or non-quantified impacts that accrue to cities, such as charitable contributions, sponsoring athletic events, employee volunteering, or services provided to municipalities like tax and fee collection. Many banks holding municipal deposits also attest to supporting community economic development such as youth entrepreneurship and business retention and expansion through cash and in-kind contributions (Hattery, 2005). The study does not illustrate how New York communities will lose these non-economic benefits, such as bank employees volunteering with charities, if municipalities removed deposits. In focusing on free or for-cost services offered by banks to municipalities, the study merely illustrates the benefit-cost decision of whether to keep excess money in banks and receive services or seek a higher rate of return elsewhere.

The SBA 504 Program study makes a similar assumption the New York study, assuming none of the loans that the SBA 504 program made would have been made without the program (Applied Development Economics, Inc., 2008). The study must show that the program does not duplicate what private lenders would do in order to attribute growth to program loans. Conceptually, the SBA 504 program cannot be credited with causing economic growth that would occur if other lenders were available and willing to make the same loans.

A further difficulty with the SBA 504 Program study, which highlights the importance of causality in attributing particular effects to a particular policy, involves what actually causes growth within the firm receiving the loan. This is relevant because, as noted earlier, the study also projected the economic multiplier impacts of the continued growth of firms receiving the loans within the period. Program loans are available for specific purposes, purposes that must be

stated by recipient firms. Eligible purposes for loans include purchasing land, constructing new buildings, purchasing or renovating existing structures and purchasing capital equipment (Applied Development Economics, Inc., 2008). In tracking the growth of loan recipients, the study researchers made no effort to establish if growth came because the firm received a loan. To illustrate, assume a small firm always made product A. The firm takes a loan for a new project to make product B. Suppose product B fails, yet product A suddenly breaks through and sells much better than it ever had. The survey employed by the SBA 504 program study would not be able to distinguish between these types of growth, attributing growth to the loan even though the project supported by the loan failed. This flaw exposes a difficulty in projecting economic growth resulting from loans in general. When economic growth would occur absent the loan program, then the increase in economic activity cannot correctly be attributed to a loan program.

The New Mexico Study assumes that the rate policy changes will either directly or indirectly increase the cost of participating in the program (Arrowhead Center, 2009). While an increase in cost is likely, it is only relevant if the cost of the state program exceeds the bank's cost of capital from other sources. Even presuming an increase in the cost of participation beyond the cost of alternative capital, the study assumption that fewer local loans will result, leading to decreased economic activity, depends on a dearth of other lenders willing and available to make loans. The survey serves as the basis for determining bank participation in the program, which should incorporate these concerns. The difficulty, however, is in designing a survey to eliminate the incentives to overstate the policies affect on program participation. In our application, we recommend a survey be used to determine the volume of new loans issued in Virginia and to assess the most recent loan-to-deposit ratio in Virginia Banks. This can provide JLARC with robust estimates for these key parameters and allow JLARC to distinguish between

national and community banks. Clearly, great care must be taken in survey design to minimize any bias in the reported results.

Both Maryland studies assumed that loan recipients lacked adequate access to credit or alternative means of funding, yet were viable businesses and loan candidates (RESI, 2005; Sage Policy Group, 2005). To address this problem, a previous study conducted by SPG determined that Baltimore area has an underrepresentation of minority-owned firms, and one of the factors contributing to this is a lack of access to capital. SPG supported the assumption of no access to credit by citing anecdotal evidence from loan recipients who attested to the inability to secure other means of financing. SPG tempered the assumption with the acknowledgement that some loans would have been made to recipients even without the program (Sage Policy Group, 2005). The studies did not review statistics concerning repayment of program loans.

The Oklahoma study by REI assumes that these underserved business sectors would not be able to get loans from other providers (Economic Impact Group, 2006). The ACCION Texas study makes similar assumptions, stating that those served by ACCION Texas could not procure funding through other means (ACCION Texas, 2009). Neither study cites compelling support for the assumptions, although the difficulties in finding information about the viability of small businesses and the discrimination that continues to exist today in the loan approval process supports the assessment that underserved communities do in fact exist.

Economists at the Federal Reserve Bank in Cleveland examined if there is an economic effect of government intervention in small business loaning. If there is an effect, then there is reason to believe that specialized loan programs can both make some loans that would not be made by the market, and that on a whole these loans have a net-positive value. Using regression analysis, the economists achieved results consistent with SBA loans increasing income in a given

region. These could imply the existence of credit rationing for small business loans, giving a justification for government intervention (Craig, 2004).

The State of Washington supports a linked deposit program. In interviewing bank loan officers, the Joint Legislation Audit and Review Commission of the State of Washington found that many loan officers believed that loans given would happen without the program. Anecdotally, there were reported cases of loan offers arranged as a standard bank loan, which were then reformulated as loans under the linked deposit program to take advantage of lower interest rates. The Commission notes that absent any criteria for establishing if a borrower lacks access to credit, a program cannot be evaluated with respect to the extent to which it extends credit to borrowers without access to loans. In reviewing program evaluation in other states, 10 out of 14 states offering linked deposit programs for women or minority owned businesses instituted performance evaluations measuring the number of jobs created or retained per loan issued.

In summary, a policy must have clearly stated objectives, and to the extent that these are to promote economic growth, easy to measure performance objectives. The Joint Legislative and Audit Review Committee of Washington State, in analyzing the linked deposit program in that state, recommended "modest, cost-effective, yet meaningful indicators to measure program performance." While the Washington State-sponsored linked deposit program loaned specifically to women and minority owned business, evaluation could be implemented in a more general program such as that under consideration in Virginia.

A study of the flow of funds in banks and the issues surrounding loan programs measuring the performance of the proposed legislation to determine the volume of loans resulting from investments in local banks could entail:

Table 2.1 Methodology for Determining the Direct Effects of Policy Programs

Action	Purpose
Identifying the need served by a program	Demonstrating a lack of access to credit by viable loan applicants
Evaluating if the need is filled by the program	Quantifying how the program serves viable loan applicants without access to credit
Projecting degree to which the program will continue fill the need.	Projecting inability of viable loan applicants to gain credit in the future and how the program will serve the applicants

2.4 METHODOLOGIES USED IN THE LITERATURE

The most common instrument for projecting the economic impacts of a program and policies of this nature is an input-output model. An input-output model is a fitting tool to examine the economic impact because it can show the marginal changes that occur as a given sector of the economy, such as banking, increases its demand for services. By determining how spending resonates through the economy, and tracing the demand effects through each sector of the economy, input-output models can determine the increase in economic output, the job creation, and the increases in incomes and tax revenues resulting from the increased demand associated with a program or policy.

While no study found in the literature precisely addresses the policy proposed in Virginia, each has elements that lend themselves to the analysis. On one hand, deposits in banks will generate a direct positive impact on the banking industry and those industries that serve the banks (Hattery, 2005). On the other hand, the implicit intention of the bill is to promote lending to Virginia businesses and it therefore shares elements of various studies aimed at evaluating the economic impact of loans generated as a result of the proposed legislation.

Conceptually, the closest study examined is that for evaluating a policy in New Mexico that would require the State Treasurer to invest only in those banks that can provide an interest rate equivalent to the LIBOR. This study follows the flow of funds from the banks, once these

have been affected by the policy, to the loans that those funds would originate. The key parameters required are summarized as follows:

1. Reserve ratio for banks;
2. Percent of loans issued in the state;
3. Distribution of loans by industry sector.

While these studies do provide some direction to guide the economic impact analysis of the proposed legislation, they also provide some important cautionary tales for the use of input-output models for policy analysis. In this way they provide a basis for improvement of those methodologies such that they may be more fully applicable to evaluating the impact of depositing Treasury managed funds in institutions in Virginia.

3 DATA

Data are primarily collected from the Federal Deposit Insurance Corporation (FDIC) database. In addition, regional data with respect to value added, private investment and employment by industry sector is collected by the Department of Commerce, at the Bureau of Economic Analysis. Regional data with respect to output and other important study area data are collected from the IMPLAN modeling system database.

To begin an analysis of the expected economic impact of increasing lending within Virginia, it must be established how much of the total deposited amount will be loaned out by banks to companies and individuals in Virginia. The first factor in determining how much will be loaned within Virginia can be found by identifying the relationship between deposits to loans. The loan-to-deposit ratio is the key piece of data that provides information as to the amount of money available for loans as a result of an increase in deposits in banks. The loan-to-deposit ratio measures the total amount of loans held by banks, or the bank's assets, and the total amount of deposits held by banks, or the banks liabilities.

Banks are required by law to hold a specific level of reserves for deposits and negotiable certificates of deposit. Beyond what is required by law, banks may choose to hold a greater volume of funds, and do so typically when macroeconomic growth is less pronounced. This allows the bank to improve its financial position. In addition, during times of recession, investor and consumer confidence can play an important role in defining the amount of deposits held by banks.

Figure 3.1 shows the loan-to-deposit ratio in the Commonwealth of Virginia for the period between 1967 and 2008. The loan-to-deposit ratio shows a generally upward trend punctuated by periods of significant decline associated with recessions in 1991, 2001, and more recently in 2008. The loan-to-deposit ratio reached its maximum value in 2007 of 1.2. The average loan-to-deposit ratio over the 40 year period is 0.79. The 2008 loan-to-deposit ratio of 0.73 perhaps most fully represents the current state of credit markets, highlighting the reluctance on the part of banks to extend credit in this macroeconomic environment.

Figure 3.1 The Loan-to-Deposit ratio

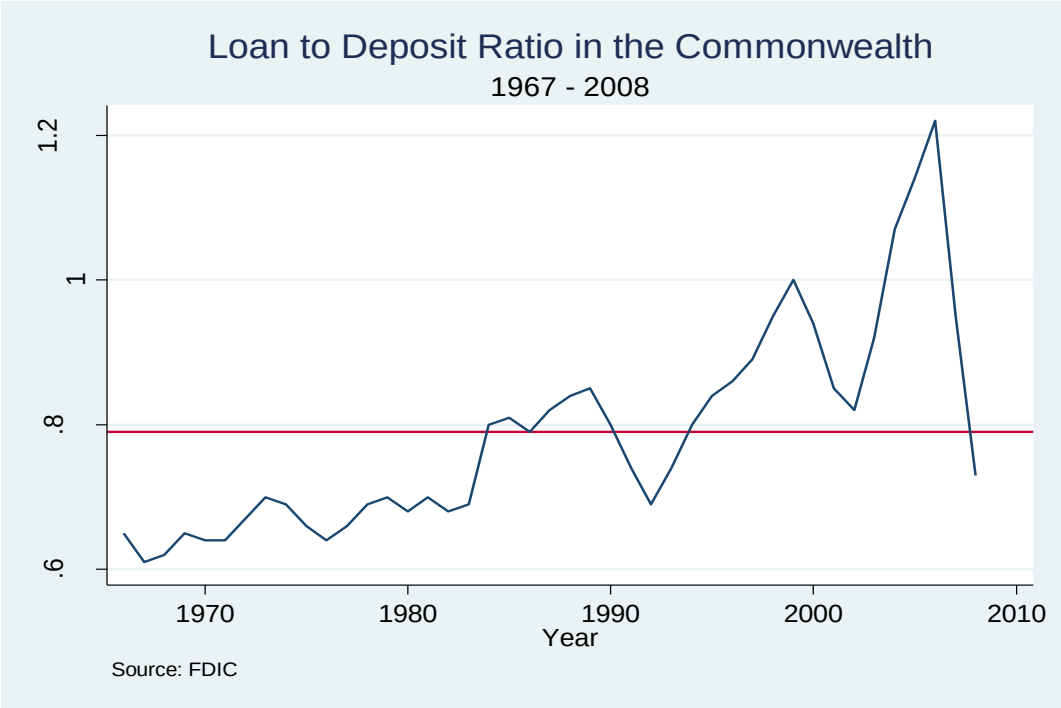


Figure 3.1 highlights important information associated with the loan-to-deposit ratio. In particular, several clear spikes are observed in 1991, 2001, and 2008 associated with recessions in those years. In addition, the peak loan-to-deposit ratio observed in 2007 of 1.2 highlights how a bank position of this nature can lead to instability in credit markets. The loan-to-deposit ratio in 2007 underlies the weak position of many financial institutions particularly when defaults on loans began to cause significant losses in financial companies. In many respects, this is one of the primary causes of the 2008/2009 recession and the financial crisis of October 2008.

The second key piece of information necessary to assess the impact of loans resulting from the proposed legislation is the volume of loans that will be issued to companies and households in Virginia. In this respect there is an important distinction between national federally chartered banks and state chartered banks. The primary difference is that state chartered banks have less access to information regarding credit markets across the United States and then tend to be more regionally dependent with respect to their customer base. Federally chartered banks hold 88.6% of total deposits in Virginia. As a result, because the proposed legislation does not specifically indicate the institutions that will receive the deposits we consider that 88.6% of the total amount of funds to be deposited will be deposited with large federally chartered banks with branches in various states.

From a customer's perspective, small businesses and families are more likely to seek loans from institutions where their deposits are kept or to banks, national or community based, that are close in proximity to their geographic location. Larger businesses, such as Altria, Alcoa and other Fortune 1000 companies with headquarters in Virginia, have more financing options available including the sale of shares and public offering. They also have access to a greater degree of flexibility in seeking financing, particularly short term financing in a competitive

fashion from institutions operating anywhere in the United States as well as from international institutions.

Also, the primary originator of a loan will typically sell the loan. This implies that, to a certain extent, loans that are issued in Georgia, Maryland and elsewhere in the US may be a competitive asset for banks operating in Virginia to hold on their balance sheet even if a rate differential between the originating loan and the purchase of that loan is used to satisfy certain liquidity constraints. That is a bank in Georgia may offer to sell the debt that they loaned to a business in Georgia to a bank operating in Virginia at a lower present value that the loan in order to have access to those funds before the loan reaches maturity.

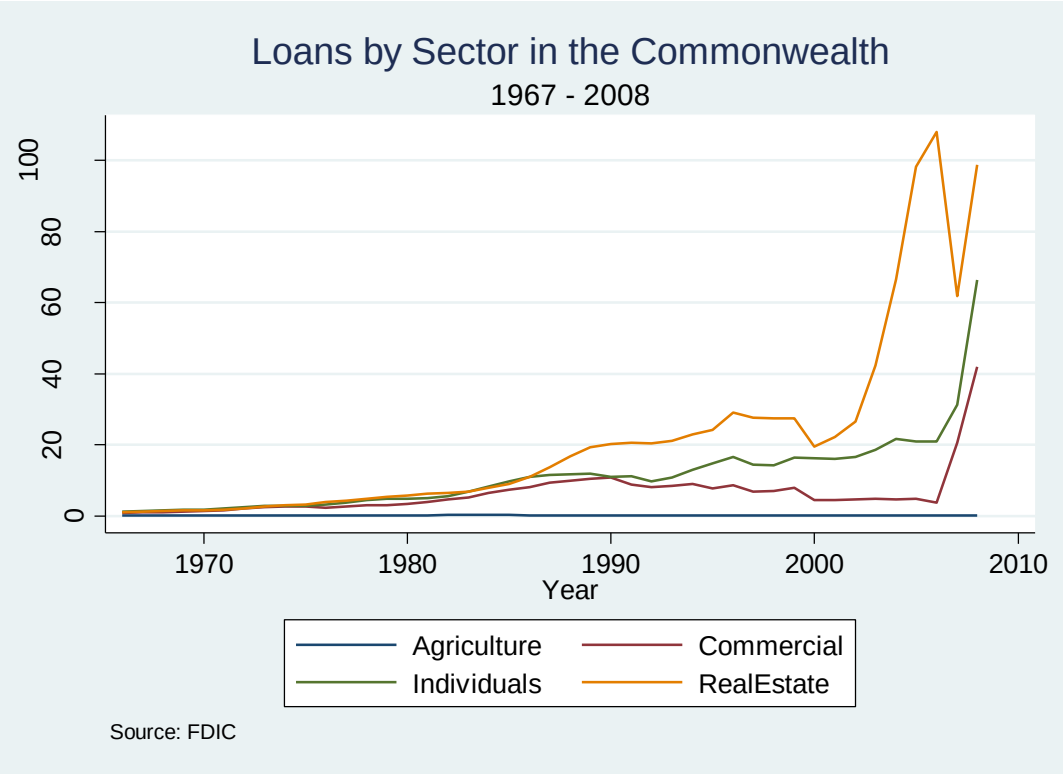
In 2008, loans in Virginia accounted for 3.14% of all loans in the United States. As most federally chartered banks manage their loanable funds in a common national framework, our central scenario assumes that 3.14% of the funds deposited in federally chartered results in loans in Virginia. State chartered banks, however, are assumed to issue 85.0% of their loanable funds to customers in Virginia. We also consider pessimistic and optimistic scenarios in which all banks loan 3.14% of their loanable funds in Virginia and 85.0% of their loanable funds in Virginia. Note that because federally chartered banks have much larger deposit volumes in Virginia the percentage of loanable funds in these banks that result in loans in Virginia drives total loan volumes in Virginia as a result of the proposed legislation. In particular, our central scenario corresponds to an effective rate of 12.5% of loanable funds issued to customers in Virginia, while our pessimistic scenario corresponds to an effective rate of 3.14% and our optimistic scenario to 85.0%.

A survey of banks in Virginia should be used to more precisely assess this important piece of data. We also consider an extensive sensitivity analysis with respect to the volume of

news loans issued in Virginia. This sensitivity analysis considers all levels between 0-100% of loanable funds originating loans in Virginia.

The final key piece of information necessary to assess the impact of loans originated as a result of the proposed policy is the sector to which the loan was issued. Loan volumes, particularly those secured by real estate, increased substantially between 2001 and 2007. Home loans have been the largest share of loans between 1967 and 2008, although the more recent trend shows a striking increase in the percentage of total loans secured by real estate. Consumer credit is the next largest loan category, followed by commercial and industrial loans. Loans to businesses that engage in agricultural activity have remained stable and relatively low throughout the time period under consideration.

Figure 3.2 Loans by Sector

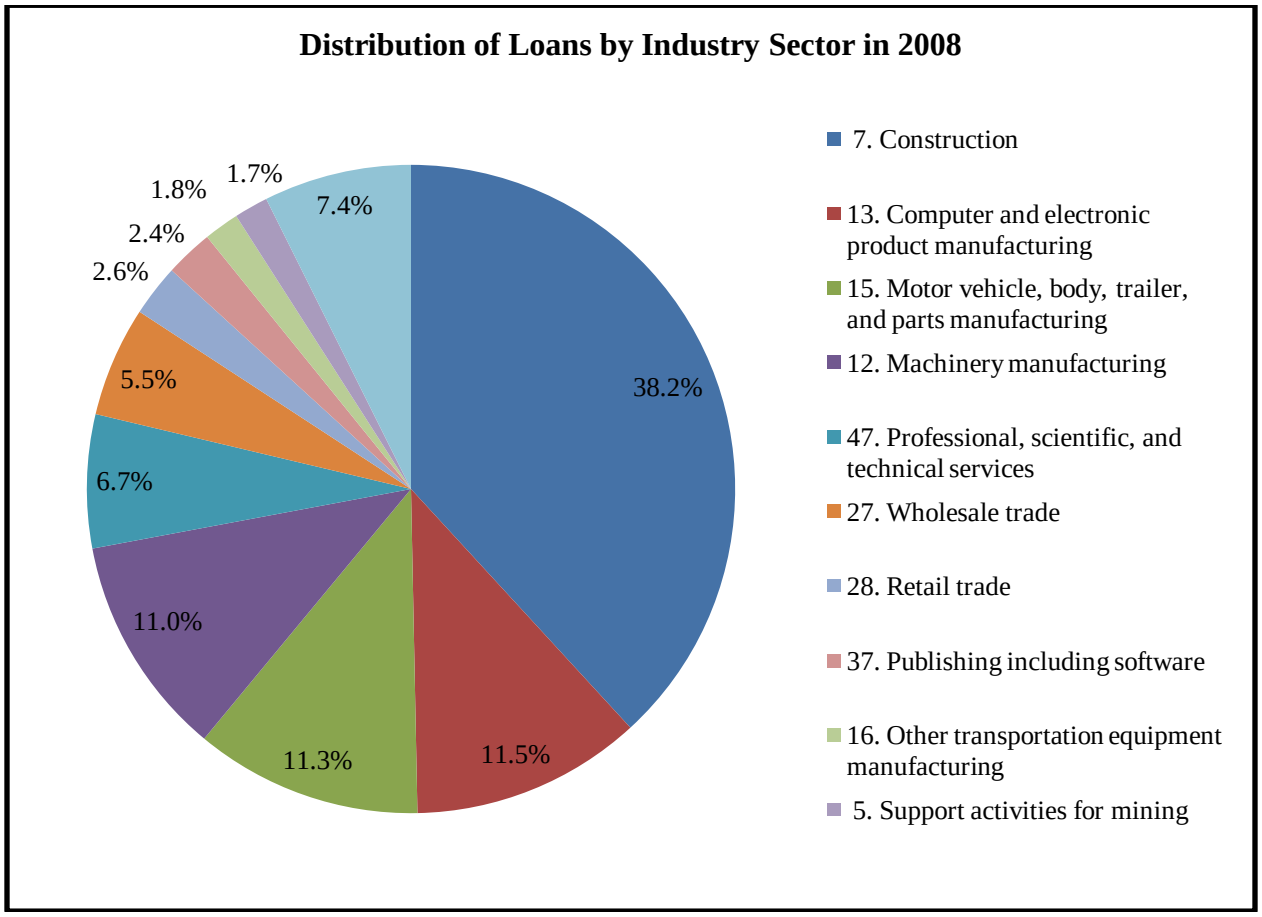


In order to fully assess the extent to which loans affect economic activity, it is useful to further decompose the volume of loans in Virginia, particularly those in the commercial and industrial sectors, into the various industry sectors operating in Virginia. Figure 3.3 shows investment data compiled from the Bureau of Economic Analysis for 2008 for commercial and industrial sectors. The sector that receives the largest volume of investment and loan volumes is construction (38.2%) followed distantly by computer and electronic product manufacturing (11.5%), motor vehicle and parts manufacturing (11.3%) and machinery manufacturing (11.0%). The remaining sectors account for a smaller volume of loans and private investment in Virginia.

Table 3.1 Loans in Virginia by Sector of Economic Activity

	Agriculture	Commercial and Industrial	Individuals	Real Estate
2008	0.09%	19.37%	30.63%	47.13%
2007	0.10%	17.45%	26.68%	53.81%
2006	0.08%	2.80%	15.57%	81.31%
2005	0.08%	3.82%	16.79%	79.58%
2004	0.10%	4.92%	22.64%	70.54%
2003	0.13%	7.13%	27.27%	63.31%
2002	0.23%	9.30%	32.94%	53.90%
2001	0.23%	10.38%	36.68%	52.28%
2000	0.25%	10.91%	39.59%	48.68%
1999	0.20%	14.24%	29.41%	50.19%
1998	0.22%	13.93%	28.05%	55.13%
Average	0.16%	10.39%	27.84%	59.62%
Source: FDIC				

Figure 3.3 Investment by Commercial and Industrial Sector in Virginia in 2006



Source: Bureau of Economic Analysis

This data serves as the basis for evaluating the economic impact of requiring the Treasury to deposit 10% of the LGIP in banks in Virginia. It is outside the scope of this project to assess the composition, yield, and rating of the Local Government Investment pool, an analysis that serves as another important component of the holistic policy evaluation for which this study is a part. In that respect, it would be important to assess the current level of deposits supported by the LGIP in Virginia banks in order to determine the actual incremental volumes that are to be deposited. In this study we consider that the full 10% of the value of the Local Government Investment Pool of $420 million is to be deposited in Virginia banks and determine the economic impact of having that 10% deposited in Virginia.

4 METHODOLOGY

The objective of this section is to describe the methodology used to determine the economic impact of requiring the Treasury to invest in Virginia banks. First, we briefly describe the input-output modeling methodology. The main analytical tool that results from the model is a set of multipliers that describe the impact of final demand shocks on the economy. We then describe the procedure for determining the direct effect of requiring the Treasury to invest in Virginia Banks and an application of the model to determining the economic contribution of the banking industry through the direct, indirect and induced rounds of spending it generates. Key methodological points are addressed in greater depth in the first appendix, including discussions of the use of the RIMS II and IMPLAN modeling systems.

4.1 OVERVIEW

Credit markets play an important role in the economy, facilitating investment activities and serving as a source of consumer finance for the purchase of durable household goods, automobiles, and homes. Banks are the primary source of credit intermediation services and are, in many instances, the only source of loans for small businesses and individuals.

Bank balance sheets reflect the importance of loanable funds as the primary vehicle for generating revenue. This means that, to the extent that it is feasible and satisfies the particular risk profile and liquidity requirements for the particular fund source, banks will loan funds to qualified applicants. These considerations suggest that unless there are explicit regulations requiring those funds to generate loans in the Commonwealth, and these do not displace existing loans, less than the total amount of funds invested in financial institutions in the Commonwealth will reach households and businesses operating in Virginia.

The nature of the proposed legislation is that the impact of the policy is such that the purchase of negotiable certificates of deposit by the Treasurer will have no impact on CD rates, savings rates nor on the interest rate charged on loans. This is so due to the relatively small volume of funds relative to total deposits in Virginia and much more so once we consider the fact that financial markets across the United States are closely connected. As a result, the direct impact of the proposed legislation is to stimulate the demand for negotiable certificates of deposit and thereby increase the amount of loanable funds. We use the RIMS II input-output modeling system to evaluate the economic impact of the proposed legislation. We further consider the impact of the type of multiplier used and compare our results with those obtained using the IMPLAN modeling system.

We consider three levels of economic impacts that result from the proposed legislation. First, the increase in the demand for banking services provides a positive stimulus to the banking

industry. Second, once reserve requirements have been satisfied and banks have offered loans to businesses and individuals across the United States, banks in Virginia can take advantage of their knowledge of local markets and issue loans to companies in Virginia. Finally, recognizing that institutions in Virginia are best situated to evaluate local credit markets, banks can issue loans and sell these loans out of state.

The funds deposited in banks by the Treasury induce banks to increase their level of services which generates significant downstream economic benefits. On the margin, though, these funds are primarily directed at variable cost inputs to production. This means that the funds are used to finance an increasing need for loan assessment, computers, office supplies, transportation costs and other business expenses. As a corollary, these funds are not necessary needed to purchase additional buildings or increase utility costs significantly. As a result, we consider the input structure of the banking industry in great detail and attribute these funds proportionally across those inputs that constitute variable costs excluding any fixed costs following a bill of goods approach to computing the economic impact of increasing banking operations in Virginia.

In order to evaluate the impact of the proposed legislation on loan volumes and then the component of the economic impact that results from loans, we consider three primary factors. First, we adjust the total volume of funds invested for the more current loan-to-deposit ratio observed in Virginia in order to more fully capture the recent economic climate. Second, we adjust the volume of loans by the percentage of loans that are issued in state versus those that go to companies out of state. We then allocate those loans to particular sectors of the economy in a fashion consistent with the available investment data.

We exclude loans to individuals from the analysis because these do not provide a stimulus to economic activity in Virginia but rather shift spending by households forward through time. Consumer credit does not contribute to a positive impact on economic activity because it does not build productive stock but rather finances current consumption at the expense of future private consumption activities. The premium that consumers pay on these loans reflects their time preference for consumption and effectively reduces overall consumption levels.

Finally, recognizing that institutions in Virginia are best situated to evaluate local credit markets, banks can issue loans and then sell these loans out of state. In effect, the standard money multiplier can be applied, granted of course that the impact is purely distributional geographically. The following relationship is used to determine the money multiplier which considers both the level of reserves and the volume of funds in loans within Virginia.

$$M = \frac{1}{1 - (Loan\ to\ Deposit\ Ratio)(Percent\ of\ Loans\ in\ Virginia)}$$

Once reserves and in-state loan volumes are initially assigned, these can serve as the basis for computing a maximum money multiplier that would account for the possibility of issuing more loans from the sale of loans issued in Virginia. This value increases explosively as the loan to deposit ratio and the percent of loans in Virginia approaches one. Of course banks that are currently receiving Treasury funds conduct the same sort of activity so the net *global* effect is null. At the regional level, however, this impact may be quite significant. We therefore also evaluate the impact of larger loan volumes resulting from the money multiplier for loans in Virginia.

4.2 ECONOMIC THEORY AND BACKGROUND

Regional economic models use Keynesian macroeconomic foundations as a basis to analyze policies that affect demand. The models depict short-run economic relationships, as they typically do not consider the supply side of the economy and changing production and investment levels (Schaffer, 1999). *The General Theory* written by John Maynard Keynes describes the theoretical development of consumption and government spending multipliers that are based on households' marginal propensity to consume. These are derived from fundamental income definitions primarily based on the following relationship that defines GDP:

(3.1) $$Y = C + I + G$$

(3.1) states that GDP, Y, is equal to the volume of expenditure on consumption, C, private investment, I, and government purchases, G. At a first level we can assume that tax levels, investment, and the savings rate are held fixed which allows us to rewrite (3.1) as follows:

(3.2) $$Y = c(Y - T) + I + G$$

where c is the marginal propensity to consume and describes the level of personal consumption as a fraction of net of tax incomes, that is, spent in the economy and not saved. Solving this equation for Y yields

(3.2a) $$Y = \frac{1}{(1-c)}(I + G - c'T)$$

Here, $\frac{1}{(1-c)}$ is our spending multiplier, because tax payments depend on the level of spending and because investment is fixed, this expression gives us the impact of a one unit change in government spending on output. In other words, if consumers spend 60 percent of their income ($c = 0.6$) then the government spending multiplier is equal to $\frac{1}{(1-0.6)} = 2.5$.

This multiplier tells us that a one dollar increase in government spending increases national income by two dollars and fifty cents. This is a linear relationship. These multipliers have been

extended to consider total output as a function not only of final demand expenditure levels but also intermediate consumption of goods and services. This allows us to determine the impact of changes in demand in a particular sector on the level of economic activity.

Originally developed by Leontief, the linear fixed coefficient production function serves as the basis for the input-output model and serves to map the transformation of inputs into output, describing the structure of intermediate demand in the economy (Leontief, 1949). The model is formally presented in Appendix one. In the next section, the multipliers that arise from input-output analysis are described in greater detail.

4.3 MULTIPLIERS

The relevant deliverable of an input-output model is a set of multipliers that describes the economic impacts of final demand shocks. These impacts are generally described in terms of the direct, indirect, induced and extended impact on economic activity.

A ***direct effect*** of a policy is the change in final demand associated with that particular policy or activity. That is, the direct effect of an increase in the demand for new homes is to increase new home construction and sales and therefore to increase output of the residential construction sector by an amount equal to that value. Similarly, the direct effect of an increase in the demand for deposits and for certificates of deposit is an increase in output in the sector of economic activity responsible for depository credit intermediation.

The ***indirect effect*** of a policy or activity represents the accumulated increase in intermediate demand for inputs to the sector directly affected by the policy. For example, as new home sales increase, the residential construction sector that directly experienced the increase in demand, and therefore production, now must purchase inputs of bricks, mortar, electrical wiring, lumber, steel, concrete, architectural design and engineering services, and all the other materials

required to build a new house. The concrete industry, for example, then purchases gravel and equipment to satisfy the increased demand for their products in the residential construction sector. The gravel and limestone quarrying companies increase their mining activities to satisfy the demand of the concrete industry, and demand from gravel and limestone quarrying companies for material and equipment results. The increase in intermediate demand in each sector is tempered and gets smaller and smaller as the impact is dispersed and ripples through the economy in a manner consistent with the share of those inputs produced domestically and those imported. Eventually, the marginal increase approaches zero. The accumulated effect then represents the indirect effect of the initial direct increase in demand for new homes.

The ***induced effect*** is determined by considering not only the intermediate demand for goods and services but also the increase in incomes that are induced by the direct and indirect increases in economic activity. To continue our construction example, the construction workers and contractors that are employed by the residential construction companies receive wages and salaries that are then used to purchase food, clothing, entertainment, computers, televisions, books and all of the other items that households purchase and that constitute private consumption. In addition, a portion of that income is saved and not, at that time, reintroduced into the economy. The purchase of consumer goods initializes an increase in spending in the economy that stimulates demand and promotes economic activity. The ***extended induced effect*** considers not only labor income but the effect of income from capital services and tax payments on investment spending and government spending. These then drive additional increases in intermediate demand for inputs to production.

Type I Multiplier: A Type I multiplier measures the direct and indirect impact on economic activity.

Type II Multiplier: A Type II multiplier measures the direct, indirect and induced impact on economic activity.

Type SAM[1] Multiplier: A Type SAM multiplier, sometimes referred to as type III multiplier, measures the direct, indirect, induced and extended impact on economic activity.

These three types of economic impact multipliers can be used to determine the impact of final demand shocks on output, employment, incomes and tax revenues. The multiplier derived directly from the ***Output Multiplier*** can be constructed from the system of regional accounts. The primary data collected by the Bureau of Economic Analysis typically directly reflects the volume of inputs purchased and total sales of goods and services by each sector of economic activity. The multipliers that arise from this data represent the accumulated effects of an increase in final demand on total output that is, on the intermediate and final demand for goods and services. These are particularly useful in understanding the impact of policies that would affect final demand on total production levels. From the output data collected by the Bureau of Economic Analysis, we can determine the impact of final demand shocks on employment levels, income and public sector tax receipts.

The ***Employment Multiplier*** can be derived from output data by assuming that labor productivity in each sector is a constant within that sector. In other words, total output divided by the number of employees in a particular sector, such as construction of residential buildings, gives a measure of the productivity of each employee in terms of the total value of output from that sector. Labor productivity is therefore sector specific. By applying these ratios to the original

[1] SAM is an acronym for Social Accounting Matrix

survey data we transform the units represented by that data into the number of employees affected by production in that sector. We can then construct the appropriate multipliers that will provide us with information about the effects of an increase in the final demand for goods and services on the number of employees.

The ***Income Multiplier*** can be derived from employment and average wage data for each sector of economic activity. Just like the employment multiplier, we can rewrite the basic multipliers in terms of the product of the number of employees and the volume of wages in each sector of the economy. These then give us sector specific values and the total effect of changes in final demand on income levels.

Tax Revenue Multipliers use information about the total volume of output and sales, incomes and the effective gross sales and income tax rates to determine the impact of policies on tax revenue within the context of input-output models. The effective tax rates are determined by dividing total tax receipts from a particular stream by the total volume of activity, by dividing total revenue from the gross sales tax by total sales to determine the effective tax rate for gross sales. This will account for any exceptions and specific considerations involved in the collection of a particular tax. This is particularly important when we consider the large number of tax brackets associated with the personal income tax.

4.4 CONTRIBUTION OF THE BANKING SECTOR TO THE VIRGINIA ECONOMY

Although not a primary focus of this analysis, it is important to highlight the importance of the banking industry in the Virginia economy. In addition, this provides an important detailed application that better fleshes out some of the more important methodological elements of the input-output modeling methodology.

In 2006, the banking sector directly accounted for $13,447 million dollars (1.8 percent) of value added and employed 78,808 thousand workers, 0.8 percent of total employment in the Commonwealth (IMPLAN, 2006). Table 3.1 presents the economic importance of the banking sector. The primary contribution of the banking industry to economic output and to employment in Virginia is naturally the direct result of activity in that industry. Beyond its direct impact, the banking industry purchases intermediate inputs that generate a secondary indirect contribution to the economic output and employment. Once the indirect and induced effects are considered, the banking industry accounted for $31,763 million dollars of output, $21,126 million dollars in value added and 184,020 part time and full time jobs. The induced effect is particularly important in the banking industry due to the relatively large average wages in the industry.

Table 4.1 The Economic Contribution of the Banking Sector

	RIMS II	IMPLAN	Direct	Indirect	Induced
Output	$ 41,823,085,422	$ 31,763,030,547	$ 19,332,109,375	$ 5,275,773,224	$ 7,155,147,948
Employment	171,402	184,020	78,808	41,418	63,794
Earnings	$ 8,001,560,070	$ 11,818,362,425	$ 6,686,251,830	$ 2,212,133,145	$ 2,919,977,450
Value Added	$ 22,624,367,602	$ 21,126,824,937	$ 13,447,668,266	$ 3,293,077,633	$ 4,386,079,039
Indirect Business Taxes		$ 1,311,471,263	$ 598,932,556	$ 190,969,819	$ 521,568,889

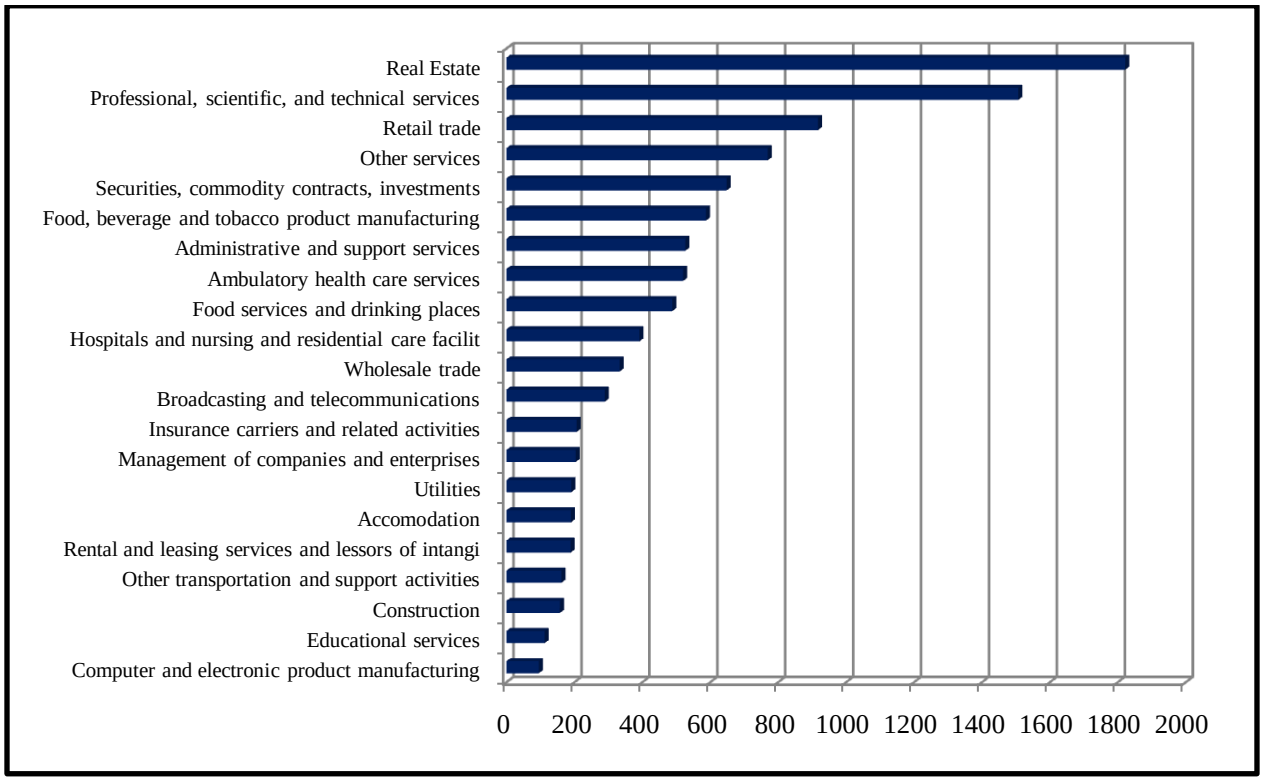
Source: Authors' Calculations using RIMS II and IMPLAN

Figure 4.1 depicts the economic impact of the entire banking industry on output by industry sector. The banking industry makes its largest imprint on the real estate market through its purchase of buildings for its operations. This impact on real estate constitutes 5.3 percent of the total impact of the banking industry on the economy of the Commonwealth. Another 4.5 percent of the economic contribution of the banking sector is the result of the use of professional and business services. Banks require economic forecasting services to guide investment decisions They further rely on a variety of professional and technical services to maintain their databases and computer systems and to guide their credit intermediation activities. A third, very

significant, set of industries affected by operations in the banking sector is manufacturing, accounting for 4.5 percent of the banking sectors impact on the economy. This is due to the need to purchase office supplies, paper, and computers to ensure that the branch operations function effectively.

In addition to the direct effect on the banking sector and the indirect effects on downstream industries, the economic impact induced by higher wages in the banking industry is particularly pronounced. This is because the industry garners a high wage and, as spending on consumer goods increases, additional positive effects on the economy are created.

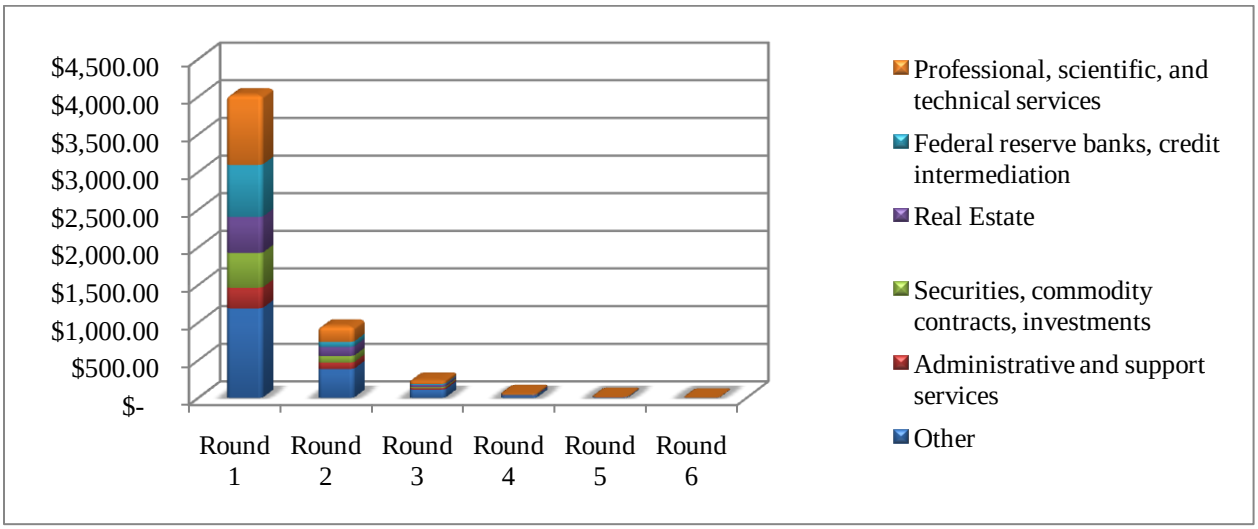
Figure 4.1 Contribution of the Banking Sector to Output by Industry (top 20 Industries)



Source: Authors' Calculations

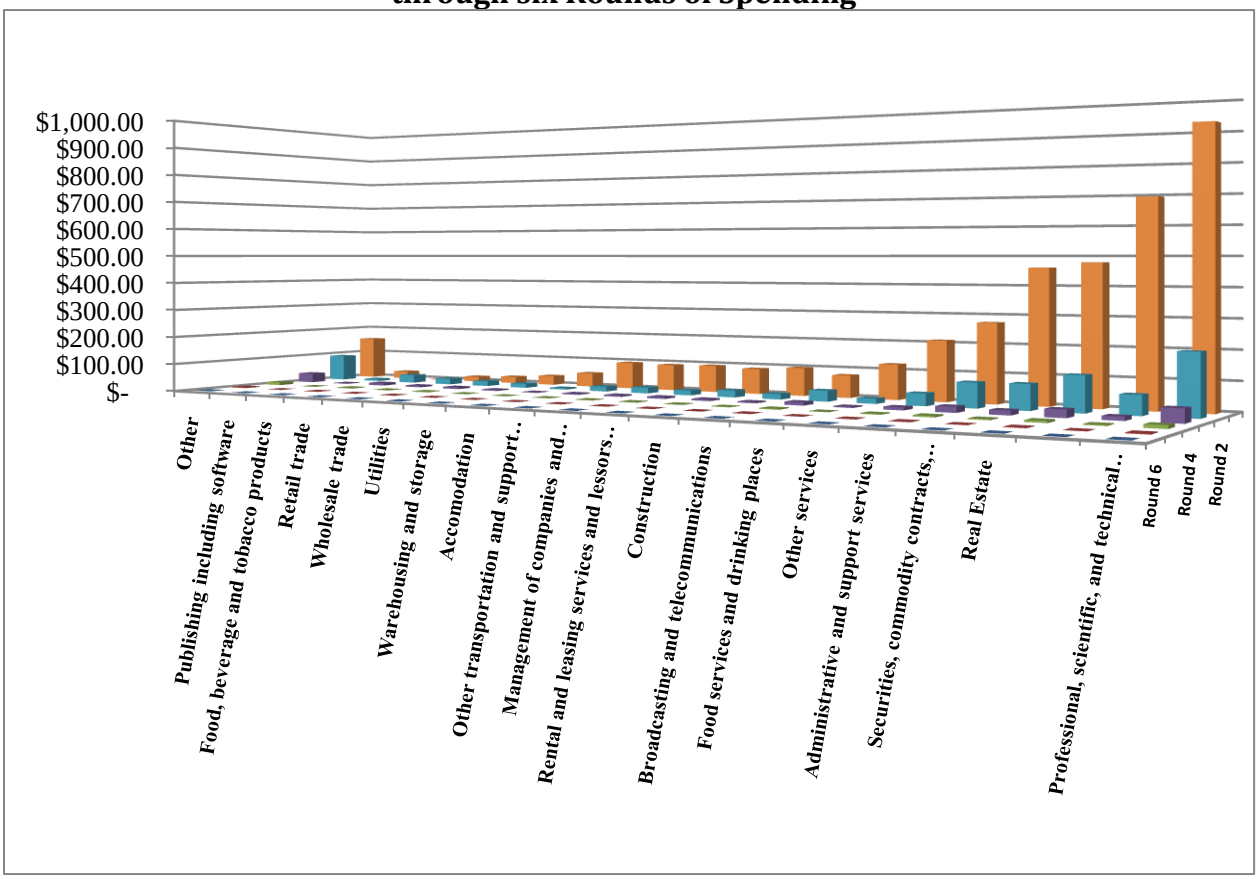
Figures 4.2 and 4.3 illustrate the ripple effect that the banking industry generates in the economy, demonstrating the indirect effects of the policy and are the effect of the Type II output multipliers. The initial round of spending not presented in the figures is the direct effect of the banking industry which includes all intermediate and final demand purchases of banking sector outputs. The second round corresponds to the spending by the banking industry on the purchase of intermediate goods and services from other industry sectors. Each round thereafter then shows the resulting regional purchase of goods and services. The first six rounds of spending capture 76.0% of the total indirect effect of the banking industry on the Virginia economy. What is also apparent when comparing these to Figure 4.1 is that real estate and retail trade industries, which are important industries supported by the induced effects of the banking sector through employee wages, are not among those sectors that are indirectly affected by the banking industry. These are primarily supported by spending of earnings from the banking and downstream industries.

Figure 4.2 Economic Impact of the Banking Sector through six Rounds of Spending



Source: Authors' Calculations

Figure 4.3 Economic Impact of the Banking Industry by Sector through six Rounds of Spending



Source: Authors' Calculations

5 RESULTS

This section discusses the results of our analysis along two important vectors. The first is the decomposition of the total impact of the proposed legislation on economic output into those proportions attributable to growth in the banking industry and those attributable to an increase in lending activity. The second component of this section explores the sensitivity of our results to the influence of two key parameters, the loan-to-deposit ratio and the percent of loans to companies and individuals in Virginia as opposed to outside of the state. We also assess the sensitivity of our results to the choice of modeling system and type of multiplier used in the analysis.

5.1 RESULTS

Our central estimate of the impact of the proposed legislation resulting from the loans it generates are based on a central scenario that considers loan-to-deposit ratio of 0.73 and that 3.1% of deposits in federally chartered banks and 85.0% of deposits in state chartered banks result in new loans to companies and individuals in Virginia.

The banking industry is directly affected by the proposed legislation. The direct effect of the increase in banking activity is determined by identifying those inputs to production in the banking industry that constitute variable costs and excluding those inputs that will not be affected by the increase in demand for banking services, such as real estate and utilities. The stimulus to economic activity and downstream industry resulting from the increase in business expenses and output in the banking industry is equal to $608 million, which includes the $420 million directly deposited in banks and an additional $188 million as a result of downstream spending and induced effects. The proposed legislation creates 2,869 jobs as a result of the stimulus to the banking industry and increases indirect business taxes by $18.2 million dollars.

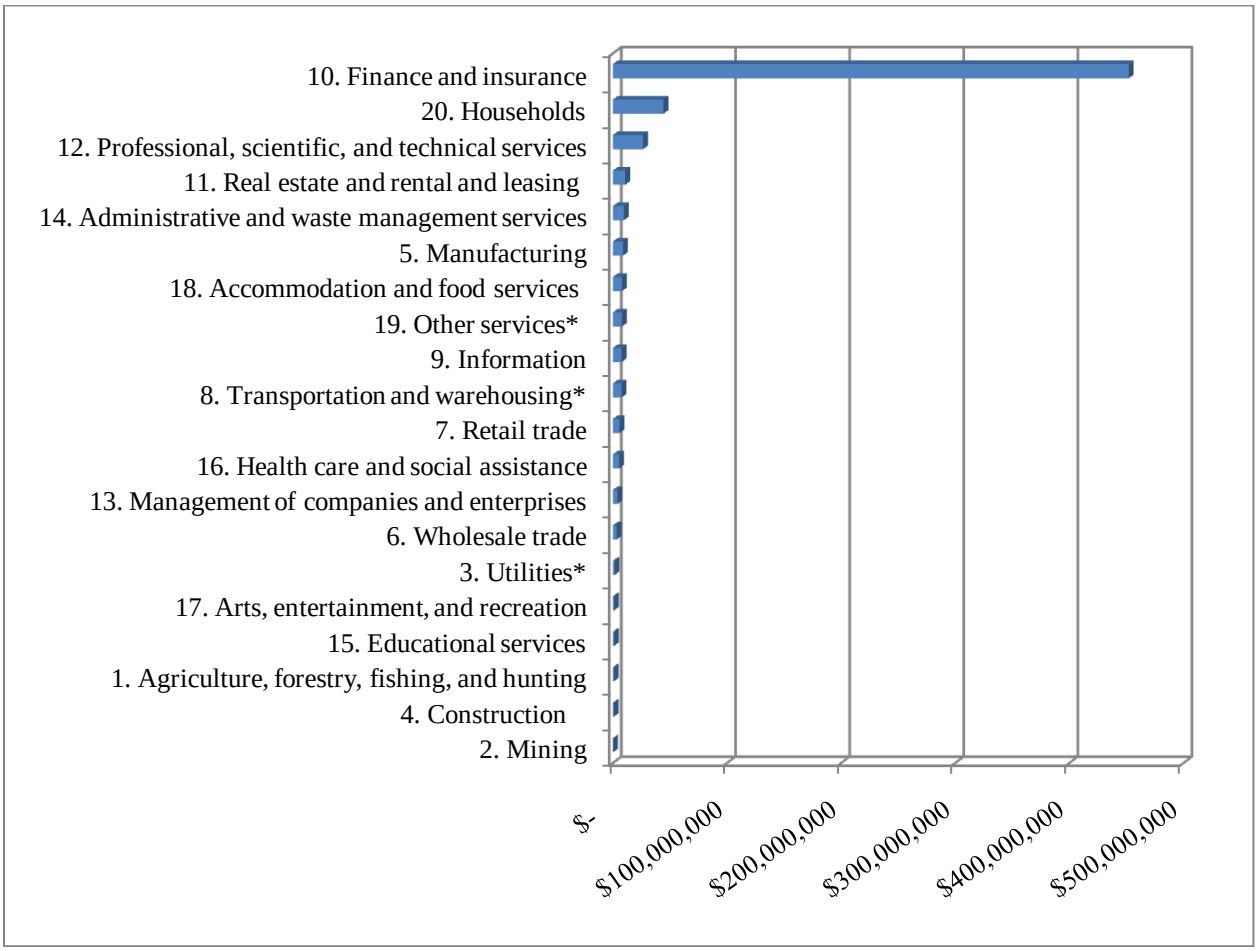
Table 5.1 The Economic Impact resulting from Bank Operations

	RIMS II	IMPLAN	Direct	Indirect	Induced
Output	$ 608,237,243	$ 551,736,081	$ 72,136,943	$ 23,754,013	$ 35,845,126
Employment	2,869	2,853	2,349	184	320
Earnings	$ 323,557,342	$ 338,409,983	$ 314,301,178	$ 9,466,222	$ 14,642,583
Value Added	$ 381,991,082	$ 372,815,741	$ 336,629,091	$ 14,213,720	$ 21,972,930
Indirect Business Taxes		$ 18,185,890	$ 14,610,656	$ 959,763	$ 2,615,471

Source: Authors' Calculations

Figure 5.4 shows the distribution of economic impacts by sector of economic activity. The most significant sectors that provide inputs to banking, both directly and indirectly, is the banking industry itself, including depository credit intermediation, nondepository credit intermediation, securities, and funds, trusts and other vehicles. Due to the significant impact of spending resulting from wages in the industry, it is no surprise that this policy has a somewhat positive impact on households as well. In addition are the professional and technical service industries, which had the third greatest impact for the impact from loans.

Figure 5.1 Impact of Banking Industry by Sector



Source: Authors' Calculations

The economic impact of the proposed legislation attributable to the increasing loan volumes is to increase output of $54.8 million, an increase in employment of 205 jobs, an increase in earnings of $ 6.9 million, an increase in value added of $31 million and an increase in tax revenue of $3.9 million as a result of the $420 million deposit in Virginia banks.

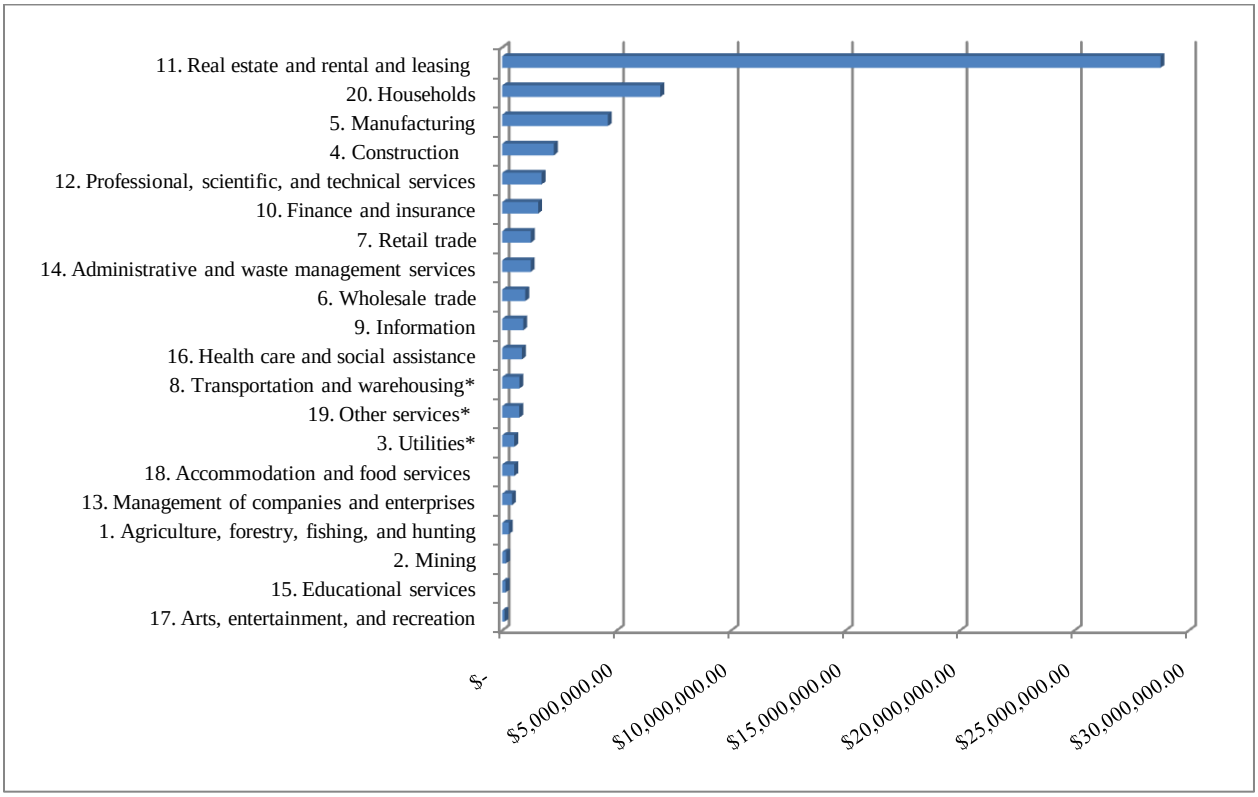
Table 5.2 The Economic Impact resulting from Increased Loans

	RIMS II	IMPLAN	Direct	Indirect	Induced
Output	$ 54,766,205	$ 42,267,316	$ 30,742,130	$ 6,550,923	$ 4,974,263
Employment	205	191	98	49	44
Earnings	$ 6,903,372	$ 8,110,305	$ 3,744,378	$ 2,362,104	$ 2,003,823
Value Added	$ 31,809,171	$ 29,585,410	$ 22,437,955	$ 4,098,262	$ 3,049,194
Indirect Business Taxes		$3,910,198	$ 3,219,449	$ 332,825	$ 357,925

Source: Authors' Calculations

Due to the fact that more than 50% of loans are secured by real estate and the central role that real estate plays in many economic activities, it is no surprise that by far the largest impact of the increasing loan volumes is the real estate sector. Households, manufacturing and the construction industry also show a modest positive impact although substantially smaller than real estate.

Figure 5.2 Impact of Loans by Industry Sector



Source: Authors' Calculations

Overall these considerations imply a total economic impact of $663 million. The impact on loans accounts for 8.3% of the total economic impact while the stimulus to the banking industry accounts for 91.7% of the total economic impact. This is a direct result of the fact that the vast majority of the loanable funds resulting from the policies are sent to customers outside of the Commonwealth. The policy creates 3,074 jobs, increases earnings in the state by $330 million and increases value added by $413 million. The policy also increases indirect business tax revenue by $22 million dollars. Figure 5.3 and 5.4 show the economic impact on output and employment by industry sector. The banking sector is overall the sector that most benefits from the proposed legislation with 1,874 jobs created, 61.0% of the total number of jobs created.

Table 5.3 The Economic Impact of Placing 10% of the LGIP in Virginia Banks

	RIMS II	IMPLAN	Direct	Indirect	Induced
Output	$ 663,003,447	$ 594,003,397	$ 102,879,073	$ 30,304,936	$ 40,819,388
Employment	3,074	3,044	2,447	233	364
Earnings	$ 330,460,713	$ 346,520,289	$ 318,045,556	$ 11,828,326	$ 16,646,407
Value Added	$ 413,800,253	$ 402,401,152	$ 359,067,047	$ 18,311,981	$ 25,022,124
Indirect Business Taxes		$ 22,096,088	$ 17,830,105	$ 1,292,588	$ 2,973,395

Source: Authors' Calculations

Figure 5.3 Economic Impact on Output by Industry Sector

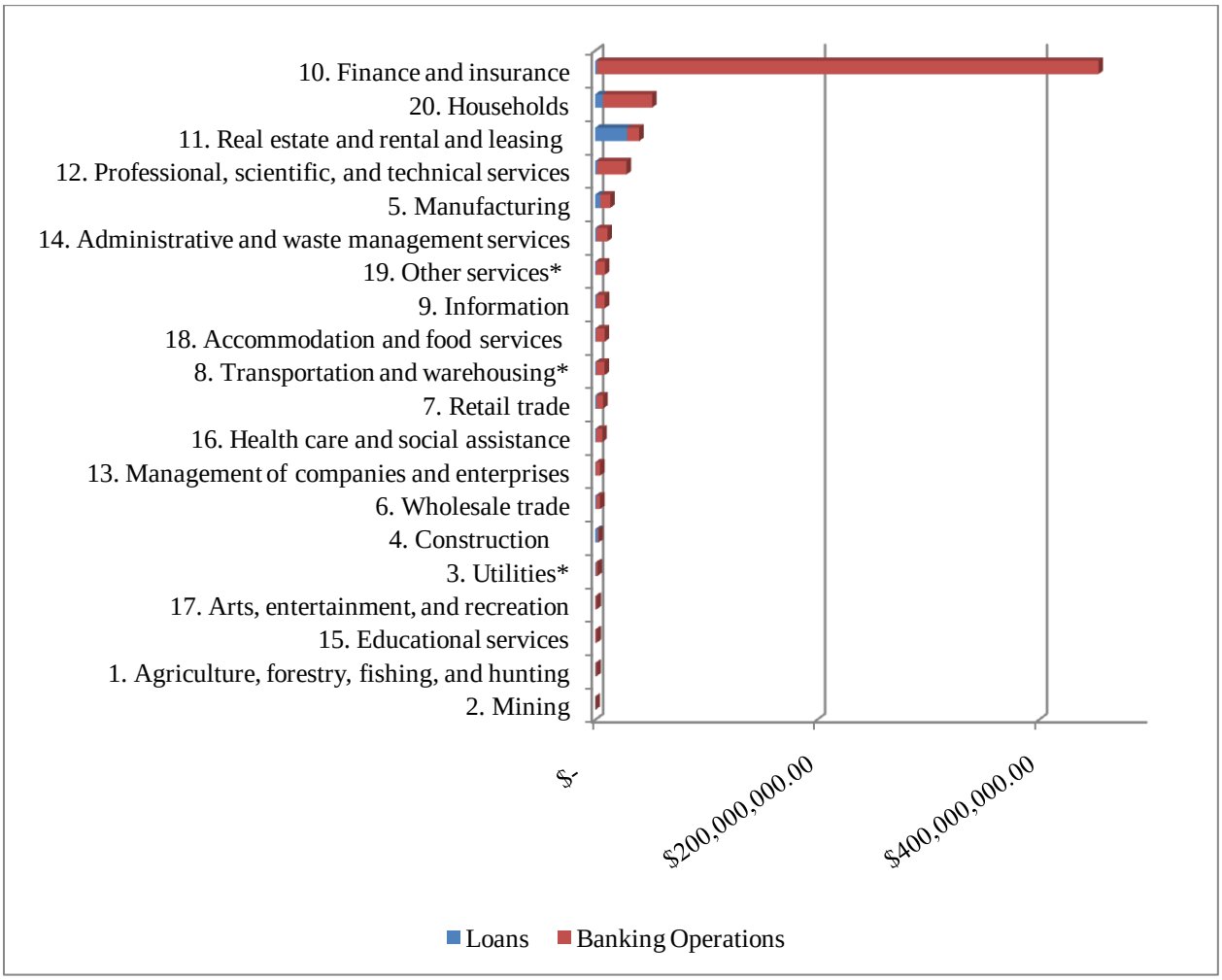
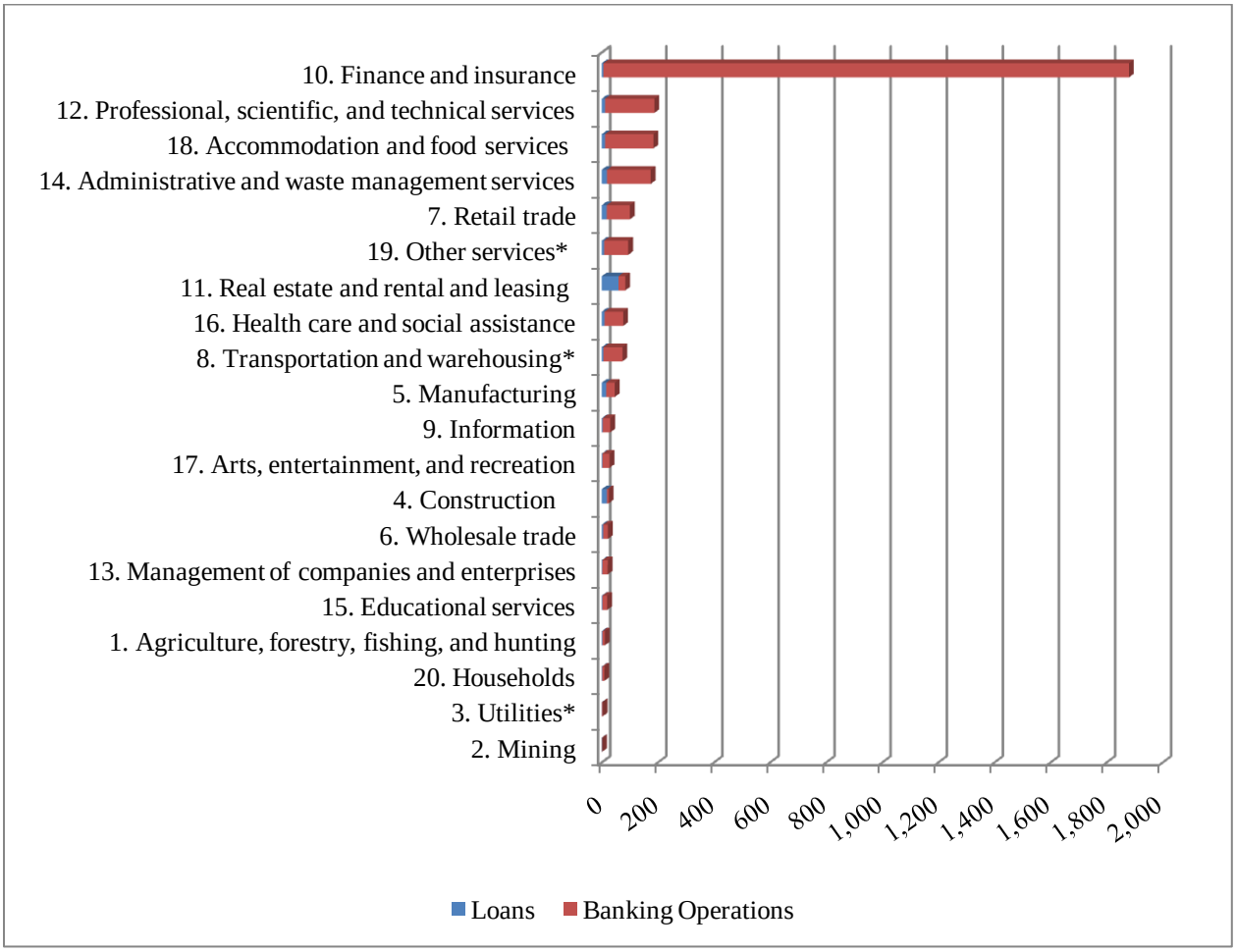


Figure 5.4 Economic Impact on Employment by Industry Sector



Source: Authors' Calculations

Table 5.4 presents a summary decomposition of the economic impact of the proposed legislation with respect to that attributed to loans and to the increase in banking operations. Clearly, the impact on the banking industry dominates all of the effects. This is driven by the low volume of loans (3.14% of all loanable funds for over 88% of the funds) that are issued to customers in Virginia.

Table 5.4 Decomposition of the Economic Impact of the Proposed Legislation

	Output	Employment	Earnings	Value Added
Loans	$ 54,766,205	205	$ 6,903,372	$ 31,809,171
	(8.3%)	(6.7%)	(2.1%)	(7.7%)
Banking Operations	$ 608,237,243	2,869	$ 323,557,342	$ 381,991,082
	(91.7%)	(93.3%)	(97.9%)	(92.3%)
Total	$ 663,003,448	3,074	$ 330,460,714	$ 413,800,253

Source: Authors' Calculations.

Table 5.5 presents the economic impact in the optimistic and pessimistic scenarios. Notice that the pessimistic scenario is much closer to the central scenario. This is primarily the result of the fact that federally chartered banks account for most of the funds deposited in Virginia and issue fewer loans in Virginia as a percentage of their total deposits. In addition, at these lower levels the money multiplier is substantially lower. To gain an appreciation of this effect, consider that in the optimistic case the money multiplier increases to 2.66 whereas in the central case the money multiplier is equal to 1.10. This means that in the optimistic case the volume of loans becomes substantially more important accounting for 48.4% and 39.9% of the total impact on output and employment relative to the banking sector effects.

Table 5.5 Economic Impact in Optimistic and Pessimistic Scenarios

Optimistic Scenario	RIMS II	IMPLAN
Output	$ 1,510,368,190	$ 1,247,980,312
Employment	6,238	6,007
Earnings	$ 437,272,457	$ 472,006,194
Value Added	$ 905,964,539	$ 860,158,516
Indirect Business Taxes		$ 82,596,252
Pessimistic Scenario	**RIMS II**	**IMPLAN**
Output	$ 621,048,116	$ 561,623,223
Employment	2,917	2,898
Earnings	$ 325,172,174	$ 340,307,140
Value Added	$ 389,431,862	$ 379,736,341
Indirect Business Taxes		$ 19,100,561

Source: Authors' Calculations.

5.2 SENSITIVITY ANALYSIS

The key parameters determining the economic impact of loans resulting from the proposed legislation are the loan-to-deposit ratio and the percent of loans that are issued in Virginia from those funds available for making loans. Table 5.6 presents the economic impact on output and Table 5.7 presents the economic impact on employment of the proposed legislation for a variety of scenarios with respect to the loan-to-deposit ratio and the percent of funds invested in companies and individuals in Virginia.

Table 5.6 Sensitivity of Economic Impact on Output to Changes in the Loan to Deposit Ratio and the Percent of Loans in Virginia

		Percent of Loans in the Commonwealth									
		10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Loan-to-deposit Ratio	10%	$613.72	$619.31	$625.02	$630.84	$636.79	$642.87	$649.07	$655.41	$661.90	$668.52
	20%	$619.31	$630.84	$642.87	$655.41	$668.52	$682.22	$696.56	$711.58	$727.33	$743.87
	30%	$625.02	$642.87	$661.90	$682.22	$703.98	$727.33	$752.46	$779.57	$808.90	$840.75
	40%	$630.84	$655.41	$682.22	$711.58	$743.87	$779.57	$819.22	$863.55	$913.42	$969.93
	50%	$636.79	$668.52	$703.98	$743.87	$789.08	$840.75	$900.37	$969.93	$1,052.13	$1,150.78
	60%	$642.87	$682.22	$727.33	$779.57	$840.75	$913.42	$1,001.11	$1,109.04	$1,245.13	$1,422.05
	70%	$649.07	$696.56	$752.46	$819.22	$900.37	$1,001.11	$1,129.50	$1,298.74	$1,532.02	$1,874.16
	80%	$655.41	$711.58	$779.57	$863.55	$969.93	$1,109.04	$1,298.74	$1,572.75	$2,003.34	$2,778.40
	90%	$661.90	$727.33	$808.90	$913.42	$1,052.13	$1,245.13	$1,532.02	$2,003.34	$2,921.17	$5,491.10
	100%	$668.52	$743.87	$840.75	$969.93	$1,150.78	$1,422.05	$1,874.16	$2,778.40	$5,491.10	

Source: Authors' Calculations

Table 5.7 Sensitivity of Economic Impact on Employment to Changes in the Loan-to-Deposit Ratio and the Percent of Loans in Virginia

		Percent of Loans in the Commonwealth									
		10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Loan-to-deposit Ratio	10%	2,890	2,911	2,932	2,954	2,976	2,999	3,022	3,046	3,070	3,095
	20%	2,911	2,954	2,999	3,046	3,095	3,146	3,199	3,255	3,314	3,376
	30%	2,932	2,999	3,070	3,146	3,227	3,314	3,408	3,509	3,619	3,738
	40%	2,954	3,046	3,146	3,255	3,376	3,509	3,657	3,823	4,009	4,220
	50%	2,976	3,095	3,227	3,376	3,545	3,738	3,960	4,220	4,527	4,895
	60%	2,999	3,146	3,314	3,509	3,738	4,009	4,337	4,740	5,248	5,908
	70%	3,022	3,199	3,408	3,657	3,960	4,337	4,816	5,448	6,319	7,597
	80%	3,046	3,255	3,509	3,823	4,220	4,740	5,448	6,471	8,079	10,974
	90%	3,070	3,314	3,619	4,009	4,527	5,248	6,319	8,079	11,507	21,104
	100%	3,095	3,376	3,738	4,220	4,895	5,908	7,597	10,974	21,104	

Source: Authors' Calculations

The loan-to-deposit ratio is sensitive to the macroeconomic environment, the climate of confidence in the economy and the particular risk structure of the bank. Generally, in periods of low economic growth stimulating investment appears to be more urgent due to the fact that investment is the most volatile component of national accounts. The net effect of the policy, however, will be smaller in periods of low economic growth as banks will typically maintain a lower loan-to-deposit ratio. On the other hand, in periods of economic expansion an increase in the availability of funds may permit banks to invest in riskier assets as the total volume of loans increases and, on the margin, the more secure and profitable investments are exhausted.

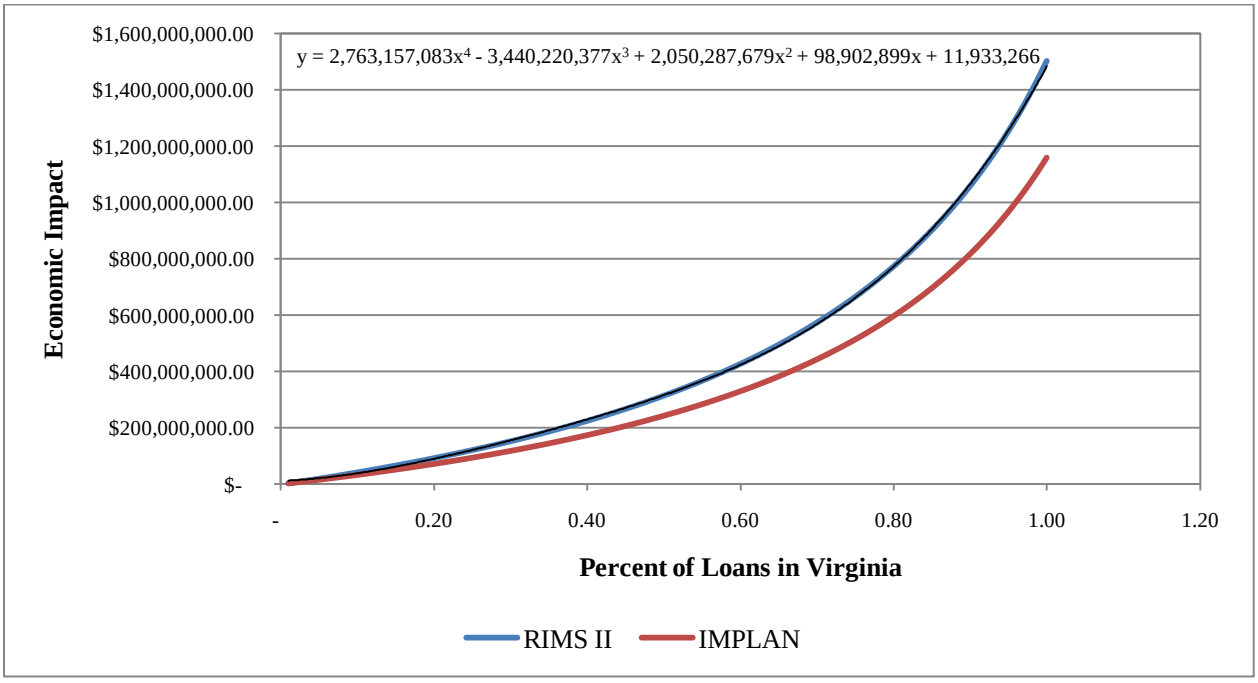
The percentage of new loans that are issued to companies and individuals in Virginia are sensitive to a variety of factors. Perhaps the most important factor to consider is the size and geographic reach of the bank. Larger interstate banking institutions have a greater access to information in a variety of markets and will naturally invest a larger portion of those funds available to them in markets of outside of Virginia. Community banks, through, have a much more regional focus and will typically invest a larger portion of those funds available to them in Virginia.

Another important factor to consider, that in much the same way bridges the divide between the use of these funds in Virginia and outside of the Commonwealth, is that some percentage of these loans will displace loans issued by institutions in Virginia to Virginia customers. In fact, this is one of the mechanisms that contribute to the fact that not all of the funds available will be invested in the Commonwealth. It is also interesting to note that holding all other things constant a one percentage point increase in the loan-to-deposit ratio and a one percentage point increase in the percent of total loans that result in new loans issued in Virginia generate the same incremental impact to economic output. That is to say that the table given

above is symmetric and that a loan-to-deposit ratio of 0.73 coupled with the percentage of new loans in Virginia of 0.85 is equivalent to a 0.85 loan-to-deposit ratio and a 0.73 ratio of new to total loans in Virginia. Notice also that the economic impact increases substantially for higher loan-to-deposit ratios and loan volumes due to the strong influence of the money multiplier.

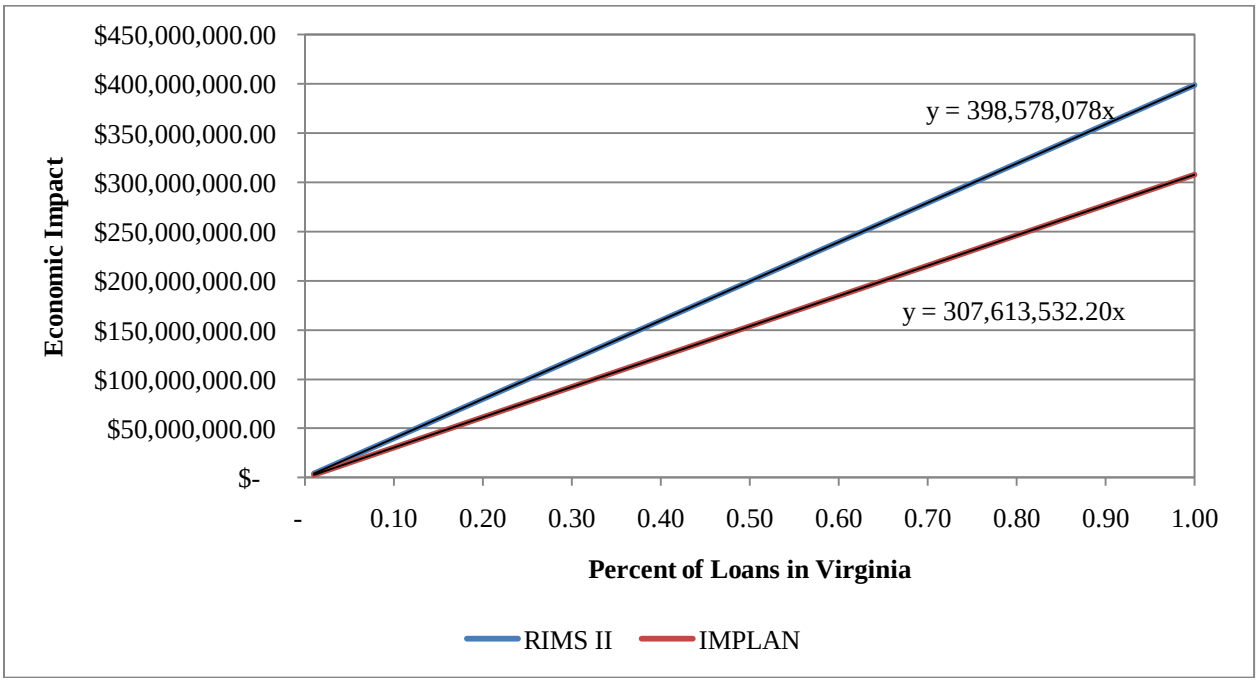
The economic impact of loans resulting from the proposed legislation is computed for a wide range of possible percentage values of new loans in Virginia, holding the loan-to-deposit ratio constant. Figure 5.5 shows the sensitivity of the economic output attributable to loans volumes to the percentage of new loans in Virginia resulting from the proposed legislation. The direct input-output multiplier effect is a linear relationship is justified on the grounds that these funds correspond to a very small portion of total deposits and loans and should not stimulate any significant non-linear macroeconomic feedback mechanisms. These are displayed in figures 5.6 and 5.7 for the impact on output and employment due to loans. The clearly nonlinear, fourth order polynomial relationship shown in figure 5.5 results from the fact that the money multiplier plays an important role, particularly at high levels for the percent of investment in Virginia. As the denominator approaches zero the money multiplier increases substantially and causes the economic impact to grow explosively.

Figure 5.5 Sensitivity of Loan Impact on Output to Percent of Loans in Virginia



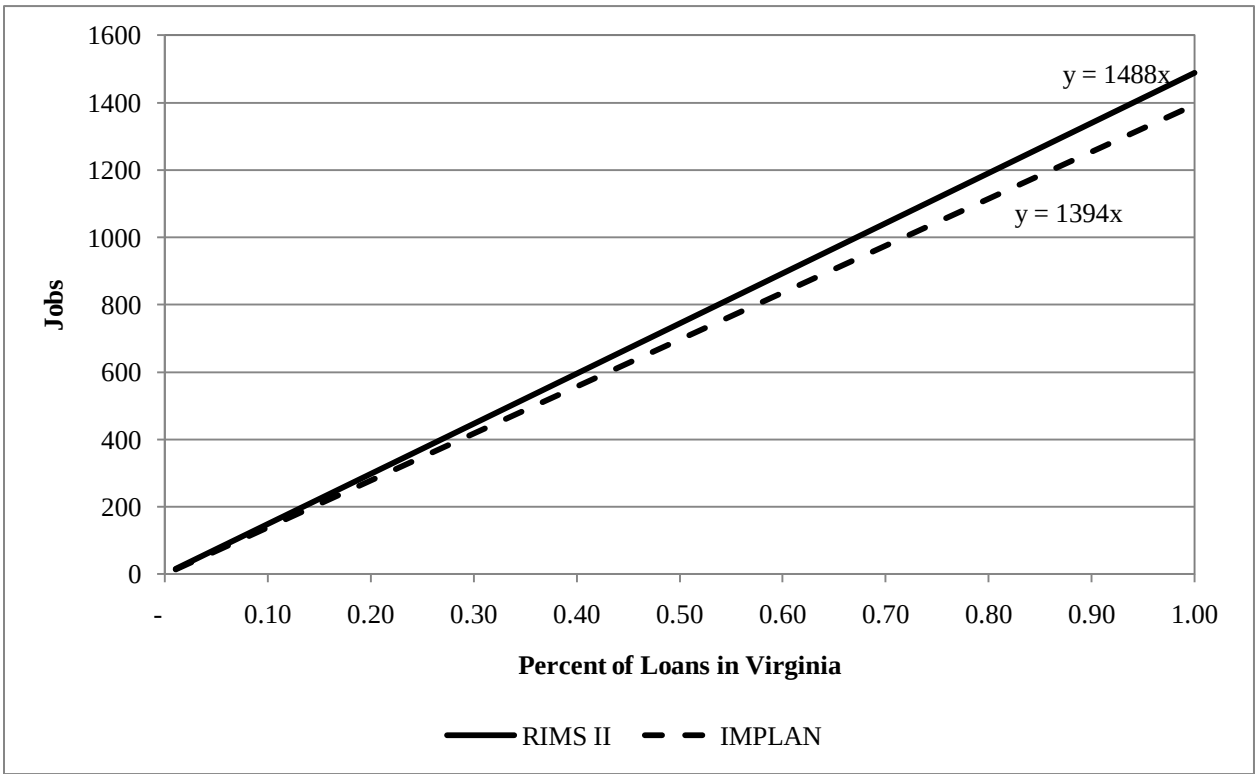
Source: Authors' Calculations

Figure 5.6 Sensitivity of the Economic Impact on Output due to Loans with Respect to the Percent of Loans in Virginia



Source: Authors' Calculations

Figure 5.7 Sensitivity Analysis of the Economic Impact on Employment with Respect to the Percent of Loans in Virginia



Source: Authors' Calculations

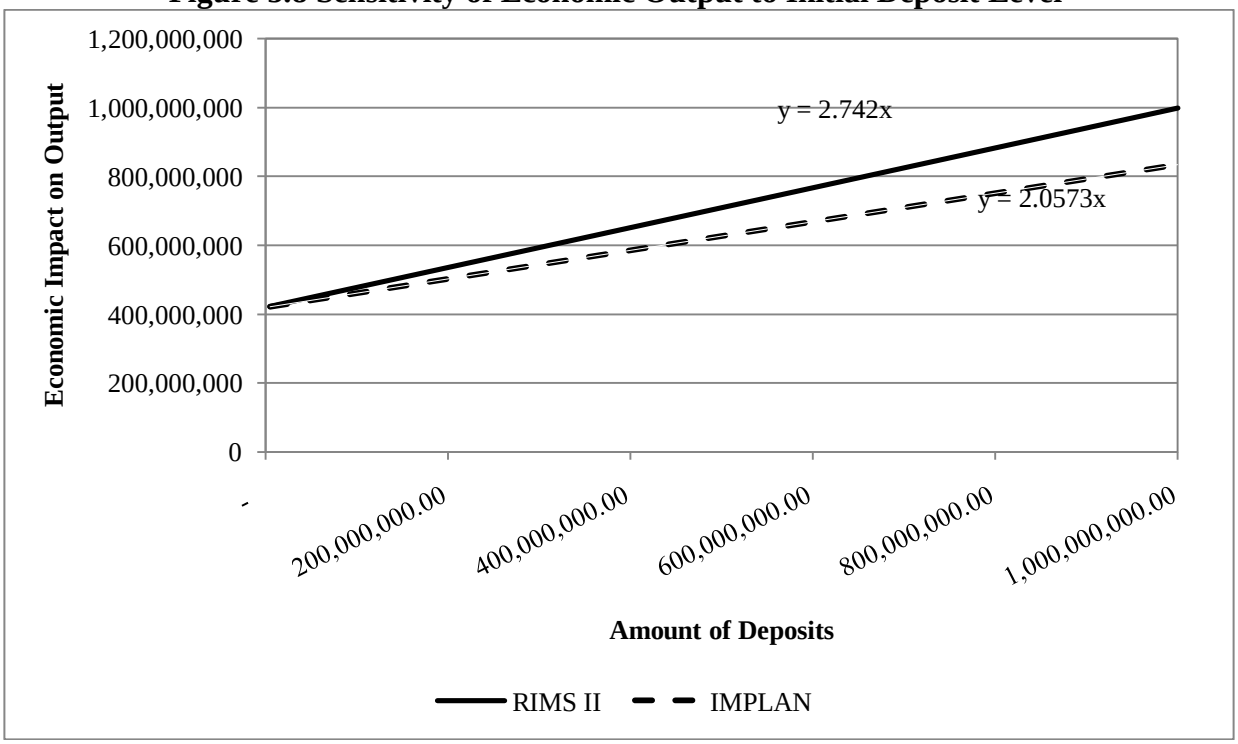
The results of this analysis are also marginally sensitive to the choice of modeling system. Along these lines the total investment volume and the percent of new loans issued in Virginia begins to play a more significant role because the composite multiplier, the multiplier resulting from the distribution of funds across industry sectors, influences the slope of the linear relationship between the total output and employment impacts of the policy and the level of deposits in Virginia banks. At smaller levels the difference between the various multipliers is very small and relatively insignificant. Somewhat different results emerge when we consider our central case in this analysis.

First, it is useful to compare IMPLAN multipliers across the various types of output multipliers available. It is no surprise that the Type I multiplier, which does not consider any

induced spending effects from increased wages yields the smallest results, 11.7% lower than our central case. The Type II multiplier, which does consider these induced effects, generates results that are 1.6% greater than our central case. This results from the fact that the default IMPLAN SAM multiplier disaggregates households by income levels. This disaggregation introduces household specific savings rates and consumption patterns as opposed to averages, which means that effects are only present when they are actually occurring. This is an important source of aggregation error in the models as well as in the sectoral aggregation which can generate an overestimate of the true economic impact because expenditure categories are included when they may only apply to one small portion of the aggregate, and particularly, not that sector under evaluation. The full SAM multiplier available from IMPLAN generates significantly larger effects, 82.0% greater than our central case. This results from considering additional effects induced by government tax revenue and expenditure and capital rental and investment.

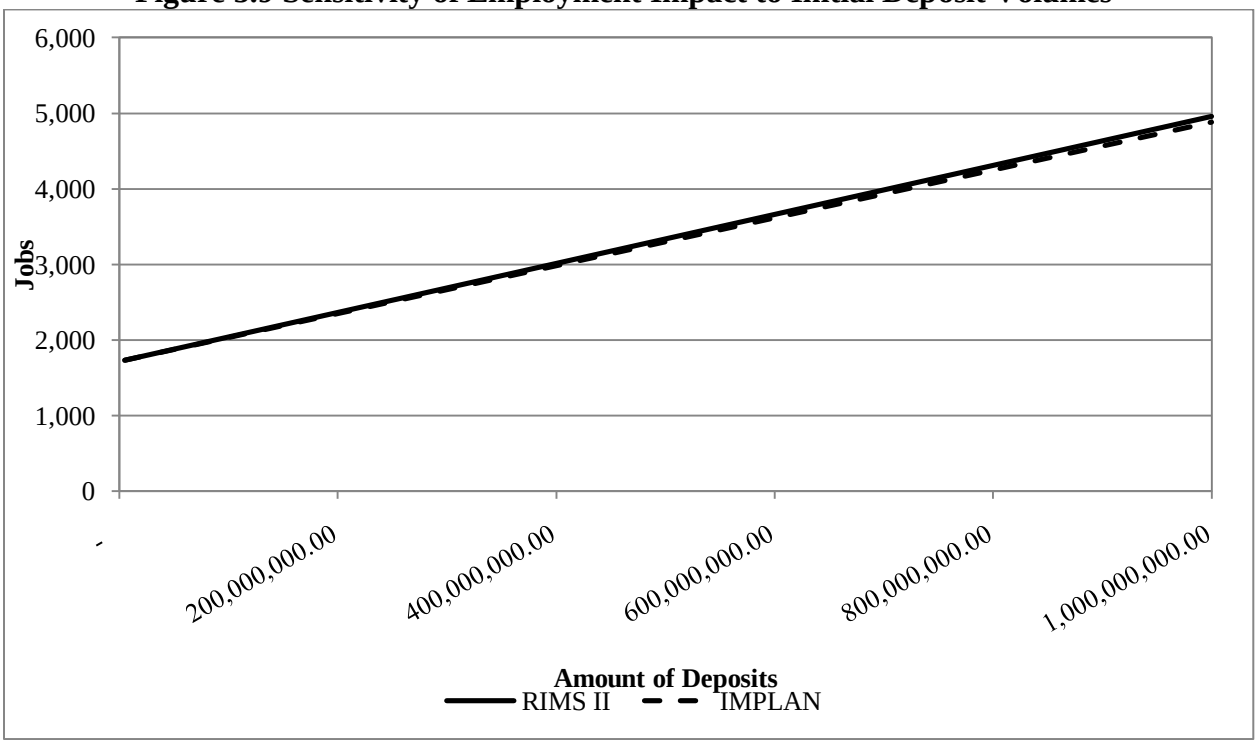
The RIMS II model produces results that are 29.3% greater than our central case. RIMS II is a distinct modeling system using different data sources and data from different years. In addition, the regionalization strategy employed by the RIMS II modeling system is one of regional purchase coefficients defined by location quotients that indicate the relative importance of a particular industry in the region. In contrast, the IMPLAN modeling system uses a distance based gravity model to compute trade flows between regions and adjust the standard national input-output tables. The difference between the two for this type of impact can be attributed to a combination of these factors. These percent differences maintain at greater loan volumes but they correspond to larger absolute differences in economic impact as the level of the impact increases. The differences in impact on employment due to the modeling system are minimal and well within our bounds of confidence.

Figure 5.8 Sensitivity of Economic Output to Initial Deposit Level



Source: Authors' Calculations

Figure 5.9 Sensitivity of Employment Impact to Initial Deposit Volumes



Source: Authors' Calculations

6 Conclusion

This paper examines the economic impact of proposed legislation in the Commonwealth of Virginia that would require the State Treasurer to invest at least 10% of the Local Government Investment Pool in financial institutions in Virginia. The proposed legislation generates two important stimuli for economic activity, the first in increasing loan volumes by increasing deposits in banks and the second by directly increasing the demand for bank services and operations in Virginia. The $420 million dollar deposit by the Virginia Treasury generates a $608 million dollar increase in output, creates 2,869 jobs and increases state tax revenue by $18 million dollars due to the banking sector impacts alone. The total impact of the proposed legislation is to increase output by $663 million, increase employment by 3,074 jobs, increase earnings by $330 million and increase value added by $414 million. The proposed legislation is also projected to increase indirect business tax revenue by $22 million. The lion's share of these benefits, with respect to increases output, occurs in the banking industry and in real estate.

While this study provides a clear, comprehensive assessment of the economic impact of the proposed legislation in terms of the impact of increases in bank operations and increases in lending activity, it is a principal component of a larger ongoing policy evaluation process that necessarily considers the impact of this policy on yields in the Local Government Investment Pool as well as the distributional implications of this policy.

Further research on the economic impact of the proposed legislation would also include a survey component designed to better assess the impact of bank structure and type of the loan-to-deposit ratio and the client base for lending operations at the bank. The survey could provide robust estimates for these key parameters and allow for a finer analysis of the impact of community banks relative to larger national banks.

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APPENDIX 1 – METHODOLOGICAL BACKGROUND

The objective of this appendix is to provide a detailed description of the more technical aspects of input-output analysis; these necessarily begin with the social accounting matrix. The social accounting matrix serves as a strong macroeconomic accounting framework useful in policy analysis. The key identity here partitions total output in a particular sector of the economy in a given region into its uses as intermediate inputs by other industries, final demand by households, use for private investment, government accounts and net exports of that good.

The inter-industry relationships are detailed in make and use tables constructed by the Bureau of Economic Analysis. These describe the production of commodities by industries and the uses of commodities by industries. Together these form the input-output table that details the intermediate industry transactions within the economy. Expanding the table to include final demand for industry output as well as employment and capital services yields the social accounting matrix.

Figure A.1 Social Accounting Matrix

	Intermediate Demand		Private Consumption	Private Investment	Government Spending	Exports	Total Output
	Sector 1	Sector 2					
Sector 1	x_{11}	x_{12}					
Sector 2	x_{21}	x_{22}					
Wages and Salaries							
Capital Services							
Tax Payments							
Imports							
Total Inputs	t_1	t_2					

The key here is that inputs to a particular industry can be divided by total inputs to derive the proportion of each industries inputs used. The resulting matrix is called the intermediate transactions matrix.

$$A = \begin{pmatrix} a_{11} = x_{11}/t_1 & a_{12} = x_{12}/t_2 \\ a_{21} = x_{21}/t_1 & a_{22} = x_{22}/t_2 \end{pmatrix}$$

COMPARISON OF TYPE I, TYPE II AND TYPE SAM MULTIPLIERS

As the discussion above indicates type I, type II and type SAM multipliers include different portions of the social accounting matrix and therefore account for different types of flows when considering the impact of an increase in the demand for the output of a particular industry. A multiplier expresses a linear relationship between the demand for output in a particular industry and the resulting increase in output across the economy. As a result, these can be normalized to consider the direct effect of a policy as equal to a stimulus of one. The indirect effects can then be measured as the increase above the direct effect resulting from the initial direct effect. A type I multiplier of 1.35 for the professional and business services indicates that an increase in the demand for these services of one million dollars, for the sake of concreteness, increases output directly by one million dollars and generates indirect rounds of spending that increase output by an additional 350 thousand dollars yielding the type I multiplier of 1.35.

The type II multiplier considers not only the direct and indirect effects of policies; it also considers the impact on labor income and therefore increased spending. As a result, the type II multipliers are always larger than the type I multipliers. The induced effects can be a very significant portion of the total impact in industries such as professional services and securities and financial investments where higher incomes generate large absolute levels spending, even when accounting for a higher savings rate and therefore lower marginal propensity to consume. In addition, sectors such as education and healthcare and transportation, which receive a large portion of private consumption spending, also see relatively large induced effects of policies relative to the indirect effect resulting from intermediate demand for inputs.

Table A.1 Comparison of Type I, Type II and Type SAM Multipliers

Sector	Type I Multiplier	Type II Multiplier	SAM Multiplier	Difference
Agriculture	1.65	2.01	1.97	2.17%
Mining	1.37	1.78	1.74	2.79%
Electric Power	1.13	1.41	1.41	0.00%
Natural gas distribution	1.36	1.66	1.62	2.21%
Water sewage and other systems	1.22	1.74	1.68	3.62%
Construction	1.55	2.11	2.04	3.49%
Manufacturing	1.63	1.99	1.99	0.00%
Wholesale Trade	1.32	1.83	1.76	3.86%
Transportation and warehousing	1.44	2.05	1.96	4.08%
Retail trade	1.34	1.89	1.81	3.90%
Information	1.40	1.80	1.75	3.01%
Nondepository credit intermediation and related	1.32	1.91	1.83	4.17%
Securities- commodity contracts- investments	1.56	2.27	2.18	4.25%
Insurance carriers	1.40	1.83	1.77	3.19%
Insurance agencies- brokerages- and related	1.11	1.60	1.54	4.15%
Funds- trusts- and other financial vehicles	1.66	2.23	2.16	3.22%
Monetary authorities and depository credit in	1.27	1.63	1.58	2.96%
Real Estate	1.21	1.37	1.35	1.38%
Other	1.40	2.00	1.92	4.07%
Professional services	1.35	2.11	2.01	4.80%
Education and Healthcare	1.38	2.05	1.96	4.41%
Arts and Entertainment	1.47	1.99	1.92	3.56%
Government	1.06	1.96	1.83	6.49%

Source: IMPLAN

The type SAM multiplier[2] is less than or equal to the type II multipliers in every case. The difference can range from a decrease of 0.0% in electric power and manufacturing to 4.8% in professional and technical services relative to the type II multiplier. This results from the fact that greater detail is provided by the type SAM multiplier. In particular, the same multiplier differentiates ten household types by income level, allowing for differences in the marginal propensity to consume across household types, where higher income households typically spending a smaller fraction, albeit a larger absolute amount, of their income on consumption. In

[2] The household SAM multiplier is the default SAM multiplier for the IMPLAN input output modeling system.

addition, the type of spending patterns also reflects the capacity to purchase luxury goods and other types of services, including arts and entertainment. SAM type multipliers can also be constructed to include tax revenue and public sector spending, capital income and investment spending and other value added and final demand categories.

FORMAL MODEL PRESENTATION

Input output models are based on a system of linear equations that define total output for each of n sectors of the economy. Output in sector 1, denoted by x_1, is equal to the sum of value added, y_1, and the intermediate consumption of that sectors output by each and every other sector in the economy. Equation 1.1 presents the system of equations used to describe output in each sector of economic activity.

$$\begin{aligned} y_1 + a_{11}x_1 + a_{21}x_2 + \cdots + a_{n1}x_n &= x_1 \\ y_2 + a_{12}x_1 + a_{22}x_2 + \cdots + a_{n2}x_n &= x_2 \\ &\vdots \\ y_n + a_{1n}x_1 + a_{2n}x_2 + \cdots + a_{nn}x_n &= x_n \end{aligned} \tag{1.1}$$

Note that a_{ij} corresponds to a fixed technical coefficient that is between 0 and 1 that describes the percentage of the output of sector i used in the production of the output of sector j. This means that the sum, $a_{11} + a_{12} + \cdots + a_{1n}$ plus the use of capital, labor and imported goods is equal to one.

The same information can be displayed more compactly in matrix notation. To do so we define the following matrices:

$$\boldsymbol{y}_{(\boldsymbol{n}\times\boldsymbol{1})} = \begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{pmatrix}, \qquad \boldsymbol{x}_{(\boldsymbol{n}\times\boldsymbol{1})} = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}, \qquad \boldsymbol{A}_{(\boldsymbol{n}\times\boldsymbol{n})} = \begin{pmatrix} a_{11} & a_{11} & \cdots & a_{n1} \\ a_{12} & a_{22} & & a_{n2} \\ \vdots & & \ddots & \vdots \\ a_{1n} & a_{2n} & & a_{nn} \end{pmatrix}, \qquad I_{(\boldsymbol{n}\times\boldsymbol{n})} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$\boldsymbol{y}$ is a $n \times 1$ vector of final demand in each sector of the economy. $\boldsymbol{x}$ is a $n \times 1$ vector of output in each sector of the economy. $\boldsymbol{A}$ is a $n \times n$ matrix of technical coefficients and $\boldsymbol{I}$ is the

identity matrix. The system of linear equations above can be expressed then in the form shown in equation 1.2.

(1.2)
$$\begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{pmatrix} + \begin{pmatrix} a_{11} & a_{21} & \cdots & a_{n1} \\ a_{12} & a_{22} & & a_{n2} \\ \vdots & & \ddots & \vdots \\ a_{1n} & a_{2n} & & a_{nn} \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix} = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}$$

or more compactly,

(1.3)
$$\boldsymbol{y} + \boldsymbol{A}\boldsymbol{x} = \boldsymbol{x}$$

To determine the impact of an increase in final demand, that is an increase in private consumption, private investment or government spending, solve 1.3 for x[3], resulting in equation 1.4.

(1.4)
$$(\boldsymbol{I} - \boldsymbol{A})^{-1}\boldsymbol{y} = \boldsymbol{x}$$

The term $(\boldsymbol{I} - \boldsymbol{A})^{-1}$ is the multiplier matrix.

Another equivalent way of expressing the same relationship is by recognizing that an increase in the demand for the goods and services provided by a particular sector imply that, first, that sector will increase its demand for intermediate inputs. Then those sectors that provide inputs to the sector that received the demand shock will increase their demand in a manner consistent with the share of input to the shocked sector that originates in the other sectors of economic activity.

(1.5)
$$Economic\ Impact = \boldsymbol{I}\boldsymbol{y_s} + \boldsymbol{A}\boldsymbol{y_s} + \boldsymbol{A^2}\boldsymbol{y_s} + \boldsymbol{A^3}\boldsymbol{y_s} \ldots$$

In other words, our initial direct effect, $\boldsymbol{I}\boldsymbol{y_s}$, is an increase in the demand for the products and services produced in the sector receiving a demand shock. The second round effects, $\boldsymbol{A}\boldsymbol{y_s}$, represent the increase in demand for inputs by the first sector. The third round, $\boldsymbol{A^2}\boldsymbol{y_s}$, represents

[3] $\boldsymbol{y} + \boldsymbol{A}\boldsymbol{x} = \boldsymbol{x}$,
$\boldsymbol{y} = \boldsymbol{x} - \boldsymbol{A}\boldsymbol{x}$,
$\boldsymbol{y} = (\boldsymbol{I} - \boldsymbol{A})\boldsymbol{x}$,
$(\boldsymbol{I} - \boldsymbol{A})^{-1}\boldsymbol{y} = \boldsymbol{x}$.

the increase in demand for intermediate inputs resulting from the increase in spending in the second round.

These incremental increases in demand decrease through the rounds of spending as the initial direct effect is separated and divided into smaller portions consistent with the technical coefficients representing the input from each sector of economic activity. This results because the technical coefficients are between 0 and 1. The result is a convergent geometric series that converges to $(\boldsymbol{I} - \boldsymbol{A})^{-1}y$.[4]

REGIONAL INPUT OUTPUT MODELS

Regional input-output models are constructed from survey data or derived from national input-output tables. The national tables are in turn derived from survey data and compiled by the Bureau of Economic Analysis. These surveys collect information with respect to the intermediate demand for goods and services by firms as well as their use of labor and capital services and their tax payments, receipts from the public and sales.

An alternative to survey data is to construct input output tables from the national tables constructed by the Bureau of Economic Analysis. This is done by recognizing that interstate trade serves as an important source of inputs to production and that these effects are not captured by the region in which the demand occurs but in the region that exports those goods and services. ***Regional purchase coefficients*** are generally constructed from employment data because employment data is more reliable and accessible. These sector specific coefficients account from the regional purchase of inputs in the economy. These are often determined from **location quotients** given by the ratio of employment in one sector of economic activity to total

[4] A geometric series for a scalar is: $y + ay + a^2y + a^3y + a^4y + \cdots + a^{p-1}y = \frac{y}{1-a}$.

employment in the regional economy and to the ratio of employment in that sector of economic activity to employment at the national level. That is,

$$\frac{Regional\ \ Employment\ \ in\ Sector_{\ i}}{Total\ \ Regional\ \ Employment} \Bigg/ \frac{National\ \ Employment\ \ in\ Sector_{\ i}}{Total\ \ National\ \ Employment} \tag{1.6}$$

Practically, this means that geographic specialization in particular sectors implies that a greater share of the output of that sector is used locally. Anecdotally, the strength of the telecommunications and professional and business service firms in Northern Virginia means that those companies in the area requiring such services will satisfy their demand by looking for firms in the region which can provide those services. Similarly, the large number of automobile manufacturing facilities in Michigan implies that if firms need cars in their production process they will be more likely to increase the demand for automobiles produced in that region.

An example may help to clarify and make the concept of the location quotient more concrete. Table A.2 presents employment in banks and credit intermediation as well as employment in professional and technical services in the Commonwealth of Virginia and in the United States as a whole.

Table A.2 Employment Data

		Federal Reserve banks, credit intermediation and related services		Professional, scientific, and technical services	
		Employment	Percent of Total	Employment	Percent of Total
2008	United States	2717854	2.40%	7816999	6.92%
2008	Virginia	66375	2.23%	374271	12.55%
2007	United States	2866579	2.52%	7635062	6.71%
2007	Virginia	71294	2.38%	358324	11.97%
2006	United States	2922180	2.60%	7392850	6.57%
2006	Virginia	74171	2.50%	346609	11.68%
2005	United States	2870855	2.60%	7055427	6.39%
2005	Virginia	73051	2.50%	329914	11.29%
2004	United States	2813110	2.60%	6768868	6.25%
2004	Virginia	71242	2.50%	307656	10.79%

Source: Bureau of Labor Statistics

The companies that provide professional and technical services make up a significantly larger portion of employment in Virginia than in the United States as a whole. These industries are typically concentrated in Northern Virginia, with a sizeable presence in Richmond and Hampton Roads. Table A.3 shows the resulting location quotient taken by dividing the percentage of employment in Virginia relative to the percentage of employment in the United States as a whole. The concentration of companies providing professional and technical services is clearly greater suggesting that these industries import less services from out of state. On the other hand, the banking industry in Virginia has less weight than in the US as a whole and relatively more of these services are imported from outside of the state.

Employment data is typically used to determine the degree of specialization that occurs in a particular region. If a particular sector, such as professional business and consulting services, has a greater relative employment levels in Virginia than in the nation as a whole the multiplier for that sector in Virginia will be greater than the national average. Practically, the multipliers are then adjusted by the ratio of sector-specific employment in a particular region to the national table from which the multipliers were originally derived from survey data. Studies have shown that multipliers derived in this way are fairly consistent with those collected from more expensive survey methodologies. Various other more complex methodologies are available that estimate the volume of trade flows between regions as both a function of the degree of specialization in a particular region and their distance to other regions with significant output in those sectors. An example of one alternative methodology is that of a gravity model, which like the principles in physics relates the force of attraction, i.e. the trade flows, between two objects or regions as inversely related to the distance between them. The actual relationship is typically estimated from data.

Table A.3 Location Quotients for the Commonwealth of Virginia

		2008	2007	2006	2005	2004
1	Crop and animal production	0.4233	0.4375	0.4503	0.4632	0.4658
2	Forestry, fishing, and related activities	0.3374	0.3514	0.3479	0.3515	0.3597
3	Oil and gas extraction	0.0857	0.0653	0.0602	0.0660	0.0538
4	Mining, except oil and gas	1.1657	1.2072	1.2650	1.2806	1.2925
5	Support activities for mining	0.2301	0.2338	0.2702	0.2313	0.2229
6	Utilities*	0.7792	0.7712	0.7570	0.7530	0.7934
7	Construction	1.1887	1.2080	1.2430	1.2672	1.2702
8	Wood product manufacturing	1.3514	1.3707	1.3711	1.3563	1.3490
9	Nonmetallic mineral product manufacturing	1.0814	1.1535	1.2403	1.3135	1.3074
10	Primary metal manufacturing	0.4868	0.4926	0.4987	0.4852	0.4871
11	Fabricated metal product manufacturing	0.4808	0.5264	0.5248	0.5259	0.5228
12	Machinery manufacturing	0.6126	0.6131	0.6228	0.6079	0.6166
13	Computer and electronic product manufacturing	0.4862	0.5086	0.4838	0.4624	0.4544
14	Electrical equipment and appliance manufacturing	0.7777	0.7339	0.7251	0.6932	0.6584
15	Motor vehicle, body, trailer, and parts manufacturing	0.8425	0.8450	0.8634	0.8746	0.8674
16	Other transportation equipment manufacturing	ND	ND	ND	ND	ND
17	Furniture and related product manufacturing	1.0814	1.1535	1.2403	1.3135	1.3074
18	Miscellaneous manufacturing	0.4615	0.4638	0.4550	0.4549	0.4582
19	Food, beverage, and tobacco product manufacturing	0.8823	0.8862	0.8924	0.9192	0.9711
20	Textile and textile product mills	1.2640	1.2804	1.2487	1.4011	1.4908
21	Apparel, leather, and allied product manufacturing	0.3693	0.3611	0.3965	0.4896	0.4819
22	Paper manufacturing	0.9136	0.9157	0.9330	0.9222	0.9228
23	Printing and related support activities	0.9195	0.9243	0.9240	0.9209	0.9278
24	Petroleum and coal products manufacturing	0.2686	0.3018	0.2753	0.2688	0.2492
25	Chemical manufacturing	0.7480	0.7250	0.7270	0.7244	0.7618
26	Plastics and rubber products manufacturing	0.9381	0.9602	0.9673	1.0196	1.0197
27	Wholesale trade	0.7627	0.7714	0.7700	0.7709	0.7747
28	Retail trade	1.0424	1.0483	1.0460	1.0375	1.0423
29	Air transportation	1.1273	1.0952	1.0947	1.2554	1.2174
30	Rail transportation	ND	ND	ND	ND	ND
31	Water transportation	1.0291	0.9319	0.9949	1.1216	0.9299
32	Truck transportation	0.8339	0.8390	0.8622	0.8792	0.8944
33	Transit and ground passenger transportation*	0.6413	0.6599	0.6610	0.6591	0.6705
34	Pipeline transportation	0.3558	0.3614	0.3960	0.3974	0.4042
35	Other transportation and support activities*	0.8934	0.8984	0.8897	0.9272	0.9134
36	Warehousing and storage	1.0727	1.1292	1.1876	1.2343	1.2271
37	Publishing including software	0.8942	0.8832	0.8611	0.8579	1.0240
38	Motion picture and sound recording industries	0.4566	0.5329	0.5024	0.4905	0.5006
39	Broadcasting and telecommunications	1.2472	1.3440	1.2342	1.2382	1.2110
40	Information and data processing services	1.4667	1.4017	1.7370	1.8131	2.1068
41	Federal Reserve banks, credit intermediation and related services	0.9255	0.9457	0.9622	0.9608	0.9617
42	Securities, commodity contracts, investments	0.5848	0.5862	0.5793	0.5746	0.5517
43	Insurance carriers and related activities	0.7015	0.7109	0.7167	0.7106	0.7149
44	Funds, trusts, and other financial vehicles	ND	ND	ND	ND	ND
45	Real estate	1.0468	1.0507	1.0461	1.0653	1.0646
46	Rental and leasing services and lessors of intangible assets	0.9606	0.9905	0.9824	1.0067	1.0141
47	Professional, scientific, and technical services	1.8145	1.7846	1.7773	1.7656	1.7260
48	Management of companies and enterprises	1.5257	1.5815	1.5919	1.5997	1.5708
49	Administrative and support services	0.9983	0.9690	0.9541	0.9567	0.9728
50	Waste management and remediation services	0.8340	0.8778	0.8666	0.8576	0.8721
51	Educational services	0.9080	0.9139	0.8904	0.8776	0.8587

Cont'						
52	Ambulatory health care services	0.9107	0.8973	0.8900	0.8746	0.8783
53	Hospitals and nursing and residential care facilities	0.8425	0.8171	0.8156	0.8166	0.8106
54	Social assistance	0.8491	0.8122	0.7882	0.7735	0.7667
55	Performing arts, museums, and related activities	0.8313	0.8136	0.8322	0.8423	0.8513
56	Amusements, gambling, and recreation	0.9408	0.9367	0.9363	0.9151	0.9070
57	Accommodation	0.9902	0.9926	1.0042	0.9878	0.9848
58	Food services and drinking places	1.0040	1.0001	0.9977	0.9914	0.9906
59	Other services*	1.1592	1.1467	1.1270	1.1252	1.1248
60	Households	0.7299	0.7776	0.8148	0.8398	0.8571

Source: Authors' Calculations

Another important consideration that arises when regionalizing the national input-output table constructed by the Bureau of Economic Analysis involves annual updating of the input-output table. The technical coefficients that represent the proportion of inputs to a production from the various sectors of economic activity change through time as technologies change. The surveys that serve as the basis for the national tables constructed by the Bureau of Economic Analysis are administered every five years and are then processed within a year. The resulting technical coefficients are then very influenced by the current state of technology and the particular industrial processes and businesses practices in that year, as well as their scale.

To update the table various procedures can be employed each of them based on ensuring that sum of intermediate and final demand, that is intermediate demand for goods and services as inputs and private consumption, investment, government spending and exports is equal to the use of those inputs in production and the value added of those sectors. The objective then is to alter the matrix annually in such a way that minimizes any changes we make to the survey data while ensuring that our income and expenditures are equal.

COMPUTATIONAL IMPLEMENTATION

Basic input-output models require very few mathematical operations and can be easily implemented in a variety of formats. The key issue involved in applying input-output models is the use of reliable, detailed and current data at the regional level, a task which is often not trivial. Various data services and software packages are available that facilitate the implementation of input output models, including RIMS II, IMPLAN and REMI.

RIMS II

The **R**egional **I**nput-output **M**odeling **S**ystem (***RIMS II***) developed by the Department of Commerce's Bureau of Economic Analysis is an important source of data that provides input-output multipliers for 473 industries[5] for any region consisting of one or more counties. The multipliers are given as a matrix with dimensions 38×473 and can be manipulated in a spreadsheet or simply visually inspected.

The national survey data is regionalized to exclude imported goods from the regional economy. The regional purchase coefficient is based on the location quotient defined in (1.6) based on 1992 wages and salaries by industry at the four-digit SIC level, adjusted for the share of total earnings accounted for by wages and salaries. The data is based on the 1997 survey data collected by the Bureau of Economic Analysis. Aggregate multipliers for 60 sectors are based on 2006 data.

The RIMS II multipliers cost $225 dollars per region and $50 dollars for a specific industry in a region. Type I and type II multipliers are available for output.

[5] These sectors are aggregated into 38 row sector which means their effects at the industry level are described only for 38 larger sectoral aggregates. All 471 sectors have multipliers to describe an initial direct shock to that activity.

The RIMS II multipliers can be viewed in the RIMS II viewer and include the following files:

1. Output Multipliers – Detailed Industries
2. Earning – Detailed Industries
3. Employment – Detailed Industries
4. Value-Added – Detailed Industries
5. Total Multipliers – Detailed Industries
6. Output Multipliers – Aggregate Industries
7. Earning – Aggregate Industries
8. Employment – Aggregate Industries
9. Value-Added – Aggregate Industries
10. Total Multipliers – Aggregate Industries

The package also includes a complete data set with respect to final demand categories for the various industries in the commonwealth including private consumption, private fixed investment, exports, imports and very detailed information regarding the composition of intermediate demand.

The RIMS II output, employment, earnings and value added multipliers can be found in the accompanying excel documents "EconomicImpactAnalysis_RIMSII.xls" and "RIMSII_Detailed.xls" to facilitate their use for conducting economic impact analysis for policies and programs in Virginia. The first excel file contains 60 sector aggregate industry classifications while the second contains 480 industry sector classifications.

An important first step in the conducting economic impact analysis of programs and policy is defining the industry sector directly affected by the policy under evaluation. Often times this can be very specific, such as evaluating the economic impact of providing loans to businesses in a small clearly defined industry such as Cattle Ranching and Farming or more broadly defined to provide loan support to firms engaged in Crop and Animal Production. Narrowly defined sector delineations are preferred as these tend to more precise, though these

direct impacts are often complicated by limited data availability. This section will describe the use of these excel spreadsheets. Both are based on the same structure and as a result we will focus on the spreadsheet application of the multipliers for the aggregate industry classifications, "EconomicImpactAnalys_RIMSII.xls".

The workbook contains the following worksheets:

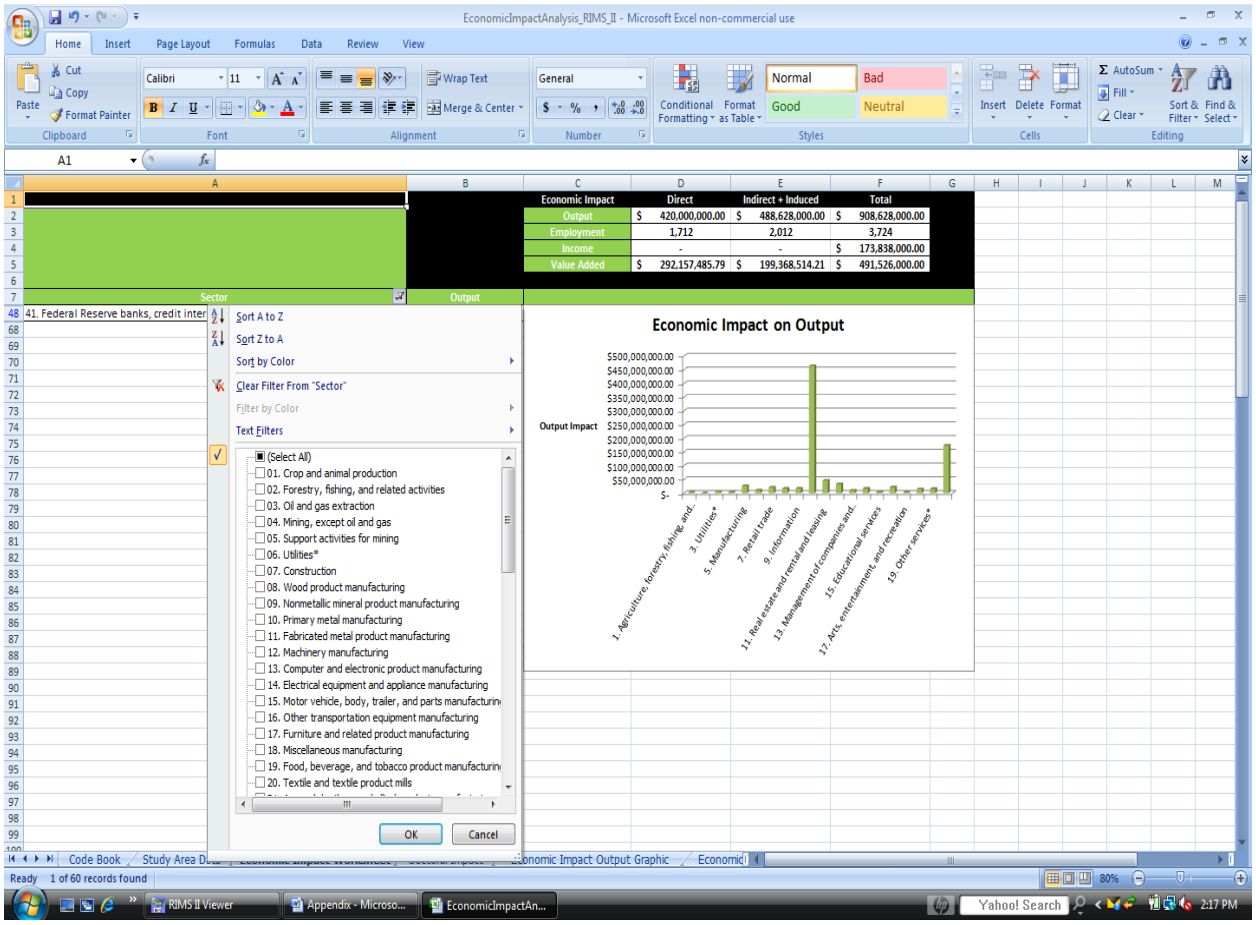
Worksheet Name	**Purpose**
Study Area Data:	General economic data for Virginia in 2006, IMPLAN data.
Economic Impact Worksheet:	Primary interactive worksheet. User defined direct impacts by industry are used to compute economic impacts.
Sectoral Impact:	Worksheet for computations only, also contains table of sector specific policy impacts.
Economic Impact Output Graphic:	Bar chart depicting industry level distribution of output effects
Economic Impact Emp Graphic:	Bar chart depicting industry level distribution of employment effects
Economic Impact Earning Graphic:	Bar chart depicting industry level distribution of earnings effects
Econ Imp Value Added Graphic:	Bar chart depicting industry level distribution of value added effects
Output_Type II:	RIMS II Type II Output Multipliers
Employmen_Type II:	RIMS II Type II Employment Multipliers
Earnings Type II:	RIMS II Type II Earnings Multipliers
Value Added Type II:	RIMS II Type II Value Added Multipliers

Most of the worksheets are used for presentation of data tables and for computational purposes. The worksheets *Sectoral Impact*, *Economic Impact Output Graphic*, *Economic Impact Emp Graphic*, *Economic Impact Earning Graphic*, and *Economic Impact Value Added Graphic* are all primarily used for presentation of results. The last four worksheets are data tables for computations with the workbook and are RIMS II data tables.

The central interactive worksheet is *Economic Impact Worksheet*. This worksheet receives input from the user with respect to the direct impact of the policy on each sector of economic activity and presents the economic impact in terms of output, employment, earnings and value added. Figure A.2 shows a screenshot of the Economic Impact Worksheet. The

important areas stand out. The first is a graphic showing the economic impact by sector. The worksheet contains all of the graphics in the analysis, that is, the industry distribution of impacts for output, employment, earnings and value added. The same graphics are each contained in individual worksheets.

Figure A.0.2 Spreadsheet Implementation of RIMS II



The second important region of the worksheet is the table indicating the total economic impacts of the policy with respect to output, employment, earnings and value added enclosed in a black border. Note that the employment impact considers both full time and part time jobs. Finally, the most important segment of the worksheet is the area listed under sector. By clicking

on the filter tab next to the column sector the user can select the industry or industries affected by the policy. Once these have been selected, the direct economic impact of the policy or program in terms of increased production of output can be inputted into the relevant row in the column labeled output. The economic impacts are then automatically computed.

IMPLAN

The IMact and PLANing model (***IMPLAN***) provides an input-output software package and additional data elements for analysis. The model was developed and is managed by the Minnesota IMPLAN group. Data is available for 509 sectors for all counties in the US, zip code level data and some international data as well. Type I, type II and type SAM multipliers are available for output, value added, employment, income, and tax revenue. Income and tax revenues are further reported for a variety of specific subsections. The software costs $450 and the data costs $400 dollars for state level data per state and $200 dollars for county level data per county.

The regionalization of the national tables is made in a manner that is marginally more sophisticated than simple location quotients. The regional purchase coefficients are econometrically estimated from a gravity model using 1997 Commodity Flow survey data and distance data adjusted for the ease of mobility collected by the Oakridge National Transportation Research Laboratory. These commodity flows are then used to purge imported flows from the regional input-output tables and construct regional multipliers.

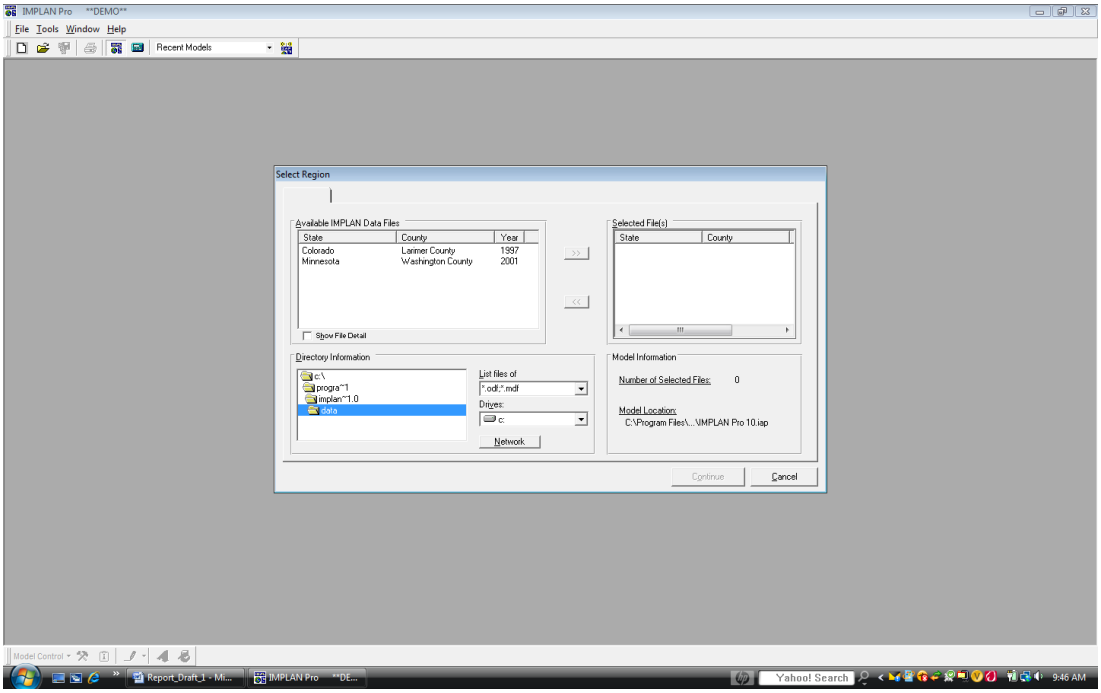
In order to more fully demonstrate the nature and the utility of the IMPLAN modeling software we will present an example developed and implemented using the demo IMPLAN V2

model. A demo of the IMPLAN V2 model is available online[6]. The following steps are required to conduct an input-output analysis in IMPLAN:

Step 1: Select Study Region
Program builds study region
Step 2: Construct Model
Program Implements Model and Constructs Multipliers
Step 3: Create Direct Impacts
Step 4: Run Impact
Step 5: Impact Analysis
Step 6: Report Results

The user first selects **File** > **New** from the drop down menu. After the study has been named and saved Figure A.3 opens shows a screenshot of the IMPLAN modeling software. The demo comes with two counties, Larimer County, Colorado for 1997 and Washington County, Minnesota for 2001. Other counties and time periods are available for purchase. Double clicking on the region of interest moves this to the box labeled "Selected Files". Selecting "Continue" builds the study region.

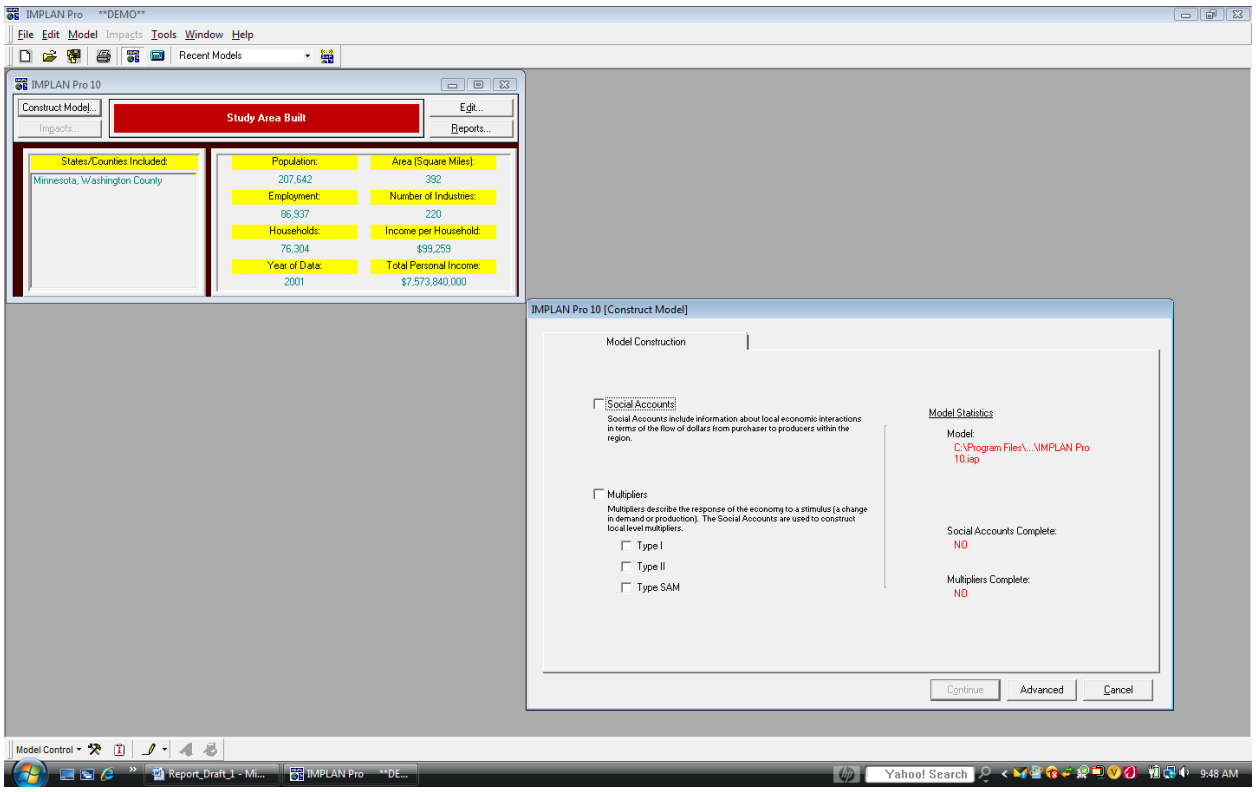
Figure A.3 Select Study Region



[6] http://implan.com/v3/index.php?option=com_docman&task=cat_view&gid=61&Itemid=138)

The built study region provides basic data for the region including population, employment, the number of households, area, number of industries, income per household and total personal income. From the box that describes the built study area the user clicks on the box labeled "Construct Model" which opens the screenshot displayed in Figure A.4. This box allows the user to select the type of analysis and multipliers, type I, type II or type SAM multipliers that are to be used in the analysis. Advanced options are available to specify the type regionalization strategy for the model and edit and view the basic data. Typically the default values for these are acceptable and a SAM type of multiplier would provide the most sophisticated level of analysis available in IMPLAN.

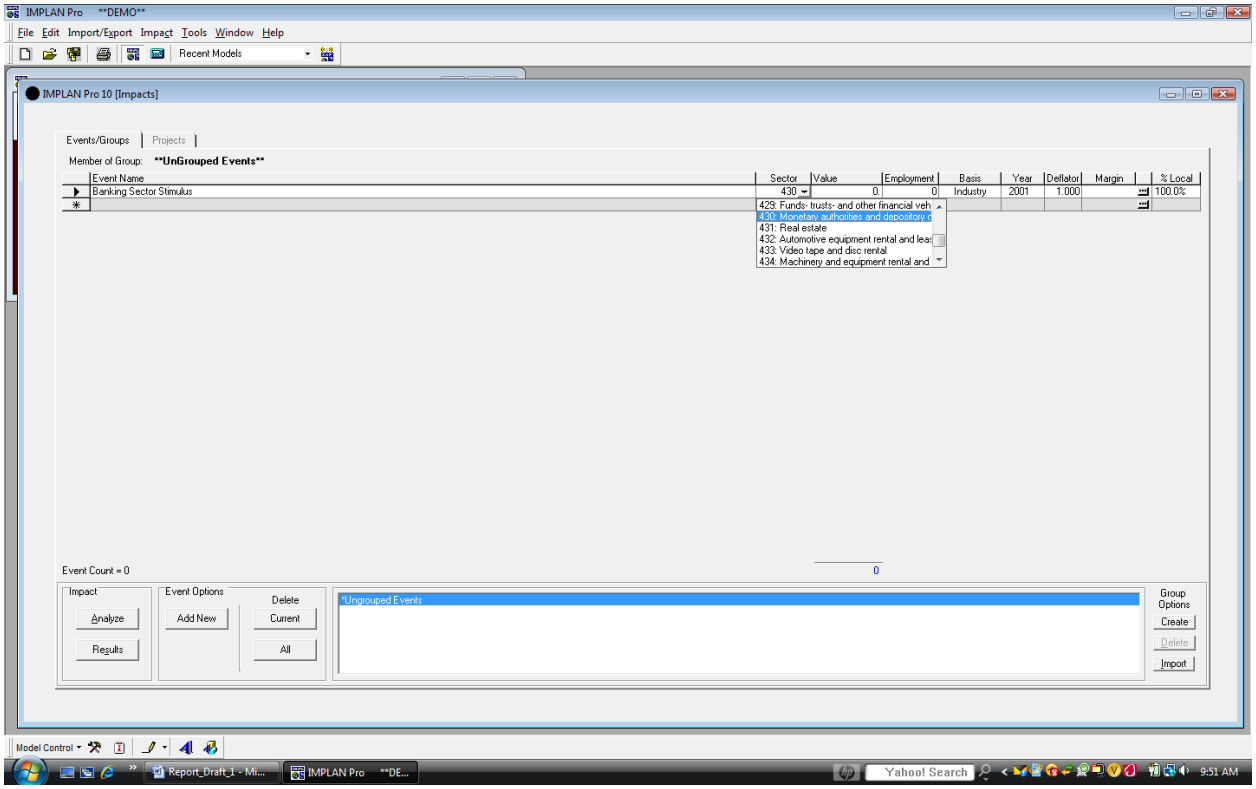
Figure A.4 Screenshot of Model Construction



After the model has been constructed the user clicks on the box "Impacts" on the box describing the study area, which opens the screenshot shown in Figure A.5. Placing cursor in the box indicating the "Event Name" allows the user to enter a name for the event, here named "Banking Sector Stimulus". Below "Sector" the user can select the sector of economic impact to define the impact from a drop down menu,

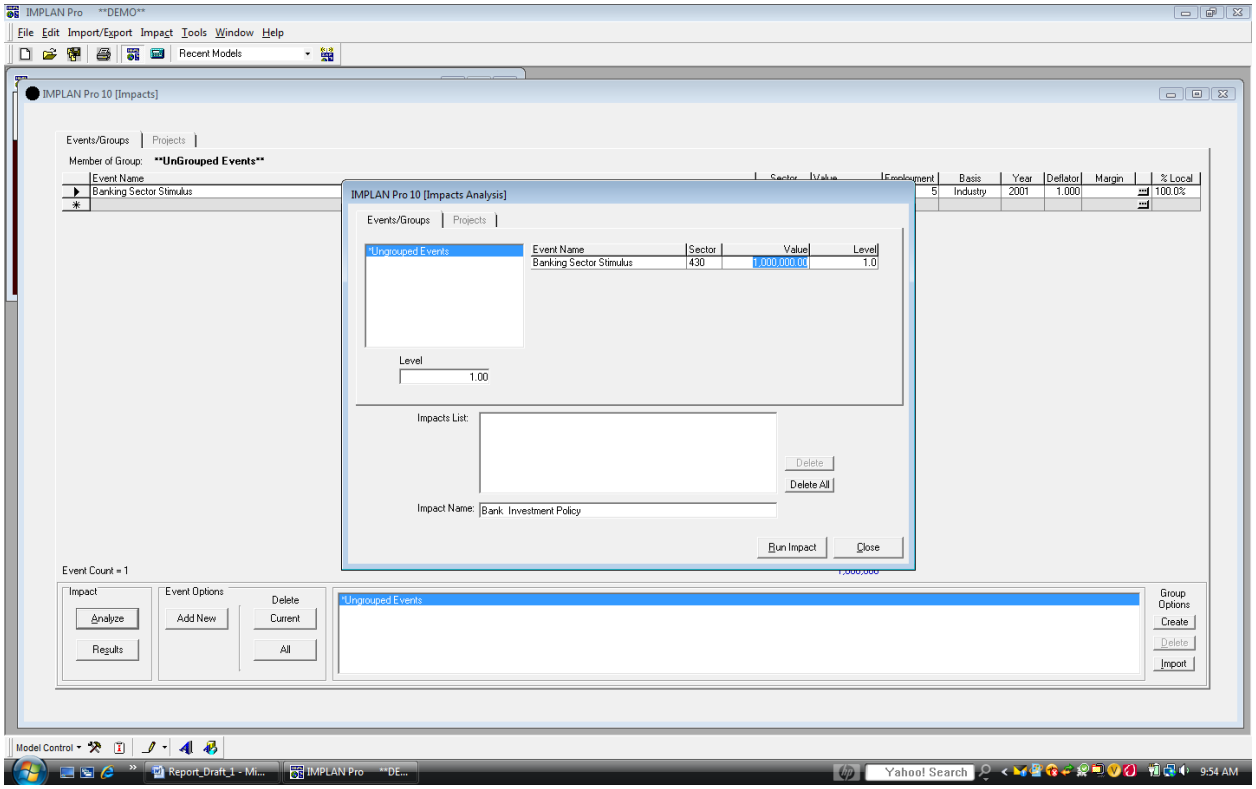
here we select IMPLAN sector 430 "Monetary Authority and Depository Credit Intermediation". Note that multiple impacts for various sectors can be defined simultaneously.

Figure A.5 Screenshot for direct impact construction



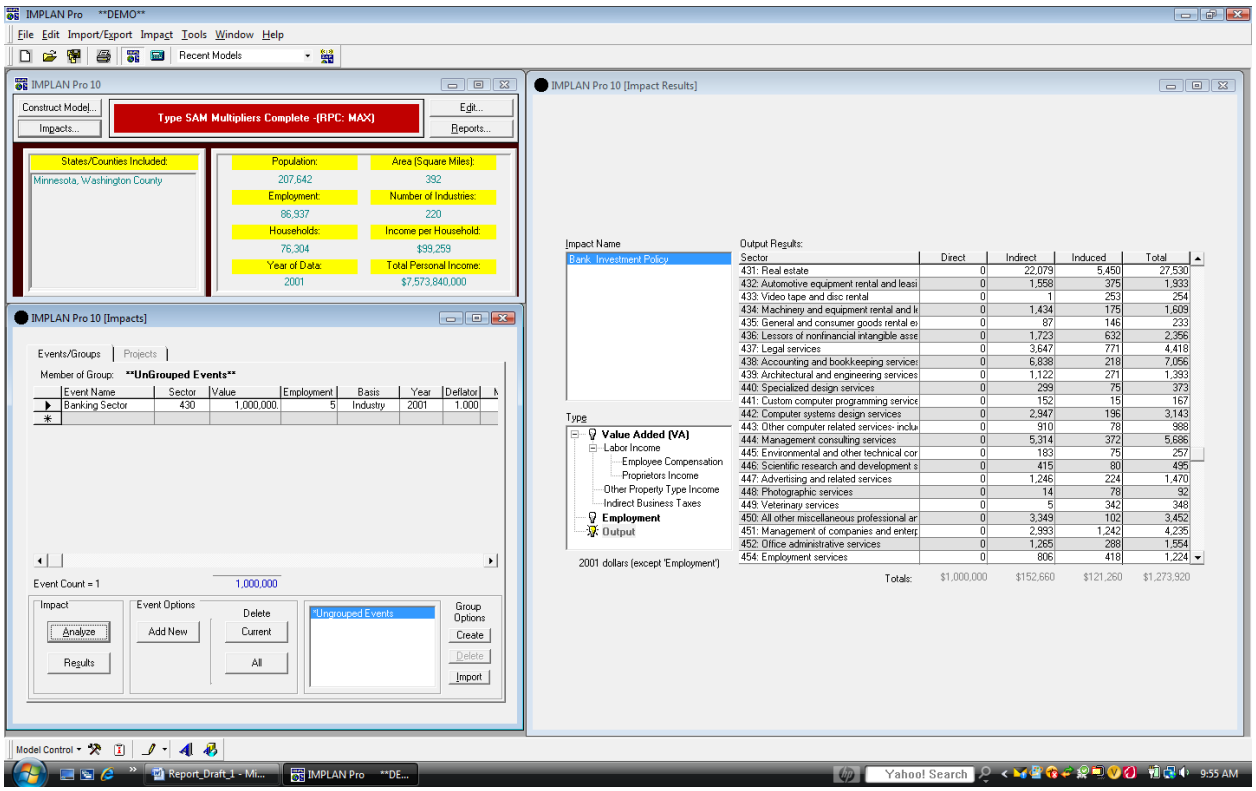
Once the direct impacts have been defined the user can create groups of impacts. That is direct impacts can be grouped together to determine the impact of simultaneous differentiated shocks to multiple sectors of economic activity. The user the clicks the button "Analyze" and the screenshot in Figure A.6 appears on the screen. Here the name of the particular impact analysis must be defined and the grouped impacts selected.

Figure A.6 Screenshot of Impact Analysis



Once the impact has been named and the event selected the user clicks on the button "Run Impact", the impact analysis runs and a dialogue box appears prompting the user to indicate whether the results are to be viewed. Clicking "yes" generates the screenshot shown in Figure A.7. The results are presented for each sector of economic activity and show the total direct, indirect and induced effects of the direct impact to economic activity resulting from the policy under evaluation.

Figure A.7 Screenshot of Impact Results



REMI

Regional Economic Models, Inc. (REMI) developed Policy Insight, simply known as the REMI model, which adds certain analytical features to the basic input-output model structure that increases its realism and the range of policy impacts that can be analyzed. The primary value added provided by the REMI model is that a regional econometric model is linked to the input output model. This allows the model to represent varied economic behavioral responses to policy changes such as diminishing marginal returns and trace the impact of policy shocks on wages, prices and demographic patterns. The econometric model defines final demand in the economy and behavior in labor markets. The econometric model also includes elements of regional science and geography that allow for the economic climate in a particular region to influence the degree of migration and the size and quality of labor force in the area. This further introduces elements

that adjust the regional purchase coefficients to reflect the growth of particular industries in the area.

In addition to the econometric model, REMI adds certain simulation and optimization elements that allow for dynamic economic relationships to play a prominent role in determining the economic impact of activities that affect output. The linear production technologies of the input-output models are retained for intermediate demand, however, value added such as labor income and capital incomes are linked to the model by means of a Cobb-Douglas production technology which allows for decreasing marginal returns to these inputs. The capital stock is dynamic and therefore responds to investment.

The resulting model allows the user to simulate a variety of activities and policies including the effect of aging on the economy, a reduction in the cost of capital an increase in production costs, changes in tax parameters and a variety of other policy variables. In addition, the effects can be analyzed through time which allows for an assessment of the amount of time it takes for industries to bounce back from negative policy shocks. In addition, it provides an assessment of the duration of certain effects on the economy. It provides the tools for comparing a one-time economic stimulus relative to a sustained permanent policy.

The software costs $13,000 for a 3-month license for a single region and $48,000 for the purchase of the regional model. Additional regions are eligible for small discounts.

COMPARISON OF COMPUTATIONAL IMPLEMENTATIONS

	RIMS II	IMPLAN		
	Type II*	Type II	SAM I	SAM II
Crop and animal production	2.0808	1.7379	1.7059	1.4626
Forestry, fishing, and related activities	1.7874	1.9963	1.9541	1.6460
Oil and gas extraction	1.7195	1.4782	1.4518	1.1906
Mining, except oil and gas	2.0320	1.6197	1.5766	1.2612
Support activities for mining	2.2028	1.6359	1.5917	1.3052
Utilities*	1.6959	1.3341	1.3072	1.1062
Construction	2.2877	1.8225	1.7615	1.3495
Wood product manufacturing	2.3482	1.8800	1.8345	1.5436
Nonmetallic mineral product manufacturing	2.0115	1.6765	1.6314	1.3427
Primary metal manufacturing	1.8481	1.5347	1.5021	1.2954
Fabricated metal product manufacturing	1.9410	1.5538	1.5095	1.2343
Machinery manufacturing	1.9654	1.6749	1.6318	1.3629
Computer and electronic product manufacturing	1.8717	1.8551	1.8094	1.5183
Electrical equipment and appliance manufacturing	2.0097	1.6517	1.6051	1.3158
Motor vehicle, body, trailer, and parts manufacturing	1.9108	1.5470	1.5175	1.3330
Other transportation equipment manufacturing	2.0498	1.6832	1.6267	1.2720
Furniture and related product manufacturing	2.2225	1.7465	1.6914	1.3493
Miscellaneous manufacturing	2.0507	1.7667	1.7098	1.3287
Food, beverage, and tobacco product manufacturing	2.0378	1.8551	1.8230	1.6175
Textile and textile product mills	2.3785	1.5857	1.5486	1.3147
Apparel, leather, and allied product manufacturing	2.1838	1.6748	1.6291	1.3387
Paper manufacturing	2.1378	1.6235	1.5852	1.3398
Printing and related support activities	2.2435	1.6175	1.5554	1.1605
Petroleum and coal products manufacturing	1.5993	1.3977	1.3829	1.2617
Chemical manufacturing	2.0795	1.5819	1.5502	1.3457
Plastics and rubber products manufacturing	2.0139	1.5970	1.5564	1.3038
Wholesale trade	1.9704	1.7278	1.6652	1.2719
Retail trade	2.0940	1.7878	1.7224	1.3048
Air transportation	2.0384	1.8065	1.7468	1.3752
Rail transportation	2.0103	1.6692	1.6114	1.2540
Water transportation	2.2768	1.7914	1.7381	1.4047
Truck transportation	2.1289	1.8597	1.7983	1.3972
Transit and ground passenger transportation*	2.1105	1.7591	1.6939	1.2782
Pipeline transportation	2.1429	1.6529	1.6149	1.3621
Other transportation and support activities*	2.0574	1.8515	1.7569	1.1593
Warehousing and storage	2.0398	1.8201	1.7345	1.2030
Publishing including software	1.9737	1.7286	1.6731	1.3131
Motion picture and sound recording industries	1.8487	1.9251	1.8758	1.5548

Broadcasting and telecommunications	1.9623	1.7031	1.6610	1.3888
Information and data processing services	2.0751	1.8721	1.8078	1.3909
Federal Reserve banks, credit intermediation and related services	1.7496	1.7002	1.6430	1.2729
Securities, commodity contracts, investments	2.1662	2.1553	2.0703	1.5252
Insurance carriers and related activities	2.0715	1.7456	1.6923	1.3514
Funds, trusts, and other financial vehicles	2.1661	2.1382	2.0749	1.6311
Real estate	1.4576	1.3288	1.3121	1.1860
Rental and leasing services and lessors of intangible assets	1.4976	1.6569	1.6218	1.3859
Professional, scientific, and technical services	2.0354	1.9900	1.9000	1.3120
Management of companies and enterprises	2.0942	1.9120	1.8324	1.3373
Administrative and support services	1.9866	1.9048	1.8246	1.3094
Waste management and remediation services	2.1257	1.7069	1.6529	1.3150
Educational services	2.2087	1.9301	1.8497	1.3365
Ambulatory health care services	2.1332	1.8694	1.7891	1.2624
Hospitals and nursing and residential care facilities	2.2393	1.9473	1.8680	1.3682
Social assistance	2.1916	1.8838	1.8083	1.3305
Performing arts, museums, and related activities	2.1314	1.9685	1.8940	1.3743
Amusements, gambling, and recreation	2.0993	1.8651	1.7987	1.3788
Accommodation	1.9319	1.7887	1.7270	1.3343
Food services and drinking places	2.1744	2.0421	1.9810	1.5961
Other services*	2.0464	1.8555	1.7495	1.0963
Households	1.3691	2.0749	1.9415	0.0000

APPENDIX 2 – LITERATURE REVIEW REFERENCE

Bank Municipal Deposits: Their Importance to New York Communities

Creator: SUNY Binghamton – Center for Local Government
Funding Source: New York Bankers Association
Year: 2005
Commercial Model: IMPLAN

Summary: Proposals in New York would allow local governments to withdraw municipal deposits from banks and seek a greater rate of return elsewhere. The study's purpose is to inform state and local decision makers of the benefits provided by New York banks and the economic impact of moving municipal deposits from New York banks.

Economic Impacts: If all municipal deposits were withdrawn from state banks, contraction of the banking sector would cause a projected loss of 6349 jobs statewide and a loss of more than $1.4 billion in economic output.

Assumptions: Assumes a decrease in employment in banks proportional to the decrease in total deposits. Assumes all municipal deposits being withdrawn

Other: Projected economic impact of decreased lending should all municipal deposits be withdrawn. Resulting economic impacts are not realistic because it was not shown how much lending would be replaced by other banks

2008 Economic Impact Study: SBA 504 Loan Program

Creator: Applied Development Economics, Inc
Funding Source: National Association of Development Companies
Year: 2008
Commercial Model: IMPLAN

Summary: The SBA 504 program is a community lending program targeted at creating and retaining jobs. Using survey data about loan recipients, the study extrapolates the effects of the loan program nationwide based on changes to revenue and employment at loan receiving firms.

Economic Impacts: 7.6 billion in loans issued between 1/2003 and 2/2005 caused $24.4 billion in business revenue growth, $4.6 billion in labor income growth, and a net increase of 54,000 jobs. SBA Administrative costs were $46.6 million. In the most recent fiscal accounting year prior to the study, firms receiving loans between 1/2003 and 2/2005 caused $135 billion in industry output, $33 billion in labor income, and 827,770 jobs.

Assumptions: Assumes that loans would not be made by other lenders. Assumes that projects supported by program loans caused economic activity, not other projects of recipient firm

Other: Survey likely subject to frame error issues, internal validity issues, conclusion validity issues, and external validity issues. Most likely, these problems led to an overestimation of loan effects even prior to input/output analysis

New Mexico's Public Funds Investment Policies: Impact on Financial Institutions and the State Economy

Creator: Arrowhead Center: Office of Policy Analysis, New Mexico State University
Funding Source: The Independent Community Bankers of Association of New Mexico
Year: 2009
Commercial Model: IMPLAN

Summary: State policy is trying to maximize the rate of return of the State's portfolio at the expense of the State's economic development. Increasing the rates of return and/or increasing the collaterization requirements will lead to a decrease in institution participation and a decrease in economic output

Economic Impacts: A decrease in participation in the CD Program of 25% would lead to: a decrease of $17.5 million in value added, a decrease of $12.2 million in personal income, a loss of 320 in-state jobs, and a loss of $746,000 in tax revenues.

Assumptions: Assumes the required increased returns would exceed cost of capital for some banks, leading to decline in participation and local lending generally. Assumes that loans would not be made by other lenders

Other: Study does not show benefits of having greater revenue to the state or providing funds to more profitable banks. Surveyed banks have incentive to declare that they would not participate if program changed.

Estimating the Economic Impact of REI's New Market Tax Credit Investments 2003-2005

Creator: Rural Enterprises of Oklahoma Inc.
Funding Source: Economic Impact Group, LLC
Year: 2006
Commercial Model: RIMS II

Summary: REI attracts capital to underserved areas by offering federal tax credits to potential investors. The funds provided caused increased economic output for Oklahoma that would not exist otherwise

Economic Impacts: In 2006 dollars the economic impact of the $65 million funds acquired and loaned by REI generated $116 million in goods and services, created 970 jobs, and added $36 million in payroll income within Oklahoma.

Assumptions: Assumes loan recipients are viable firms that lack alternate means of funding.

Other: Tax expenditure approach to funding investment changes the cost accounting for government supported investment program. Tax-preferred status distorts investors choices, making the program more attractive to investors than investments more profitable absent tax concerns.

The Economic Value of the Financial Services Industry in the Bahamas

Creator: Oxford Economics
Funding Source:
Year: 2007
Commercial Model: Input-Output Table

Summary: Study focuses of the economic impacts of the Bahamian financial services sectors, capturing banks, insurance companies, and investment fund administrators. The direct, indirect and induced effects are calculated using an input-output table adapted from Hawaii

Assumptions: The study assumes that Bahamian markets act in very similar way to Hawaiian markets. The model also incorporates catalyst effects which were determined through industry surveys are growth effects attributed to the financial services sector.

Economic Impacts: The full range of impacts provided by financial services in the Bahamas contribute about 27% of the Bahamian GDP, provide 22,000 and generate yearly incomes that are between 75%and 100% higher than the national average of $24,000.

Other: The study attributes the high wages in the financial services sector to high levels of human capital that they attract and expand upon in the form of formal and/or informal training for employees.

Economic and Community Impact of ACCION Texas, 1994-2005

Creator: ACCION, Texas
Funding Source: ACCION, Texas
Year: 2009
Commercial Model: Unspecified

Summary: Study focuses of the economic impacts on micro-lending in the creation of jobs, promoting income stability, and generated public revenues. ACCION Texas provides loans to businesses that do not receive support from the commercial banking sector.

Economic Impacts: ACCION projects that from 1994 to 2008, the program generated $142.6 million in economic activity, which includes $45.3 million in payroll earnings, $8.3 in state and local tax revenue, and 1802 new jobs

Assumptions: Assumes firms would not be able to get funds through other means

Other: N/A

The Economic Impact of Capital Availability to Minority-Owned Small Businesses in Baltimore

Creator: Sage Policy Group, Inc
Funding Source: Empower Baltimore Management Corporation
Year: 2005
Commercial Model: IMPLAN

Summary: The Empower Baltimore Management Corporation provides funds to underrepresented minority-owned firms. Study examines economic impacts generated by these firms within Maryland.

Economic Impacts: Between 1998 and 2004, EMBC loans and/or investments created or retained 834 jobs, generated $29,151,600 in income, and produced $66,440,100 in the sales of goods and services within Maryland.

Assumptions: Assumes EMBC funding flows to viable companies that otherwise cannot find lenders to match capital needs. Acknowledged that some firms would receive without program loans

Other: Accepted anecdotal accounts from some beneficiaries of EBMC about difficulty of securing alternate means of funding as evidence of dearth of funding for recipient firms.

An Economic and Fiscal Analysis of CDV's Portfolio of Firms on the Maryland Economy

Creator: Regional Economic Studies Institute, Towson University
Funding Source: Meridian Management Group
Year: 2005

Summary: The CDV provides EMBC capital through loans to businesses within Baltimore's Empowerment and Enterprise Zones. The study uses a model based on IMPLAN, regionalized for Maryland, to measure effects of the contributions of CDV's clients firms to the Maryland economy.

Economic Impacts: Between 2001 and 2005, program loans generated a total economic impact of $177 million in gross sales, $62 million in income, and 544 jobs within Maryland

Assumptions: Assumes EMBC funding flows to viable companies that otherwise cannot find lenders to match capital needs.

Other: N/A

	RIMS II		IMPLA
	Economic Impact	**Economic Impact**	**Direct**
Output	$ 54,766,205	$ 42,267,316	$ 30,742,130
Employment	205	191	98
Earnings	$ 6,903,372	$ 8,110,305	$ 3,744,378
Value Added	$ 31,809,171	$ 29,585,410	$ 22,437,955
Indirect Business Taxes		$ 3,910,198	$ 3,219,449

	RIMS II	IMPLAN
Central Scenario		
Output	$ 663,003,447	$ 594,003,397
Employment	3,074	3,044
Earnings	$ 330,460,713	$ 346,520,289
Value Added	$ 413,800,253	$ 402,401,152
Indirect Business Taxes		$ 22,096,088
Optimistic Scenario		
Output	$ 1,510,368,190	$ 1,247,980,312
Employment	6,238	6,007
Earnings	$ 437,272,457	$ 472,006,194
Value Added	$ 905,964,539	$ 860,158,516
Indirect Business Taxes		$ 82,596,252
Pessimistic Scenario		
Output	$ 621,048,116	$ 561,623,223
Employment	2,917	2,898
Earnings	$ 325,172,174	$ 340,307,140
Value Added	$ 389,431,862	$ 379,736,341
Indirect Business Taxes		$ 19,100,561

N							
	Indirect		Induced				
$	6,550,923	$	4,974,263				
	49		44		0		1
$	2,362,104	$	2,003,823		0	0	4.076531
$	4,098,262	$	3,049,194		0		0.664632
$	332,825	$	357,925		0		0.695613
					0		0.030981

0.036260168	0.963739832
0.032784161	0.967215839
0.015787346	
0.035110835	