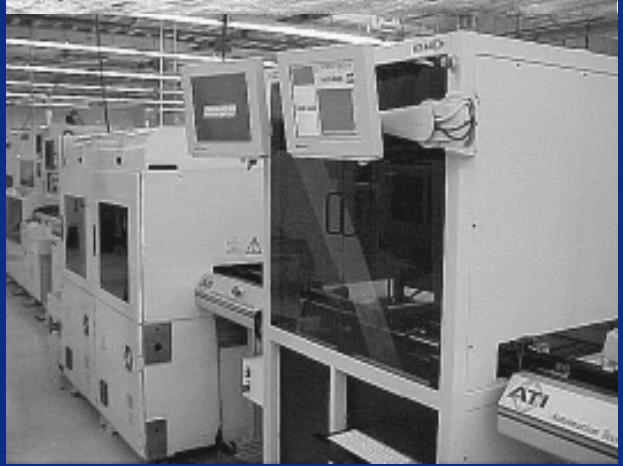

The Impact of EDA RLF Loans on Economic Restructuring

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Economic Development Administration
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Contents

Executive Summary

The purpose of this study is to determine whether Economic Development Administration (EDA) Revolving Loan Fund (RLF) loans contribute to economic structural change in counties where they are made. EDA RLF loans provide capital for investment in private-sector plants and equipment; through these investments, new permanent jobs are created and existing jobs are retained. New or retained direct jobs, in turn, create indirect jobs in the regional (county) economy. The sum of these is total jobs. An increase in total jobs can improve an economy. The study question: Do these loans, through the creation of various types and levels of new employment, move areas to a more high-tech, diverse, or stabilized economy? The answer: On average, they do.

Study Methods

This study relies on four measures of economic structural change, prominent in the economic development literature, that are quantifiable. All are associated with structural change that contributes to an increasingly sophisticated and technical regional economy. First, *economic diversification* is associated with increased competitiveness and stability and thereby contributes to structural change. Second, an increase in *earnings per worker* enhances individual competitiveness and often fosters or reflects a positive change in economic structure. A third measure, based on long-held theory, views the progression of *economic stages*—movement from more basic to more skilled industries—as indicative of positive structural change. A final measure correlates investment that results in reduced *import dependence* with positive economic structural change.

The study utilizes an extensive database of EDA RLF activity, encompassing the roughly 11,600 loans made during the 23-year period from 1976 through 1998 in approximately one-third of all U.S. counties (1,032). The database was assembled by researchers at Rutgers University's Center for Urban Policy Research (CUPR) from reports submitted to EDA regional offices by RLF loan recipients. The CUPR-EDA database includes recipient estimates of the jobs created or retained as a result of RLF loans. These job estimates appear with sector detail at the Standard Industrial Classification (SIC) four-digit level.

Jobs created or retained through RLF loans, along with an estimate of indirect or multiplier effects, provide the raw input for evaluating the impact of RLF loans on structural change. *This is a conservative measure of structural change; often, multiplier-effect jobs involve the lowest sectors and wages and actually inhibit positive structural change progression.*

A single "composite index" of regional economic structure is calculated, based on the four measures of structural change mentioned above: *economic diversification, earnings per worker, economic stage, and import dependence.* The composite index is first calculated for each of the 1,032 counties nationwide where there is EDA RLF loan activity, using existing economic conditions. The index is then calculated a second time, based on a simulation of economic con-

ditions without the jobs created or retained by the RLF loans. An evaluation of the impacts of RLF loans on economic structural change is based on a comparison of the two indices, the one with (after) and the other without (before) the RLF loans. If the standardized composite change is positive and of a certain specified magnitude, positive change has taken place; if it is negative and again of a specified magnitude, negative change has taken place. If change does not exceed a certain magnitude in either direction, no change or indeterminate change has taken place.

The point of the analysis is that a positive change in the composite index signals a positive change in regional economic structure, while the opposite is true for a negative change. Many of the individual counties exhibit changes that are very small, however, and their significance as indicators of structural change is doubtful. Accordingly, a minimum degree of index change (positive or negative) is selected as an indicator of "significant" structural change. Below this level, the impact of RLF loans on economic structural change is deemed "indeterminate."

Summary of Findings

EDA RLF Activity: Costs and Benefits

EDA's net cost to fund RLFs, calculated as potential interest cost minus RLF interest received, is $324,000 for the RLFs established between 1976 and 1998 in the average county. Total funds received in the average county (including EDA RLFs, other public monies, and private funds) are $8.1 million. The EDA leverages 25:1 in dollars made available for economic development purposes versus costs.

Positive Economic Structural Change

According to the changes indicated in the composite index and the level of significance set for this study, RLF loans create positive economic structural change in 42 percent of the counties where they are utilized.

Indeterminate Economic Structural Change

There is either no effect or an indeterminate effect in 46 percent of the counties with RLF activity. An examination of the counties in the indeterminate category shows that they tend to be larger in total population and jobs (roughly three to five times larger in total jobs) than the typical county showing a significant index change. The percentage change in total jobs brought about by RLF loans is less than 0.2 percent in indeterminate counties, compared to 3 percent to 4 percent for counties with a significant composite index change.

Total RLF loan amounts, number of loans, and total all-source loan amounts tend to be substantially lower than average in counties with an indeterminate change in the composite index. The conclusion is that where RLF and other loan activity are limited and the county job base is reasonably significant, the impact of loans on economic structural change is likely to be too small to be measurable.

Negative Economic Structural Change

In 12 percent of the counties with RLF loan activity, an apparent negative change in economic structure as measured by the composite index. This is not to be confused with economic deterioration. These counties have increased their job base due to RLF loans, but in doing so may have decreased earnings per worker, increased import dependency, limited local economic diversification, or contributed to a reverse progression in terms of economic stage. A new retailer or restaurant obtaining start-up funding from an RLF loan, while good for an area and profitable, may not advance the objectives of economic restructuring. This is not necessarily a negative outcome,

but rather a realistic result of multipurpose economic development. It is a fundamental conflict between the unassailable goal of job creation/retention and the desirable goal of restructuring.

Overall Economic Structural Change

The composite index of economic structural change is significantly positive nationwide across all counties with EDA RLF activity. This is true despite the fact that a plurality of counties register "indeterminate" on the index. The effects of positive economic structural change in counties clearly outweigh the effects of negative economic structural change in counties.

Economic Structural Change by EDA Region

RLF loans create significant positive structural change in a large number of counties in each of the six EDA regions (Philadelphia, Atlanta, Denver, Chicago, Seattle, and Austin). However, the average county effect appears indeterminate for the Atlanta and Austin EDA regions. In Austin, the indeterminate change can probably be attributed to the small size of the RLF loan effort relative to the size of the average loan-receiving county. In Atlanta, the indeterminate change is the result of opposing trends in the individual components of the composite structural change index.

Economic Structural Change by Type of Change

The two most identifiable effects of EDA RLF loans are an increase in the economic diversification and a decrease in earnings per worker. This suggests that RLF loans tend to bring new industries to regions and to reduce dependence on any one or a handful of industrial sectors. At the same time, the new industries generally pay wages that are lower than countywide averages.

Other predictable effects of EDA RLF loans are a reduction in import dependence and a setback in the economic stage. The impacts of RLF loans on import dependence and economic stage are, however, less predictable than they are on economic diversification and earnings per worker. Significant positive-change and negative-change counties are much closer in number in the case of the economic stage and import-dependence indices, and the number of indeterminate-change counties is generally greater. Nearly 80 percent of all counties show an indeterminate change in the economic stage index, for example.

The overall slightly negative change in the economic stage index suggests that EDA RLF loans tend to favor lower-stage industries (process and fabricative manufacturing)—a possible corollary to the slightly negative effect RLF loans have on average earnings per worker. At the same time, the improvement in import dependence suggests that RLF loans tend to favor industries that help counties fill their need for business inputs and consumer goods—and this is a corollary to the positive effect of EDA RLF loans on economic diversification.

Econometric Corroboration of Overall Job Impacts

An independent econometric analysis was conducted to corroborate the RLF loan impacts indicated by the loan-recipient analysis. The econometric analysis corroborated the statistically significant effect of RLF loans on job creation and retention in counties, but showed a higher cost per job created than that indicated by the RLF loan-recipient analysis.

The econometric analysis results on job creation are difficult to assess. Clearly positive is the finding that statistically significant job creation resulted from the RLF program. Less positive is the finding that jobs were created at a somewhat higher cost than that re-

ported by grant recipients. In analyses utilizing different data sources for jobs and regression coefficients to estimate these jobs, differences in magnitude of impact can easily occur.

Benefits of this Analysis

The analysis employs a comprehensive approach that encompasses a broad array of structural change and economic development measurements. This approach provides a degree of quantification and impact specification that would not be available from a less comprehensive approach.

Introduction—Purpose of the Report

The purpose of this study is to determine whether Economic Development Administration (EDA) Revolving Loan Fund (RLF) loans contribute to positive economic structural change in the jurisdictions (counties) where they occur. RLFs are self-replenishing sources of loans in distressed areas. Borrowers are attracted to RLF loans by their very competitive interest rates and credit accessibility to those often denied conventional credit elsewhere.

EDA RLF loans provide funds for new investments in private-sector commercial and industrial establishments; through these investments, new permanent jobs are created and existing jobs are retained. Creation of new jobs and retention of existing jobs are reported by RLF loan recipients. Their data are augmented here with an input-output model estimate of indirect effects to obtain total jobs created. An independent econometric analysis is used to confirm that RLF loans contribute to the creation and retention of jobs.

The analysis of economic structural change is a way of determining major sources of change in an economy (Rose and Casler 1996). The literature on economic structural change offers a mix of often-overlapping measures. This study relies on four measures that are prominent in the literature and at the same time quantifiable. First, *economic diversification* is associated with increased competitiveness and stability, and an increase in this measure is thus viewed as positive economic structural change. Second, *earnings per worker* often reflects a positive change in economic structure. A third measure, based on a long-held theory, views economic structural change in terms of *economic stage*—movement from a lower to a higher economic stage indicates positive structural change. A fourth measure associates positive economic structural change with investment that results in reduced *import dependence*.

Economic Structural Change

Definition

A region's economic structure is reflected in its particular mix of industries, and in the manner in which those industries are connected through interindustry trade. Economic structure plays a fundamental role in determining a region's level of income, the resiliency of its economy, and its ability to grow.

"Positive economic structural change" is roughly synonymous with "progressive economic development," and is treated as such in this report. Economic structural change in a positive direction is associated with lower unemployment, increased investment, improved resource utilization, higher incomes, and enhanced prospects for future economic growth. Positive economic structural change is often accompanied by expanded private and public infrastructure and an increased availability of local goods and services.

History

The study of economic structural change and economic development dates back at least to the ancient Greeks (Schumpeter 1980). Discovering the causes and dynamics of economic development has been described as the centerpiece of classical economics (Robbins 1968). When regional economists study economic development and economic structural change, their focus is generally on ways to energize lagging regions, i.e., to alleviate unemployment and stagnation and otherwise position economies for growth.

Unfortunately, the literature on economic structural change shows little agreement on the relative importance of frequently posed measures of change (Johnson 1994). The lack of theoretical unity makes the search for a composite measure of structural change challenging to say the least.

Components of Economic Structural Change

Economic Diversification

Theories of economic diversification and regional development borrow from the finance literature on portfolio management (e.g., Siegel, Johnson, and Alwang 1995). A diversified economy suffers less from seasonal variations in demand and is less susceptible to loss or prolonged downturn in any one industry. Consequently, a diversified economy is more stable and more competitive: Progressive economic development favors the competitive economy.

Earnings per Worker

An increase in earnings per worker has been viewed as a gauge of progressive economic development and economic structural change since the time of the classical economists. In *The Wealth of Nations*, Adam Smith considers "increased income per head" as the

very definition of economic structural change (Robbins 1968). Normally, an increase in earnings per worker signifies a more intensive use of capital and/or an increasingly educated workforce.

Economic Stage

Stage theories of economic development have roots in nineteenth-century economics. In the form popularized by Clark (1951) and Fisher (1935), economic development proceeds according to a three-part process. Economies begin in a primitive agrarian stage characterized mainly by "primary" industry: extractive agriculture, timber, mining, and so on. As output grows, capital investment increases, transportation improves, and a "secondary" sector of manufacturing appears. In the final stage, "tertiary" industry (i.e., services) emerges as important. At a mature tertiary stage, financial services emerge, and the region becomes a capital exporter.

Stage theory has its critics. Robbins (1968) describes it as neither good history nor significant theory. North (1955) argues that it has some application to Europe's emergence from feudalism, but far less to the American industrial experience. North favors an export-base theory of development.

In a recent article, Parr (1999) offers a reemergence of stage theory with specific application to regional, as opposed to international, development. Parr's "export stages" approach accommodates North (1955) by affording a prominent role to export-base theory, and it expands considerably on the simple three-stage process of Clark (1951) and Fisher (1935). In the section of this report titled Measuring Economic Structural Change, a Parr-like index of regional stages is defined as the third of four indicators of economic structural change.

Import Dependence

Growth and development are not the same thing. Neither are growth and positive economic structural change. Growth occurs with a simple increase in jobs, earnings, or population. In contrast, progressive economic development and positive economic structural change require some alteration in the mix of industries or an increase in per capita wages. Positive economic structural change is often accompanied by a deepening of interindustry linkages.

While growth is not the same thing as progressive economic development or economic structural change, when sufficient growth occurs, economic development and economic structural change usually follow. As economies grow, demand grows as well, and it becomes increasingly feasible to produce locally rather than import. Reductions in import dependence are normally accompanied by stronger interindustry linkages, expansions in the nonexport base, and an increase in regional multiplier effects, all signifying positive economic structural change.

Composite Economic Structural Change

The indices described thus far reflect the four previously discussed measures of economic structural change. A composite index is constructed as a summation of the four. The composite index reflects aspects of all four individual indices, and is considered a comprehensive indicator of positive structural change.

The study relies on an extensive database of EDA RLF activity, including roughly 11,600 loans from the 23-year period 1976 to 1998, in approximately one-third (1,032) of all U.S. counties. The database was assembled by Rutgers University's CUPR from reports submitted to EDA regional offices by RLF

loan recipients. The CUPR-EDA database includes recipient estimates of the jobs created or retained as a result of EDA RLF loans. Recipient job estimates appear with sector detail at the SIC four-digit level. These jobs are subjected to an input-output model to create total jobs produced by EDA investments.

Estimating Economic Structural Change

Total job estimates provide the raw input for evaluating the impact of RLF loans on economic structural change. An index of regional economic structure is formed based on the four measures mentioned above: (1) economic diversity, (2) earnings per worker, (3) economic stage, and (4) import dependence. The index, based on existing (postloan) economic conditions, is created for each of the 1,032 counties with RLF loan activity. The index is then recreated, this time simulating economic conditions absent the jobs added or retained by the RLF loans. An evaluation of RLF loan impact on structural change is carried out by comparing the two indices, the one with (after) and the other simulated without (before) the RLF loans. If there is a change in the composite index of a certain magnitude, economic structural change is deemed to have taken place.

EDA RLFs and their Impact on Jobs

Origins of the RLF Program

Passed by Congress in 1965, the Public Works and Economic Development Act (PWEDA) enabled the Economic Development Administration (EDA) to provide grants to create new and retain existing private-sector jobs, and to stimulate business development in economically distressed urban and rural areas of the United States. Amendments in 1974 created the Title IX Economic Adjustment Program with its ability to fund RLFs. In 1998, the Economic Development Administration Reform Act (Public Law 105-393, 42 U.S.C. Section 3121 *et seq*., 112 State. 3596) reauthorized EDA programs for five years without altering EDA's basic mission and programs.

An important component of EDA's development tools, the RLF program specifically targets locations suffering from economic decline. Commercial loans can be difficult to obtain in such areas because of insufficient collateral and/or because applicants have a checkered business history or lack business experience. RLF loans are given to firms that otherwise would either be denied credit or have difficulty obtaining it.

Size of RLF Loans

Table 1 presents information on RLF loans and their impacts. Data is averaged across all 1,032 counties in the CUPR-EDA database, thereby providing a picture of the average county utilizing RLF loans and the various impacts of those loans. A similar table for each of the 1,032 counties with RLF loan activity is included in this report.

The "Loans Summary" in the upper-left-hand corner provides information on the average cumulative dollar amount of loans in counties with RLF loan activity. During the 23-year period covered by the CUPR-EDA database, the average loan-receiving county received roughly $1.3 million in EDA RLF loans (constant, year-2000 dollars). Other public funds added nearly $970,000, private-sector sources contributed more than $4.7 million, and new equity issues added another $1.1 million. Subtracting the RLF amount from the total, for every dollar of EDA RLF loans, another $5.35 in non-EDA funds were leveraged.

The item labeled "EDA Cost" is the amount of money (based on the federal treasury interest rate) that EDA could have received in interest from alternative use of the funds minus the EDA share of recipient loan interest after accounting for defaults. "EDA Cost" reflects the difference between moneys that could have been made minus moneys actually made. "Total Investment per EDA Dollar" is the ratio of all moneys received in a county (relative to the RLF) to EDA's cost of those loans. On average, this is about $8.1 million received in a county divided by about $324,000 spent in a county, or a ratio of 25.07. Thus, EDA leverages roughly 25 to 1 in terms of dollars made available for economic development versus the cost of forgone interest minus interest received.

Table 1
Average Loan Summary and Economic Structural Change Analysis,
All Counties in All Regions in the EDA Sample

Loan Moneys and Employment Creation

Loans Summary

RLF	$ 1,278,236
Other Public	$ 969,400
Private	$ 4,738,284
New Equity	$ 1,134,831
Total	$ 8,120,752

Jobs Summary (created/retained)

Direct	232
Indirect	188
Total	420
Multiplier	1.81

Loan-Leverage Ratio	5.4:1

EDA Cost	$ 323,948	EDA Cost per Direct Job	$1,395
Total Investment per EDA Dollar	$25.07	EDA Cost per Total Job	$771

Baseline Industry and Employment Analysis*

	Before	After	▲	▲%
SIC Business Types in County (4-Digit)	130	131	1	0.86%
Total Employment	64,377	64,797	420	0.65%

Economic Structural Change Analysis

	Before	After	▲%	▲STD%	
Diversification Index	3.780	3.790	0.27%	0.41%	pos
Earnings per Worker ($1,000)	$ 27.07	$ 26.99	-0.29%	-0.20%	neg
Economic Stage Index	4.347	4.342	-0.10%	-0.12%	ind
Import-Dependence Index**	29.56%	29.52%	0.13%	0.18%	ind

Summary of Indices

1 of 4 indices show positive structural change

Composite Economic Structural Change Index	0.27%	pos

*Baseline industry count and employment are from 1993
**The sign of the import-dependence index is reversed, so a positive index change will indicate a positive economic structural change
pos= positive economic structural change
neg= negative economic structural change
ind= indeterminate economic structural change

Source: Rutgers University CUPR-EDA RLF Database 2000.

Job Impacts of EDA RLF Loans

The "Jobs Summary" in the upper-right-hand corner of Table 1 shows the employment effect of EDA RLF loans in the average county. The effects include direct and indirect jobs created or retained as a result of RLF loans.

"Direct" jobs are tabulated from reports submitted to EDA by individual RLF grant recipients: These are generally jobs at the site of RLF loans. Counties with RLF loan activity averaged 232 jobs directly attributable to those loans.[1] "Indirect" jobs reflect the impact of regional economic multiplier effects. They are created by the input purchases and wages paid in the sectors affected by direct employment. Indirect jobs are estimated using an IMPLAN input-output model specifically constructed for each county.[2] In the average county, indirect effects add another 188 jobs attributable to RLF loans.

Total jobs are the sum of the direct and indirect jobs. Thus, in the average recipient county, 420 jobs can be attributed to RLF loan activity. Dividing total jobs by direct jobs yields an average job multiplier of 1.81. Accordingly, for every job directly created or retained as a result of RLF loans, another 0.81 jobs are created or retained in indirectly affected industries in the county.

[1] RLF loan recipients report direct job effects at the SIC four-digit level of detail, and these are entered into the CUPR-EDA database.

[2] Detail on the IMPLAN model and its underlying data sources and algorithms can be found at Web Site www.IMPLAN.com.

Job Impacts Relative to RLF Loans

The "Baseline Industry and Employment Analysis" in the middle of Table 1 provides background information for judging the relative impact of RLF loans. The headings "after" and "before" refer respectively to conditions with and without RLF loans. "After" simply shows total jobs and SIC four-digit industrial sectors as of 1993 (the midpoint of RLF loan activity). "Before" shows the same, but absent the effect of RLF loans. The full reasoning behind the selection of 1993 as baseline for this analysis appears in the section "Measuring Economic Structural Change." The average county reporting EDA RLF loan activity had 64,797 jobs and 131 SIC four-digit industries in 1993.

Based on the loan recipient/input-output analysis underlying the figures in Table 1, without RLF loans, the average county would have had 420 fewer jobs (as reported in the "Jobs Summary") and approximately 1.1 fewer industries. The analysis indicates, therefore, that the average county after EDA RLF loan activity has 0.65 percent more jobs and 0.86 percent more industries.

Cost per Job

Dividing the average *net* interest costs per loan by the number of jobs created by that loan yields EDA cost per job. As shown in Table 1, it is estimated that EDA cost per direct job is about $1,395 and about $771 per total job.

The cost estimates in Table 1 are based on the interest return reflecting the federal treasury rate on the EDA share of each loan granted in a county minus the EDA share of the interest returned on each loan, accounting for defaults. This calculation reflects the return available to EDA from an alternative use of

RLF funds minus the return generated from the loan recipients. At two different levels, this is the net cost of doing business and therefore the cost of providing these low-interest loans to loan recipients. The interest rate used to calculate EDA's opportunity cost is the Federal Funds Rate from the Federal Reserve Board of Governors. This study employs annual averages of the monthly daily average to establish a yearly interest rate.

The EDA cost per job found in this study ($1,395) is about $450 more per job than found in a companion study, *EDA RLFs—Performance Evaluation* ($936). The difference between these two numbers is that the present study's cost is the EDA *total cost in all counties* divided by the direct jobs created or retained in all counties. It is analogous to a mean. The other study's finding is the median cost per job for all the grantees. When compared directly in this data set, EDA costs have always been lower when expressed by the median versus the mean. Thus, it is not unexpected that a difference exists in the findings of the two studies. These differences reflect more the data distribution's influence on differences between the median and the mean than they do real differences in cost per job.

Econometric Corroboration of Overall Job Impacts

An independent econometric analysis was conducted to corroborate the EDA RLF loan impacts indicated by the loan recipient/input-output analysis. The econometric analysis relied on EDA RLF interest cost estimates for each of the 1,032 counties in the CUPR-EDA database.

The econometric analysis regressed total jobs in counties on the cumulative EDA RLF forgone interest costs in those same counties. The analysis included jobs and cumulative interest costs for each of the 23 years of the CUPR-EDA database, and for each of the approximately 3,100 U.S. counties. Counties with no EDA RLF loan activity (i.e., counties outside the 1,032 in the EDA-Rutgers database) appear with a zero RLF loan cost.

A number of econometric model formulations were attempted, including one that showed job change as a lagged effect of RLF loans. This formulation was able to address the issue of the timing of job creation. Each of these formulations proved inadequate, however, for a variety of reasons and was therefore rejected. The final formulation expressed the log (which compensates for extreme values) of total jobs in counties as a linear function of the cumulative RLF interest costs: a log-linear relationship.

The log-linear form of the model produces a statistically significant regression coefficient on the RLF loan cost variable, indicating that RLF loans contribute to the creation and retention of jobs in the counties where they occur. However, the effectiveness of RLF loans indicated by the econometric analysis is less than that indicated by the loan recipient report. In particular, where the loan recipient analysis indicates an average EDA cost per direct job of $1,395, and per total job of $771 (Table 1), the econometric analysis estimates these same average costs at multiple times those amounts.

Measuring Economic Structural Change

The Measurement Approach

After and Before Analysis

The impact of RLF loans on economic structural change is assessed through an "after and before analysis." A composite index of economic structure is formed from data reflecting the existing or "baseline" situation in each of the 1,032 counties of EDA RLF loan activity (Figure 1)—the "after" condition. Next, the total sector-specific jobs created or retained as a result of RLF loans are estimated. These include the indirect effects estimated with the aid of IMPLAN input-output models for counties. Removing the jobs attributed to RLF loans from existing county totals provides the "before" condition. A second set of indices are estimated from "before" conditions and "before" is subtracted from "after" in each of the four variables in a county. These differences are summed (including both negative and positive standardized values) and their aggregate total determines whether a county has been positively or negatively affected or is unaffected by EA RLF activity.

Selecting a Base Year of Comparison

The CUPR-EDA database conveys information on RLF loans made from 1976 through 1998, and job effects could be analyzed for each of these 23 years. However, two things work against this approach. First, data are generally lacking on the specific timing of job effects, thus making it difficult to assign jobs to specific years. Second (and equally limiting), the approach would require input-output models for each of the 23 years, and comparable models (i.e., constructed using similar input-output methodology) for such a large number of counties and years do not exist.

A practical alternative is to construct a single-year input-output model for each of the 1,032 counties, and to examine the cumulative effect of all RLF loans against the backdrop of this single "base year." Selecting the last year of the database (1998) as the base year would be one approach, but using the most recent year would bias downward the effects of EDA RLF loans.[3] The overall midpoint of EDA RLF loan activity is a preferred base-year candidate. Weighting the years of the CUPR-EDA database by the number of loans per year yields 1993 as the base-year choice. The approach adopted in this study is thus to construct the composite structural change index for county economies in 1993 (fortunately not a recession year) and to compare this to a second set of composite indices for the same economies, absent estimated RLF loan activity.

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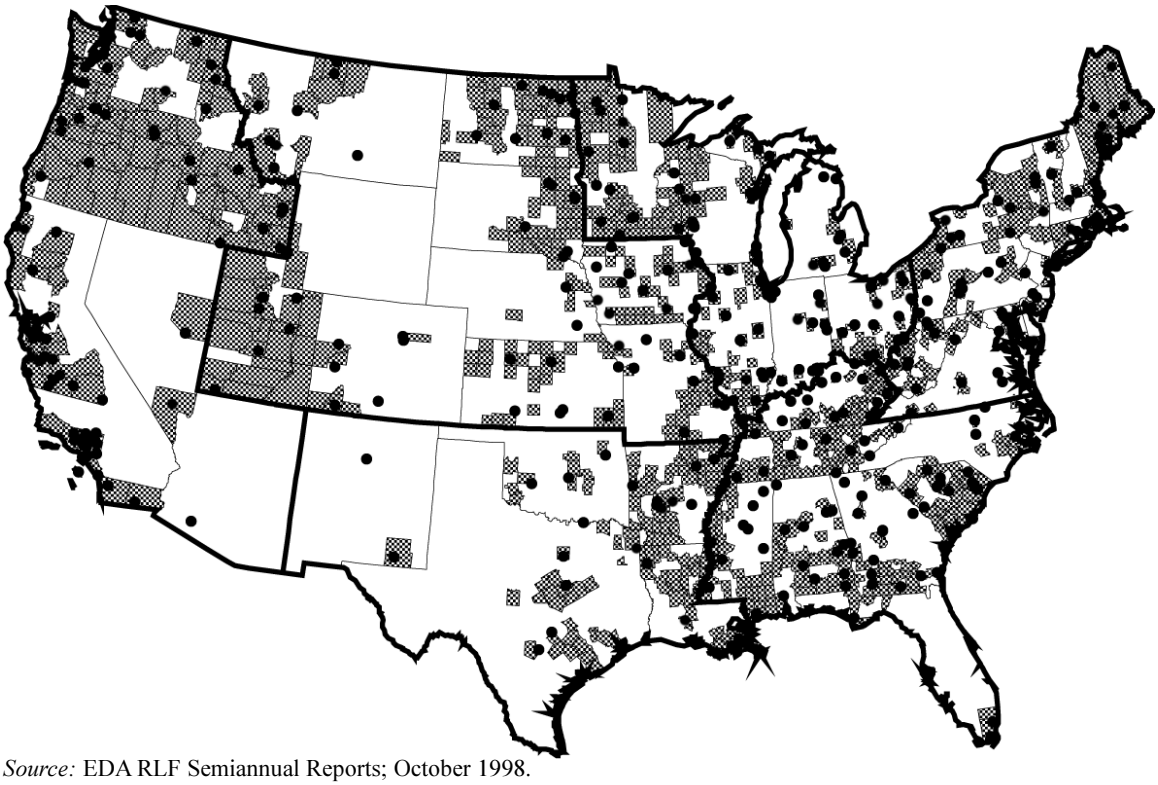
[3] For example, suppose that in the early 1990s EDA RLF loans attract an entirely new industry to a county. As measured by the diversity index, the new industry will register a positive change in regional economic structure. By 2000, however, suppose more of the same industry has moved to the county, attracted in the course of routine growth. Much of the stimulus to that growth may be owed to the RLF loans in the early 1990s. However, because these industries now exist, economic diversity measured against this later year would understate the actual impact of the RLF loans.

Figure 1
EDA RLFs and RLF Loans



Source: EDA RLF Semiannual Reports; October 1998.

Notes: Dots indicate grantees or multiple grantees and shaded areas represent counties that host at least one business receiving an RLF loan.

Alaska and Pacific Island grantees are not shown.

Most of the counties in the database will have shown some growth and development during the 23-year study period. Where the procedure simulates effects that actually took place prior to 1993, RLF loan impact on relative growth and economic structural change will be somewhat understated. The opposite effect can be expected for loans after 1993. It will be presumed that these opposing effects will offset each other to some extent.

The Role of Indirect Effects in Economic Structural Change

RLF loans create and retain jobs at the investment site, e.g., at the factory or industrial park receiving the loan. These jobs are directly attributable to the RLF loans; they are described by regional economists as "direct jobs." RLF loan recipients provide the direct jobs estimates reported in this study.

Regional economists recognize another job effect. Wage earners spend a portion of their income on local consumer goods and services, and businesses receiving RLF loans spend on locally produced business goods and services. These purchases create additional jobs, which in turn spawn further rounds of regional job formation. Regional economists refer to these as "indirect jobs."

An economic model is needed to estimate indirect job effects. Moreover, an input-output model (such as the IMPLAN model used in this report) is needed to provide the sectoral detail required for an economic

structural change analysis. The use of indirect effects in impact analysis is widely accepted; in fact, their specific inclusion is frequently mandated in federal legislation, particularly in land-use planning and transportation planning.[4]

Exclusion of indirect effects from the present analysis would generally *improve* RLF economic structural change results. Consider the impact on specific indices. Compared to direct effects (reported by RLF loan recipients), indirect effects are more likely to represent the resident-serving industries, retail trade, consumer services, and so on. These tend to be the lower-paying industries—thus, their exclusion would generally increase the impact of RLF loans on earnings per worker. A similar effect would be expected for the economic stages index, where resident-serving industries again tend to be lower-stage industries. Economic diversification would also likely decrease, with the inclusion of indirect effects, as these jobs contribute to a broadening of the category of jobs related to resident services. The effect on the import-dependence index is not clear. Although economic structural change can not be measured without considering indirect effects, their inclusion weakens the findings relative to positive economic structural change.

[4] As for how indirect effects are estimated, input-output analysis is widely used. It is the only approach capable of providing the needed sectoral detail. There are concerns about the accuracy of input-output results as predictors (e.g., Hamilton et al. 1991, 1993; Hughes and Holland 1993), but superior alternatives with demonstrated predictive performance are generally nonexistent.

Measures of Economic Structural Change

Economic Diversification

The standard measure of economic diversification is the so-called *entropy index* (Siegel, Johnson, and Alwang 1995). A region with only one industry is considered "perfectly specialized." It exhibits a diversity (i.e., entropy) index of zero. Adding a second industry of equal size (e.g., the same number of employees) raises the index to approximately 0.70. If the second industry is of a different size than the first, the index will be less than 0.70, indicating a somewhat greater degree of specialization. The diversity index jumps to approximately 1.0 with the addition of a third industry, 1.4 with a fourth, and so on. The upper bound depends on the maximum possible number of industries.

The diversity indices computed for this study rely on IMPLAN sector-specific employment data for counties. IMPLAN provides employment data at the SIC four-digit level of detail: approximately 500 different sectors in all. A county with an equal number of jobs in all 500 sectors would display a diversity index of approximately 6.0, providing the hypothetical upper bound for the indices computed in this study. Actual values range from 0.94 (Chattahoochee County, Georgia) to 4.5 (Cook County, Illinois).

Earnings per Worker

County-level earnings per worker are used to create an index of economic structure. The index is computed for the 1993 base year using county-level SIC four-digit employment and earnings data from IMPLAN. The direct and indirect job effects of RLF loans are then subtracted, and earnings per worker recomputed. The difference in earnings per worker after and before RLF loans is an indicator of economic structural change. Earnings per worker in the

1,032 counties tracked in this study range from $14,200 (Ozark County, Missouri) to $65,300 (New York County, New York).

Economic Stage

An index was constructed to capture economic structural change as envisioned by stage theories of economic development. SIC four-digit employment data provide the basis for forming the "economic stage index." Following Parr (1999), Clark and Fisher's three stages of development (primary, secondary, tertiary) are expanded to six: The manufacturing (secondary) stage is split into three stages, and the service (tertiary) stage is split into two.

The manufacturing stage is initially split into "process" and "fabricative" manufacturing. Process manufacturing uses primary goods as inputs, and these are generally obtained from the local primary sector. Examples of process manufacturing include food processing, wood and paper products, and oil refining. Fabricative manufacturing uses manufactured goods as inputs; examples include apparel, household appliances, machinery, electrical and electronic goods, and pharmaceutical chemicals.

Fabricative manufacturing is further divided into two sectors. The first focuses on traditional industrial-age products, e.g., machinery and nonelectronic devices. The second focuses on higher technology, especially computer-related products, e.g., integrated circuitry, microchips, and other electronic devices.

Service sectors are split into "consumer oriented" and "producer oriented" services. Consumer-oriented services include beauty parlors and barbershops, plumbing, and medical care. Producer-oriented services include banking, insurance, finance, publishing, information processing, consulting, planning, research and development, and higher education. The six economic stages adapted from Parr are:

1) Primary
2) Process manufacturing
3) Fabricative manufacturing limited to traditional industrial-age products
4) Fabricative manufacturing limited to electronic and computer-related products
5) Consumer-oriented services
6) Producer-oriented services

The specific SIC four-digit sectors (IMPLAN sectors) included in each of the six categories appear in Appendix 2.

Given the arrangement of county industries into the six stages above, the economic stage index is created in a simple manner. Each stage is given a score: 1 to primary sectors; 2 to process manufacturing sectors; 3 and 4 to fabricative manufacturing sectors; 5 to consumer-oriented services; and 6 to producer-oriented services. SIC four-digit employment in the county is then used as a weight to compute the average all-sector development score. This weighted average is the economic stage index. Stage indices can range from 1.0 (all primary employment) to 6.0 (all stage 6 employment). Actual values in this study range from 3.1 (Issaquena County, Mississippi) to 5.2 (Tompkins County, New York).

Import Dependence

An *import-dependence index* is created to measure the effect of RLF loans on import dependence. The index measures the ratio of imported to local labor in the value of the county's output. Import dependence in the 1,032 counties tracked in this study ranges from 15 percent (Salt Lake County, Utah) to 47.2 percent (Chattahoochee County, Georgia). Indices are computed using SIC four-digit employment data for the 1993 base year, then again for that year absent the direct and indirect job effects of RLF loans. A reduction in the import-dependence index indicates a decrease in the value of imports in county output, i.e., a

substitution of local for imported goods. The import-dependence index is formed using a location-quotient approach and SIC four-digit employment data for counties. The estimating approach is documented in Appendix 3.

The Composite Index of Economic Structural Change

Alternative Perspectives on Economic Structural Change

The indices described in the preceding section offer alternative perspectives on regional economic structure. Reflecting the lack of unified development theory, it is entirely possible for the four indices to move in contradictory directions. For example, consider the case of a new primary industry locating in a region. Because the industry is new, its addition raises the region's diversity index and thus indicates positive economic structural change and development. At the same time, the new industry might supply a local process manufacturer with an input that was formerly imported, thus decreasing the import-dependence index and providing a second indication of positive economic structural change.

However, an increase in primary industry in the region will probably bring a decline in the economic stage index; this could be construed as negative structural change, perhaps even as a setback in economic development. Similarly, if jobs in the new industry offer below-average pay, regional earnings per worker will decline, again signaling a negative economic structural change. The composite index combines the four indices into a single noncontradictory measure of economic structural change.

Logic Behind the Composite Index

This study measures structural change by comparing static indices of economic structure after and before the impact of RLF loans. Index change is expressed in simple percentage terms—the larger the change, the greater the presumed impact on economic structure.

The composite index is the standardized sum of percentage changes in each of the four separate structural change indices. Individual index changes are "standardized" so that each displays a common variance and standard deviation.[5] In general, more-sensitive indices will exhibit greater variance; without standardization, these would tend to overwhelm less-sensitive indices.

The economic development literature provides no basis for favoring one index over another. Therefore, the composite index is formed from individual indices with equal weight. The composite index combines the four otherwise dissimilar and possibly contradictory indices into a single summary measure of economic structural change. Small positive changes in three of the indices might be overshadowed by a large negative change in the remaining index, resulting in a net negative change in the composite index.

Computing the Composite Index

Computation of the composite index can be illustrated using the average county shown in Table 1. The portion of the table labeled "Structural Change Analysis" presents base-year values for the four individual

[5] The common standard deviation is computed as the simple average standard deviation of the four indices. Each individual index is then multiplied by the ratio of the average standard deviation to the particular index standard deviation. The result is the "standardized" index value, and each one exhibits the common standard deviation.

structural indices, after and before RLF loans. The third column shows the change in index value attributable to RLF loans. The diversity index increases by 0.27 percent, the economic stage index declines by 0.10 percent, and earnings per worker declines by 0.29 percent. Unlike the other three indices, a negative change in the import-dependence index is associated with a positive change in economic structure, so its sign is reversed in the table. Import dependence declines by 0.13 percent, but this is reported as a positive change of 0.13 percent in Table 1.

The fourth column of shaded entries repeats items from the third column, but in standardized form. The process, as described earlier, involves conversion using individual index standard deviations. The final step is the addition of standardized changes. The composite index shown in Table 1 reflects a positive 0.27 percent economic structural change for the average county.

Measuring "Significant" Economic Structural Change

In this analysis, a positive change in the composite index indicates a positive change in economic structure, whereas the opposite is true for a negative index change. Many of the individual counties exhibit changes that are very small, however, and their significance as indicators of structural change is doubtful. What is required is some minimum index level of change (positive or negative) above which the effect on economic structure can be judged as meaningful. An objective minimum does not exist, so the level chosen as significant is somewhat arbitrary. After carefully considering several measures, it was decided to select a 0.25 percent change (positive or negative) as the minimum threshold for significance: Changes between –0.25 percent and +0.25 percent are judged indeterminate, and those below or above those values are significant—negatively or positively, respectively. The change of 0.25 percent is roughly equivalent in magnitude to four standard errors, each of which is 0.06 percent.

A threshold of 0.25 percent might seem small, but it is actually consistent with relatively substantial changes in the factors underlying the structural change indices. The earnings-per-worker index provides the clearest example. Table 1 shows that the average county with RLF loan activity had 64,797 jobs in the base year, and that RLF loans can be credited with the creation or retention of 420 of those jobs. Average earnings per worker stood at $26,990. If the 420 jobs attributed to RLF loans paid 40 percent more than the average job in the county, the new jobs would result in a change in the county's earnings per worker of 0.27 percent.[6] According to the standard established above, this would be a significant change.

[6] Computing total earnings with and without the 420 jobs at the specified earnings levels and computing earnings per worker at both levels of employment provide these results.

Economic Structural Change and RLF Loans

This section reports the results of RLF loan recipient/input-output simulations. The focus is on economic structural change in the 1,032 counties with RLF loan activity.

The first subsections consider structural change at a national level (i.e., all 1,032 counties with RLF activity). Later sections consider change in the six EDA regions. Tables illustrate the magnitude of structural changes and their underlying patterns. A key task is to assess the elements behind the changes indicated in the composite change index.

Economic Structural Change in the Average County with RLF Loan Activity

The average of the structural indices of each of the 1,032 counties with RLF loan activity is found in Table 1. Individual county tables appear at the end of the report. The average table is based on these individual county tables.

Economic Diversification

The economic diversification index has a possible range of 1 to 6. Absolute specialization (i.e., one industry only) yields an index of 1, while a uniform distribution across all of the roughly 500 sectors of the input-output model yields an index of 6. Actual values in this study range from 0.94 to 4.5.

As shown in Table 1, the average diversification index for the 1,032 counties with RLF loan activity is 3.790. Absent the RLF loans, this average would be less, 3.780. Accordingly, the analysis estimates that, on average, RLF loans increase county diversification indices by 0.27 percent, just beyond the 0.25 percent set as the minimum for significant change in an index. The analysis thus concludes that in the average county, EDA RLF loans increase economic diversification and thereby have a positive effect on economic structural change.

Earnings per Worker

Earnings per worker in counties with RLF loan activity range from $14,200 to $65,300. RLF loans increase earnings per worker in some counties, but decrease them in others. As shown in Table 1, the effect in the average county is to decrease earnings per worker by 0.29 percent, a statistically significant but small change. Job creation and retention is the first priority in many RLF localities and can have this side-effect.

Economic Stage

The economic stage index has a possible range of 1 to 6. Observed values for the 1,032 counties range from 3.1 to 5.2. Table 1 indicates that the average county with RLF loans shows a negative change in the economic stage index of roughly 0.10 percent, less than the 0.25 percent minimum selected for significance in this study. It is thus concluded that in the

average county with EDA RLF loan activity, the effect of those loans on the economic stage is indeterminate.

Import Dependence

Import dependence in counties with RLF loan activity ranges from 15 percent to 47.2 percent. As shown in Table 1, in the average county with RLF loan activity, the effect of those loans is to decrease import dependence and thereby contribute to a positive change in economic structure.[7] The index change, 0.13 percent, is less than the 0.25 percent minimum selected as significant for this study. The analysis thus concludes that the effect of RLF loans on import dependence in the average county is indeterminate.

Composite Economic Structural Change

The composite economic structural change index is computed by summing the standardized change in the four individual change indices. As indicated in Table 1, in the average county with RLF loan activity, the effect of that activity is to increase the composite index by 0.27 percent. Thus, RLF loans create positive economic structural change, on average nationwide, in the counties where they occur. This positive economic structural change is driven by the positive change in the diversity index.

Number of Counties with Significant Economic Structural Change

Tables 2a and 2b provide an accounting of RLF loan counties according to their changes in economic structural indices. Table 2a provides a raw accounting without regard to the selected measure of minimum significance: Index change is either positive or negative, with none judged to be indeterminate. As shown in Table 2a, more counties experience positive economic structural change as indicated by the diversification and import-dependence indices, whereas more negative change is shown in the economic stages and earnings-per-worker indices. As measured by the composite index, however, more than three times as many counties show positive as compared to negative economic structural change: 73 percent versus 23 percent.[8]

Table 2b provides another view of economic structural change, wherein the changes ranging from -0.25 percent to +0.25 percent are judged indeterminate. The diversification index shows the greatest positive effect on structural change, with 36 percent of counties showing significant positive change and only 2 percent showing significant negative change. Positive effects occur where RLF loans bring new industries to a county or where they favor industries that are otherwise underrepresented. The majority (61 percent) of diversity index changes are judged indeterminate.

The earnings-per-worker index shows a significant negative change in 32 percent of the 1,032 counties and a significant positive change in only 5 percent. The effect is indeterminate in 63 percent of the counties. The reduction in earnings per worker suggests that RLF loans tend to favor industries with wages below county averages and reflects the fact that indirect jobs are often in low-paying service industries.

[7] In reporting import dependence, the sign of change is reversed: A reduction, which contributes to positive economic structural change, appears with a positive sign.

[8] The 43 counties in Table 2a indicating "No Effect" are counties where RLF loan recipients indicate no jobs were created or retained. These are all situations where the loan was too recent at the time of monitoring to have produced jobs.

Table 2a
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index
No Threshold on Index Values—All Counties

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	96	9	787	76	589	57	327	32	234	23
No Effect	43	4	43	4	43	4	43	4	43	4
Positive Economic Structural Change Indicated	893	87	202	20	400	39	662	64	755	73
Total	**1,032**	**100**	**1,032**	**100**	**1,032**	**100**	**1,032**	**100**	**1,032**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 2b
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index
Threshold on Applied to Index Values—All Counties

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	25	2	327	32	152	15	101	10	123	12
Indeterminate Effect	631	61	653	63	820	79	677	66	478	46
Positive Economic Structural Change Indicated	376	36	52	5	60	6	254	25	431	42
Total	**1,032**	**100**	**1,032**	**100**	**1,032**	**100**	**1,032**	**100**	**1,032**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

The economic stage index proves to be the least sensitive of the four indices to the effects of EDA RLF loans: Nearly 80 percent of the 1,032 counties show an indeterminate change in this index. Of those with significant change, over twice as many show negative change (15 percent) as show positive change (6 percent). This suggests that EDA RLF loans tend to favor lower-stage industries.

The import-dependence index indicates a significant positive change in economic structure in 25 percent of the 1,032 counties and a significant negative change in 10 percent of the counties. This suggests that EDA RLF loans tend to favor industries that fill in the economic structure of counties.

Finally, Table 2b's far-right column shows the effect of RLF loans on economic structural change as indicated by the composite index. The composite index balances the positive and negative effects of the four individual change indices. Note that the number of indeterminate counties drops when the composite index is formed. The number of indeterminate counties ranges from 61 percent to 79 percent in the individual indices, whereas only 46 percent of counties show indeterminate change in the composite index. Table 2b shows 42 percent of counties with RLF loan activity have significant positive structural change as a result of those loans, compared to 12 percent with significant negative structural change.

Analysis of Economic Structural Change Index Combinations

Table 3 illustrates the role of individual index change in determining the sign and magnitude of the composite index. The left side of the table shows the sign of individual index changes, while the right side accounts for counties according to the corresponding disposition of the composite index. The table is sorted in descending order, with the most common combinations appearing first.

As indicated in Table 3's first row, the most common response (294 of 1,032 counties) to RLF loans is positive change in the economic diversification and import-dependence indices and negative change in the economic stage and earnings-per-worker indices. This combination of individual index changes overwhelmingly favors positive as opposed to negative changes in the composite index, 153 compared to 11, with 130 counties showing indeterminate composite index change. The second most common response (236 of 1,032 counties) is the same as the first, except the stage index change is positive. These favor positive compared to negative change even more strongly, 164 compared to 2, with 70 indeterminate. Thus, roughly half (535) of the 1,032 counties with EDA RLF loan activity show positive changes in the diversification and import-dependence indices and negative changes in the earnings per worker index. Table 2a

Next in frequency (134 of 1,032 counties) is a positive change in diversification and negative change in the other individual indices. These favor a negative change in the composite index by roughly 7 to 1, with 76 indeterminate.

Following in frequency (61 of 1,032 counties) is the case of a negative change in the stages index and positive change in the other three individual indices. The table shows 42 of these in counties with a positive change in the composite index, 19 indeterminate, and zero negative. In no county is a negative change in the economic stage index sufficient to outweigh positive changes in the other three indices.

Next in frequency (59 of 1,032 counties) are negative changes in the economic stage and import-dependence indices coupled with positive changes in the diversification index and in earnings per worker. These favor negative composite index changes by 11 to 6, with 42 indeterminate counties.

Following in frequency (51 of 1,032 counties) are the cases of positive changes in the diversification and economic stage indices and negative changes in earnings per worker and the import-dependence index. These are evenly split between negative and positive changes in the composite index, seven counties each, with 37 counties indeterminate.

Table 3
Analysis of Economic Structural Change Index Combinations

Sign of Individual Index Change				County Count by Sign of the Composite Index			
Economic Diversification Index	Earnings per Worker	Economic Stage Index	Import Dependence	Positive	Negative	Indeterminate	Total
+	-	-	+	153	11	130	294
+	-	+	+	164	2	70	236
+	-	-	-	7	51	76	134
+	+	-	+	42	0	19	61
+	+	-	-	6	11	42	59
+	-	+	-	7	7	37	51
0	0	0	0	0	0	43	43
+	+	+	+	33	0	9	42
-	-	+	+	7	2	15	24
-	-	-	-	0	20	3	23
-	-	+	-	0	8	14	22
+	+	+	-	9	0	7	16
-	+	-	-	1	10	3	14
-	+	+	-	1	0	7	8
-	-	-	+	0	1	2	3
-	+	-	+	1	0	0	1
-	+	+	+	0	0	1	1
			Total	431	123	478	1,032

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Next in frequency (43 of 1,032 counties) is indeterminate change in any of the economic structural indices. This is the situation in counties where EDA RLF loan recipients indicated no creation or retention of jobs, and all of these are thereby counted indeterminate. These are all situations where the loan was too recent at the time of monitoring to have produced jobs.

The remaining rows track the other 154 of 1,032 counties. One of these rows demonstrates all positive individual index changes, occurring in 42 counties, resulting in 33 counties with a positive composite index change and nine indeterminate. Another captures the case of all negative individual index changes, occurring in 23 counties, with a negative composite index change in 20 counties and three indeterminate. Other rows are self-explanatory.

An analysis of Table 3 provides the following general picture: *Most counties respond to EDA RLF loans with a positive change in economic diversification and a negative change in earnings per worker. There is also considerable tendency for RLF loans to foster a positive change in the import-dependence index. Further, in combining individual indices to form the composite index, positive changes tend to overwhelm negative changes.* This is reflected in: (1) the larger number of significant positive compared to negative composite index changes shown in Table 2b, and (2) the average county significant positive composite index change shown in Table 1.

Table 4a
Effect of Positive Change on the Composite Economic Structural Change Index

Positive Change	Composite Index Significantly Positive	Composite Index Significantly Negative	Composite Index Indeterminate	Totals
Economic Diversification Index	412	82	390	884
Earnings per Worker Index	98	21	88	207
Economic Stage Index	217	19	160	396
Import Dependence Index	374	16	246	636

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 4b
Effect of Negative Change on the Composite Economic Structural Change Index

Positive Change	Composite Index Significantly Positive	Composite Index Significantly Negative	Composite Index Indeterminate	Totals
Economic Diversification Index	19	41	45	105
Earnings per Worker Index	333	102	347	782
Economic Stage Index	214	104	275	593
Import Dependence Index	57	107	189	353

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Analysis of Economic Structural Change Combinations by Type

Tables 4a and 4b provide still another perspective on economic structural change combinations. Table 4a considers the sign of change in the composite index given only positive changes (significant or not) in the four individual indices. Table 4b considers the opposite case, where individual indices show only negative changes (significant or not).

Economic Diversification

Table 4a's first row shows the sign of the composite index given a positive change in the diversification index: The far-right "Totals" column illustrates that 884 of the 1,032 counties showed a positive change in the diversification index. Table 2a indicates 43 counties with "No Effect"; these are excluded from Table 4a. The remaining 105 counties (1,032 - 884 - 43 = 105) evidenced a negative diversification index change, and these are shown in the first row of Table 4b.

Of the counties with positive diversification index change (884—Table 4a), nearly half (412) showed a significant positive change in the composite index. The rest are distributed between significantly negative composite index changes (82) and indeterminate composite index changes (390). This is contrasted with counties experiencing negative diversification index changes, shown on the first row of Table 4b. Of the counties with negative diversification index change (105), only 19 showed a significantly positive change in the composite index. Remaining counties are spread nearly evenly between significantly negative composite index changes (41) and indeterminate composite index changes (45).

Comparing the economic diversification index rows with the other index rows in Table 4a and Table 4b reveals that a positive change in the diversification index is the most common response of counties to EDA RLF loans, in terms of both total counties (884 of 1,032) and significant positive change in the composite index (412 counties). *A positive change in the diversification index might therefore be judged the best predictor of a significant positive change in the composite index.* Table 3 shows 431 counties with a significant positive change in the composite index. Of these, 412 show a positive change in the diversification index (Table 4a), whereas only 19 show a negative change in the diversification index (Table 4b).

Earnings per Worker

Counties with negative changes in earnings per worker far outnumber those with positive changes in that category, 782 to 207. Nonetheless, of those counties with a negative change in earnings per worker, a large share at the same time expressed significant positive change in the composite index; 333 of the 782.

The chief conclusion afforded by Table 4a and Table 4b is that while RLF loans can reduce average earnings per worker, their positive effect on other indices (particularly on diversification but also import dependence) usually more than compensates. And, of course, the creation and retention of local jobs is of even more fundamental importance.

Economic Stage

The effect of RLF loans on the economic stage index is less predictable. Stage indices are more likely to decrease than increase, but the numbers in each category are much closer: 593 counties with RLF loans show decreasing economic stage indices (Table 4b) compared to 396 counties with increasing economic stage indices (Table 4a).

The effect on the composite index of a given change in the economic stage index is also less predictable. Roughly one-third (214 of 593) of the counties showing a decline in the economic stage index (Table 4b) nonetheless show a significant positive change in the composite index. The portion of counties with both a positive change in the economic stage index and a significant positive change in the composite index is more than one-half (217 of 396).

The chief conclusion afforded by Tables 4a and 4b and the economic stage index is as follows: *While RLF loans tend to negatively impact the economic stage index by roughly a 3 to 2 margin (593 to 396), a negative change in the economic stage index is a poor predictor of a significant negative change in the composite index. In other words, RLF loans that produce negative change in the economic stage index more often produce overall positive change in the composite index.*

Import Dependence

The impact of RLF loans on import dependence is positive at a roughly 2 to 1 ratio, with 254 counties (25 percent) significantly positive compared to 101 counties (10 percent) that are significantly negative (Table 2b). More telling is the impact of positive changes in import dependence on the sign of the composite index (Table 4a and Table 4b): *there is a closer association between counties with positive changes in import dependence and counties with positive changes in the composite index than is the case with any other individual index except the diversification index.* In forming the composite index, the import dependence index plays a significant role in overcoming the generally negative effect of RLF loans on earnings per worker.

Broad conclusions from Tables 4a and 4b are as follows: First, a positive change in the diversification index is the best predictor of a significant positive

change in the composite index; RLF loans have an overwhelmingly positive impact on economic diversification. Second, RLF loans tend to reduce earnings per worker; however, their positive impact on the other indices, most dramatically on diversification but also on import dependence, more than compensate. Third, although the effects of RLF loans on the economic stage index is more negative than positive, the magnitudes tend to be small, as does the role of the economic stage index in determining the sign of change in the composite index: A negative change in the economic stage index is a poor predictor of a significant negative change in the composite index. Finally, while the impact of RLF loans on the import-dependence index is generally positive, the magnitudes also tend to be small. Nonetheless, positive changes in the import-dependence index play an important role in overcoming the generally negative effect of RLF loans on earnings per worker.

Economic Structural Change by County Type

Table 5 sorts index outcomes by loan and county characteristics. Rows consider each index as positive, negative, or indeterminate. The first column shows the number of counties in each category (these counts are also shown in Table 2b). The remaining columns display loan and county characteristics.

The second through fourth columns in Table 5 present data regarding the RLF loans—average cumulative amounts, number of loans, and so on. The next two columns show information on RLF job effects (average jobs created or retained) and the average multiplier effect. The next two columns deal with the size of the counties: One shows the average number of industrial sectors; the other shows average total jobs in the counties. The final column indicates the relative magnitude of the effect on jobs, presenting jobs created/retained by RLF loans as a percentage of all county jobs.

Indeterminate Change

The first item to scrutinize in Table 5 is county characteristics that tend to be associated with an indeterminate index change. The table indicates that RLF loans are too small, at least relative to large county size, to affect structural change one way or the other in these counties. Table 5 illustrates that indeterminate counties tend to be larger than average in terms of total jobs and number of industries, and smaller than average in terms of RLF job effects. Thus, in these counties there is a small job change against a large job base. These counties also tend to have the smallest total loan amount from all sources. Furthermore, the indeterminate counties tend to have the fewest average number of RLF loans and the smallest multiplier effects. An indeterminate impact on structural change is thus primarily a matter of scale, i.e., insufficient job effects given the job base of the host county.

Economic Diversification

As shown in Table 5 and elsewhere, the most common significant response to RLF loans is a positive change in the diversification index. Similarly, the least common response is a significant negative change in the diversification index. It is instructive to compare characteristics of positive change counties with those of negative change counties.

Compared to negative change counties, counties with positive change have higher RLF loan and total loan amounts, a larger number of RLF loans, and a greater average job effect. The 25 counties showing a negative change are the smallest of any category in Table 5, averaging 5,283 jobs, compared to an average of 22,402 jobs for positive change counties. Thus, in the negative change counties, the relative impact of

Table 5
Economic Structural Change Indices According to Size of Job Impact and Characteristics of Counties and RLF Loans

Index Change		Number of Counties by Index Change	Average Sum of RLF Loan Amounts in a County ($)	Average Number of Loans	Average Sum of Total Financing Packages in a County ($)	Average Job Effect	Average Multiplier	Average Number of Sectors	Average Total Jobs in County	Job Change Percent of Total Jobs (%)
Diversification	+	376	1,979,463	16	14,724,838	722	1.95	112	22,402	3.22
Diversification	Indet	631	880,481	8	4,326,665	177	1.59	143	91,731	0.19
Diversification	-	25	771,130	4	4,558,044	446	1.35	83	5,283	8.45
E per W	+	52	1,567,919	9	21,808,642	756	1.94	101	10,339	7.32
E per W	Indet	653	1,203,504	10	7,153,831	286	1.77	145	92,831	0.31
E per W	-	327	1,381,406	13	7,874,968	515	1.84	105	16,149	3.19
Stage	+	60	822,924	9	4,388,876	294	1.63	84	5,404	5.44
Stage	Indet	820	1,019,150	10	4,909,962	250	1.68	137	76,478	0.33
Stage	-	152	2,855,664	18	26,915,226	1,132	2.02	113	22,375	5.06
Import	+	101	1,734,406	11	18,777,723	836	1.79	111	21,926	3.81
Import	Indet	677	792,168	7	3,723,425	161	1.58	136	80,712	0.20
Import	-	254	2,392,389	20	15,603,571	792	1.98	123	37,719	2.10
Composite	+	431	1,797,097	15	10,847,663	552	1.91	119	32,730	1.69
Composite	Indet	478	791,480	7	5,441,393	153	1.61	146	104,370	0.15
Composite	-	123	1,351,738	9	8,977,946	679	1.76	107	19,852	3.42

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

RLF loans, i.e., the change in jobs as a percentage of total jobs, is greatest (8.45 percent) of all counties shown in the table. A negative change in diversification in the very small counties occurs in cases where RLF loans reinforce the county's already-dominant industry.

Earnings per Worker

A search for county characteristics that might explain changes in earnings per worker is inconclusive. The negative change counties tend to be slightly larger than the positive change counties, and the relative impact of jobs is greater in positive change counties. One feature that does stand out is the greater RLF loan-leverage ratio in positive change counties (where roughly $1.6 million of EDA RLF loan engenders nearly $22 million in total loans), but this may be coincidental.

Economic Stage

Despite its apparent similarity to the diversification index, the characteristics of the economic stage index counties appear just the reverse of the diversification index counties. With the stage index, positive changes occur with smaller RLF and total loan amounts, and they occur in the smaller counties. This would result in a different collection of small counties, one where the job changes occur in existing or new higher-stage industries. County and loan characteristics appear to be of limited significance in determining the impact of RLF loans on economic stage.

Import Dependence

As with the other indices, the county characteristics shown in Table 5 are not particularly helpful in explaining the effect of RLF loans on import depen-

dence. A change in this index depends on the mosaic of industries and interindustry linkages in a county, and the degree to which the jobs created by the RLF loans fill holes in this industry mosaic. None of these effects are readily apparent in Table 5.

Composite Economic Structural Change

Significant positive changes in the composite index tend to occur in the larger counties (32,730 jobs for positive change counties compared to 19,852 jobs for negative change counties). At the same time, the job effect in the positive change counties is actually slightly less than in the negative change counties (552 compared to 679). Accordingly, the average relative job change is less (1.69 percent compared to 3.42 percent).

County and loan characteristics only partially explain the response of economic structural change indices to RLF loans. The one exception is an explanation of the indeterminate counties. These clearly tend to be larger counties where the magnitude of the loans and related effects are simply too small, relative to the employment size of the counties, to have a significant impact on economic structure.

Economic Structural Change by Region

Tables 6 through 17 examine relative results broken out by the six EDA regions. Tables 6 through 11 are regional counterparts to the all-county-average Table 1. Tables 12 through 17 (each in two parts, a and b) are regional counterparts to the all-county-accounting Table 2. Tables 6 and 12 refer to structural changes in EDA's Philadelphia Region; Tables 7 and 13 refer to the Atlanta Region; Tables 8 and 14 to the Denver Region; Tables 9 and 15 to the Chicago Region; Tables 10 and 16 to the Seattle Region; and Tables 11 and 17 to the Austin Region.

From the average-county perspective shown in Tables 6 through 11, all six EDA regions showed a positive change in the composite index, though the change indicated in the Atlanta Region (0.01 percent) and the Austin Region (0.19 percent), were not significant using the 0.25 percent threshold. The Seattle Region showed the greatest positive change in the composite index (0.46 percent), followed by the Chicago Region (0.43 percent), the Denver Region (0.42 percent), and the Philadelphia Region (0.26 percent).

Tables 12 through 17 provide an accounting of the counties by region also by structural change outcome. The patterns in these tables follow the general pattern for the nationwide analysis shown in Table 2. Counties with significant positive change in diversification indices far outnumber counties with significant negative changes. Earnings per worker decline in many more counties than increase. Counties with significant negative change in economic stage indices outnumber counties with significant positive changes by a substantial margin. Counties with significant positive change in the import dependence index outnumber counties with significant negative change (Table 2a and Table 2b). All regions display a substantially larger number of counties with a significant positive change in the composite index. Note that EDA Atlanta and Austin regions, which display indeterminate composite index changes from the average-county perspective (Table 7 and Table 11) show generally larger numbers of indeterminate index-change counties compared to the other regions (Table 13b and Table 17b).

Table 6
Average Loan Summary and Economic Structural Change Analysis—
Philadelphia Region Counties

Loan Moneys and Employment Creation

Loans Summary

RLF	$ 2,680,425
Other Public	$ 2,199,206
Private	$ 11,255,086
New Equity	$ 1,306,229
Total	$ 17,440,946

Jobs Summary (created/retained)

Direct	538
Indirect	498
Total	1037
Multiplier	1.93

Loan-Leverage Ratio	5.5:1		
EDA Cost	$ 836,047	EDA Cost per Direct Job	$1,553
Total Investment per EDA Dollar	$20.86	EDA Cost per Total Job	$807

Baseline Industry and Employment Analysis*

	Before	After	▲	▲%
SIC Business Types in County (4-Digit)	166	168	2	0.97%
Total Employment	107,386	108,423	1,037	0.97%

Economic Structural Change Analysis

	Before	After	▲%	▲STD%	
Diversification Index	3.927	3.940	0.33%	0.48%	pos
Earnings per Worker ($1,000)	$ 31.07	$ 30.97	-0.32%	-0.20%	neg
Economic Stage Index	4.612	4.602	-0.21%	-0.21%	ind
Import-Dependence Index**	26.57%	26.53%	0.15%	0.19%	ind

Summary of Indices

1 of 4 indices show positive structural change

Composite Economic Structural Change Index	0.26%	pos

*Baseline industry count and employment are from 1993
**The sign of the import-dependence index is reversed, so a positive index change will indicate a positive economic structural change
pos= positive economic structural change
neg= negative economic structural change
ind= indeterminate economic structural change

Source: Rutgers CUPR-EDA RLF Database 2000.

Table 7
Average Loan Summary and Economic Structural Change Analysis—
Atlanta Region Counties

Loan Moneys and Employment Creation

Loans Summary

RLF	$ 905,683
Other Public	$ 496,419
Private	$ 2,003,139
New Equity	$ 609,294
Total	$ 4,014,536

Jobs Summary (created/retained)

Direct	155
Indirect	81
Total	236
Multiplier	1.52

Loan-Leverage Ratio	3.4:1		
EDA Cost	$ 238,003	EDA Cost per Direct Job	$1,535
Total Investment per EDA Dollar	$16.87	EDA Cost per Total Job	$1,010

Baseline Industry and Employment Analysis*

	Before	After	▲	▲%
SIC Business Types in County (4-Digit)	116	117	1	0.71%
Total Employment	39,908	40,143	236	0.59%

Economic Structural Change Analysis

	Before	After	▲%	▲STD%	
Diversification Index	3.674	3.682	0.22%	0.32%	ind
Earnings per Worker ($1,000)	$ 25.99	$ 25.89	-0.39%	-0.25%	neg
Economic Stage Index	4.272	4.266	-0.14%	-0.14%	ind
Import-Dependence Index**	31.24%	31.21%	0.07%	0.09%	ind

Summary of Indices

0 of 4 indices show positive structural change

Composite Economic Structural Change Index	0.01%	ind

*Baseline industry count and employment are from 1993
**The sign of the import-dependence index is reversed, so a positive index change will indicate a positive economic structural change
pos= positive economic structural change
neg= negative economic structural change
ind= indeterminate economic structural change

Source: Rutgers CUPR-EDA RLF Database 2000.

Table 8
Average Loan Summary and Economic Structural Change Analysis—
Denver Region Counties

Loan Moneys and Employment Creation

Loans Summary

RLF	$ 679,758
Other Public	$ 593,304
Private	$ 5,380,968
New Equity	$ 1,518,406
Total	$ 8,172,436

Jobs Summary (created/retained)

Direct	136
Indirect	119
Total	256
Multiplier	1.88

Loan-Leverage Ratio	11.0:1		
EDA Cost	$ 119,878	EDA Cost per Direct Job	$879
Total Investment per EDA Dollar	$68.17	EDA Cost per Total Job	$469

Baseline Industry and Employment Analysis*

SIC Business Types in County (4-Digit)	Before	After	▲	▲%
	108	109	1	0.84%

Total Employment	Before	After	▲	▲%
	26,944	27,200	256	0.95%

Economic Structural Change Analysis

	Before	After	▲%	▲STD%	
Diversification Index	3.732	3.744	0.30%	0.44%	pos
Earnings per Worker ($1,000)	$ 23.83	$ 23.75	-0.35%	-0.23%	neg
Economic Stage Index	4.216	4.217	0.01%	0.01%	ind
Import-Dependence Index**	30.43%	30.38%	0.15%	0.20%	ind

Summary of Indices

1 of 4 indices show positive structural change

Composite Economic Structural Change Index	0.42%	pos

*Baseline industry count and employment are from 1993
**The sign of the import-dependence index is reversed, so a positive index change will indicate a positive economic structural change
pos= positive economic structural change
neg= negative economic structural change
ind= indeterminate economic structural change

Source: Rutgers CUPR-EDA RLF Database 2000.

Table 9
Average Loan Summary and Economic Structural Change Analysis—
Chicago Region Counties

Loan Moneys and Employment Creation

Loans Summary

RLF	$ 1,371,676
Other Public	$ 1,711,338
Private	$ 4,803,228
New Equity	$ 1,614,669
Total	$ 9,500,911

Loan-Leverage Ratio 5.9:1

Jobs Summary (created/retained)

Direct	308
Indirect	265
Total	572
Multiplier	1.86

EDA Cost	$ 287,307	EDA Cost per Direct Job	$934
Total Investment per EDA Dollar	$33.07	EDA Cost per Total Job	$502

Baseline Industry and Employment Analysis*

SIC Business Types in County (4-Digit)	Before	After	▲	▲%
	142	143	1	1.04%

Total Employment	Before	After	▲	▲%
	71,602	72,174	572	0.80%

Economic Structural Change Analysis

	Before	After	▲%	▲STD%	
Diversification Index	3.876	3.888	0.31%	0.45%	pos
Earnings per Worker ($1,000)	$ 26.85	$ 26.79	-0.22%	-0.14%	ind
Economic Stage Index	4.376	4.369	-0.17%	-0.17%	ind
Import-Dependence Index**	28.58%	28.52%	0.22%	0.29%	ind

Summary of Indices

1 of 4 indices show positive structural change

Composite Economic Structural Change Index	0.43%	pos

*Baseline industry count and employment are from 1993

**The sign of the import-dependence index is reversed, so a positive index change will indicate a positive economic structural change

pos= positive economic structural change
neg= negative economic structural change
ind= indeterminate economic structural change

Source: Rutgers CUPR-EDA RLF Database 2000.

Table 10
Average Loan Summary and Economic Structural Change Analysis—
Seattle Region Counties

Loan Moneys and Employment Creation

Loans Summary

RLF	$ 1,822,936
Other Public	$ 717,484
Private	$ 3,755,281
New Equity	$ 1,335,020
Total	$ 7,630,721

Jobs Summary (created/retained)

Direct	214
Indirect	165
Total	379
Multiplier	1.77

Loan-Leverage Ratio	3.2:1		
EDA Cost	$ 366,084	EDA Cost per Direct Job	$1,709
Total Investment per EDA Dollar	$20.84	EDA Cost per Total Job	$965

Baseline Industry and Employment Analysis*

SIC Business Types in County (4-Digit)	Before	After	▲	▲%
	146	147	1	0.99%

Total Employment	Before	After	▲	▲%
	121,622	122,001	379	0.31%

Economic Structural Change Analysis

	Before	After	▲%	▲STD%	
Diversification Index	3.779	3.789	0.28%	0.40%	pos
Earnings per Worker ($1,000)	$ 31.13	$ 31.05	-0.25%	-0.16%	ind
Economic Stage Index	4.418	4.415	-0.05%	-0.05%	ind
Import-Dependence Index**	28.82%	28.76%	0.20%	0.26%	ind

Summary of Indices

1 of 4 indices show positive structural change

Composite Economic Structural Change Index	0.46%	pos

*Baseline industry count and employment are from 1993
**The sign of the import-dependence index is reversed, so a positive index change will indicate a positive economic structural change
pos= positive economic structural change
neg= negative economic structural change
ind= indeterminate economic structural change

Source: Rutgers CUPR-EDA RLF Database 2000.

Table 11
Average Loan Summary and Structural Change Analysis—
Austin Region Counties

Loan Moneys and Employment Creation

Loans Summary		Jobs Summary (created/retained)	
RLF	$ 608,644	Direct	95
Other Public	$ 370,989	Indirect	50
Private	$ 1,948,732	Total	145
New Equity	$ 421,800	Multiplier	1.53
Total	$ 3,350,165		
Loan-Leverage Ratio	4.5:1		

EDA Cost	$ 229,140	EDA Cost per Direct Job	$2,417
Total Investment per EDA Dollar	$14.62	EDA Cost per Total Job	$1,580

Baseline Industry and Employment Analysis*

SIC Business Types	Before	After	▲	▲%
in County (4-Digit)	123	124	1	0.53%
Total	Before	After	▲	▲%
Employment	55,721	55,866	145	0.26%

Economic Structural Change Analysis

	Before	After	▲%	▲STD%	
Diversification Index	3.784	3.790	0.17%	0.25%	ind
Earnings per	Before	After	▲%	▲STD%	
Worker ($1,000)	$ 25.88	$ 25.86	-0.06%	-0.04%	ind
Economic	Before	After	▲%	▲STD%	
Stage Index	4.292	4.289	-0.06%	-0.06%	ind
Import-Dependence	Before	After	▲%	▲STD%	
Index**	30.26%	30.26%	0.03%	0.04%	ind

Summary of Indices

0 of 4 indices show positive structural change

Composite Economic Structural Change Index	0.19%	ind

*Baseline industry count and employment are from 1993

**The sign of the import-dependence index is reversed, so a positive index change will indicate a positive economic structural change

pos= positive economic structural change
neg= negative economic structural change
ind= indeterminate economic structural change

Source: Rutgers CUPR-EDA RLF Database 2000.

Philadelphia

Table 6 shows average-county results for the Philadelphia region; it demonstrates a pattern and magnitude of effects close to the national averages shown in Table 1. While the county averages of both the RLF and total loan amounts are roughly double their national counterparts, the regional average of total jobs is likewise nearly double, so the relative effects are close. The Philadelphia region's similarity to the national average is echoed in Table 12, which shows the relative pattern of negative and positive change counties shown for all regions in Table 2.

Atlanta

Table 7 provides average-county results for the Atlanta region, one of the two regions showing an indeterminate change in the composite index. The total job change effect of RLF loans is a little more than half the national average, 236 compared to the 420 shown in Table 1. At the same time, however, this change amounts to nearly 0.59 percent of all jobs, which is somewhat below the national change of 0.65 percent shown in Table 1.

Atlanta's low composite index change is due to neutralizing effects of factors in the individual indices. In particular, the diversification index increased, but by less than the national average shown in Table 1. At the same time, the economic stage index declined by slightly more than the national average. Earnings per worker declined by much more than the national average. Finally, as in the case of the national average, the import dependence index went down, signifying positive economic structural change, but it declined by a smaller amount in the Atlanta region, thus contributing less to a positive composite index change. The result of all these factors combined is a small positive composite index change of 0.01 percent, indeterminate by the significance level set for this research. These differences are generally mirrored in Table 13, the accounting of counties for the Atlanta region.

Denver

Table 8 contains average-county results for the Denver region. This region displays the third-largest positive change in the composite index (0.42 percent) of any of the six EDA regions. Counties in the Denver region receiving RLF loans are smaller in total employment than counties in any of the other EDA region, 27,188 jobs compared to the national average of 64,797 jobs. Denver counties also exhibit the second-largest relative job change resulting from RLF loans, 0.95 percent. It is difficult given the information in Table 8 to ascertain how this region differs from the others. As illustrated in Table 14b, a larger share of Denver counties show significant positive change in the composite index (47 percent) compared to the nation (42 percent).

Comparing Table 8 for the Denver region with Table 1 for all regions reveals that the greatest single difference is attributable to the economic stage index. Specifically, while the economic stage index declines nationwide (Table 1) and in all of the other five regions, it goes up in the Denver region. The point spread between the usual negative and Denver's positive, and the effect this has on the composite index, explains the relatively high composite index for this region.

Chicago

Table 9 depicts average-county results for the Chicago region, while Table 15 provides an accounting of counties according to index change. Inspection of these two tables reveals results that generally parallel those shown for the Seattle region (Tables 10 and 16) and nationwide (Table 1 and Tables 2a and 2b).

Table 12a
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index No Threshold on Index Values—Philadelphia Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	8	5	119	79	119	79	48	32	32	21
No Effect	3	2	3	2	3	2	3	2	3	2
Positive Economic Structural Change Indicated	139	93	28	19	28	19	99	66	115	77
Total	**150**	**100**	**150**	**100**	**150**	**100**	**150**	**100**	**150**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 12b
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index Threshold Applied to Index Values—Philadelphia Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	3	2	42	28	36	24	23	15	19	13
Indeterminate Effect	79	53	103	69	111	74	91	61	69	46
Positive Economic Structural Change Indicated	68	45	5	3	3	2	36	24	62	41
Total	**150**	**100**	**150**	**100**	**150**	**100**	**150**	**100**	**150**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Seattle

Table 10 provides average-county results for the Seattle region. Comparison of Table 9 with nationwide Table 1 shows the two generally parallel each other.

Austin

Table 11 provides average-county results for the Austin region. Austin is one of two EDA regions showing an indeterminate change in the composite index.

Table 13a
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index No Threshold on Index Values—Atlanta Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	34	13	197	77	147	58	90	35	68	27
No Effect	19	7	19	7	19	7	19	7	19	7
Positive Economic Structural Change Indicated	202	79	39	15	89	35	146	57	168	66
Total	**255**	**100**	**255**	**100**	**255**	**100**	**255**	**100**	**255**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 13b
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index Threshold Applied to Index Values—Atlanta Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	17	7	62	24	43	17	34	13	40	16
Indeterminate Effect	154	60	182	71	198	78	173	68	128	50
Positive Economic Structural Change Indicated	84	33	11	4	14	5	48	19	87	34
Total	**255**	**100**	**255**	**100**	**255**	**100**	**255**	**100**	**255**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

In this case, the indeterminacy can be explained by the small size of the total job effect relative to the large employment base of the average county. The average county in the Austin region has 55,866 jobs, close to the U.S. average shown in Table 1, 64,797. Yet the RLF job effect in Austin is only 145, the smallest of any region, compared to 420 jobs in the national average. This rather small job effect can be at-

Table 14a
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index No Threshold on Index Values—Denver Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	21	10	168	77	98	45	69	32	42	19
No Effect	5	2	5	2	5	2	5	2	5	2
Positive Economic Structural Change Indicated	193	88	46	21	116	53	145	66	172	79
Total	**219**	**100**	**219**	**100**	**219**	**100**	**219**	**100**	**219**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 14b
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index Threshold Applied to Index Values—Denver Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	3	1	54	25	20	9	21	10	18	8
Indeterminate Effect	135	62	155	71	177	81	142	65	98	45
Positive Economic Structural Change Indicated	81	37	10	5	22	10	56	26	103	47
Total	**219**	**100**	**219**	**100**	**219**	**100**	**219**	**100**	**219**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

tributed to Austin's relatively small RLF loan amount and total loan amounts compared to the national case. Table 17 provides an accounting of counties by structural change effect for the Austin region. The patterns generally follow those nationwide, though the percentages of indeterminate individual indices are much larger.

Table 15a
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index No Threshold on Index Values—Chicago Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	12	8	103	64	95	59	38	24	27	17
No Effect	13	8	13	8	13	8	13	8	13	8
Positive Economic Structural Change Indicated	135	84	44	28	52	33	109	68	120	75
Total	**160**	**100**	**160**	**100**	**160**	**100**	**160**	**100**	**160**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 15b
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index Threshold Applied to Index Values—Chicago Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	4	3	39	24	26	16	14	9	14	9
Indeterminate Effect	86	54	105	66	127	79	89	56	64	40
Positive Economic Structural Change Indicated	70	44	16	10	7	4	57	36	82	51
Total	**160**	**100**	**160**	**100**	**160**	**100**	**160**	**100**	**160**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 16a
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index No Threshold on Index Values—Seattle Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	14	10	112	82	74	54	35	26	29	21
No Effect	1	1	1	1	1	1	1	1	1	1
Positive Economic Structural Change Indicated	121	89	23	17	61	45	100	74	106	78
Total	**136**	**100**	**136**	**100**	**136**	**100**	**136**	**100**	**136**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 16b
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index Threshold Applied to Index Values—Seattle Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	3	2	29	21	14	10	13	10	12	9
Indeterminate Effect	86	63	103	76	111	82	82	60	59	43
Positive Economic Structural Change Indicated	47	35	4	3	11	8	41	30	65	48
Total	**136**	**100**	**136**	**100**	**136**	**100**	**136**	**100**	**136**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 17a
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index No Threshold on Index Values—Austin Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	7	6	88	79	57	51	47	42	29	26
No Effect	2	2	2	2	2	2	2	2	2	2
Positive Economic Structural Change Indicated	103	92	22	20	53	47	63	56	81	72
Total	**112**	**100**	**112**	**100**	**112**	**100**	**112**	**100**	**112**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Table 17b
Summary Results of Four Economic Structural Change Measures and Composite Economic Structural Change Index Threshold Applied to Index Values—Austin Region

	Economic Diversification Index		Earnings per Worker Index		Economic Stage Index		Import Dependence Index		Composite Economic Structural Change Index	
	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%	Number of Counties	%
Negative Economic Structural Change Indicated	0	0	13	12	13	12	10	9	9	8
Indeterminate Effect	87	78	93	83	96	86	87	78	75	67
Positive Economic Structural Change Indicated	25	22	6	5	3	3	15	13	28	25
Total	**112**	**100**	**112**	**100**	**112**	**100**	**112**	**100**	**112**	**100**

Source: Economic Modeling Specialists Incorporated (EMSI) 2000.

Summary and Conclusions

RLF Loans and Economic Structural Change

The literature on economic development offers four measures of structural change that are quantified and applied to the present analysis: *economic diversification, earnings per worker, economic stage, and import dependence.* These individual indices measure different factors and therefore operate independently and often in different directions. A composite index is formulated, permitting the summation of the four separate indices into a single measure of structural change.

Positive Economic Structural Change

According to the composite index and the level of significance set for this study, *RLF loans create significant positive economic structural change in 42 percent of the counties where they are utilized. Their effect is indeterminate in 46 percent of the counties and negative in 12 percent of the counties.*

RLF loans create significant positive economic structural change, on average nationwide, in the counties where they occur. The composite index in the average county with RLF loan activity is estimated to be 0.27 percent greater as a result of those loans, above the 0.25 percent level set for minimum significance.

Indeterminate Economic Structural Change

The economic structural change analysis relies on direct job impacts as reported by RLF loan recipients, plus an estimate of indirect job impacts obtained through a county-level input-output model. The approach is not conjectural, but the kinds of objective measures of significance available in statistical analysis are not generally available here. Nonetheless, some minimum floor of significance is required to segregate counties where effects are too small to be meaningful. The significance level chosen for this analysis is a 0.25 percent change in a structural change index, either positive or negative. Index changes between -0.25 percent and +0.25 percent are judged to be "indeterminate."

An examination of the counties in the indeterminate composite index category reveals that they tend to be the larger counties, roughly three to five times larger in terms of total jobs than the typical county showing a significant composite index change, positive or negative. The percentage change in total jobs brought about by RLF loans is 0.15 percent in indeterminate counties, compared to 10 to 15 times more (2 percent to 3 percent) in significant composite index change counties.

Total RLF loan amounts, number of loans, and total all-source loan amounts all tend to be substantially lower in counties with an indeterminate change in the composite index. *The conclusion is that where RLF*

loans and related effects are small relative to county size, their impact on economic structural change is likely to be too small to be meaningful.

Negative Economic Structural Change

In 12 percent of the 1,032 counties with RLF loan activity, the result of that activity is to bring about a negative change in economic structure as measured by the composite index. An important question posed by the analysis is this: Are these counties in any sense worse off for this negative turn in the composite index value?

The indexing method employed in this analysis has a certain asymmetry about it: It is easier to describe a positive structural change as good for a location than it is to describe a negative structural change as bad for a location. *It might be better to view negative structural change counties as the result of current trends in the presence of increased numbers of jobs.*

Economic Structural Change by EDA Region

RLF loans create significant positive economic structural change in a large number of counties in each of the six EDA regions. However, the average county composite index change appears indeterminate for the Atlanta and Austin EDA regions. In Austin, the indeterminate change can generally be attributed to the small size of the RLF loan effort relative to the size of the average loan-receiving county. In Atlanta, the indeterminate change generally results from offsetting changes in the individual component indices.

The economic structure of the Seattle region appears to have experienced the greatest positive change as a result of RLF loans, with a positive change in the average-county composite index of 0.46 percent. The region also shows a large share, 48 percent, of individual counties with a significant positive change in the composite index. The results indicated for the Seattle region can be largely attributed to the substantial size of RLF and other loans relative to the size of its average loan-receiving county.

Types of Economic Structural Change

Economic Diversification

The most predictable effect of RLF loans is to increase economic diversification in the counties where they are utilized. While 61 percent of the 1,032 counties with RLF loan activity showed an indeterminate effect from RLF loans, 36 percent showed a significant positive change in economic diversification. Only 25 counties (2 percent) showed a significant negative change in the economic diversification index. The effect of RLF loans on economic diversification is also essentially uniform across EDA regions.

Earnings per Worker

The effect of EDA RLF loans on earnings per worker is very small, usually indeterminate. As a general rule, to impact significantly, the jobs contributing to a change in earnings per worker must pay substantially less than what the average job in the county pays. Counties where the negative effect of RLF loans on earnings per worker is statistically significant outnumber positive-effect counties by a margin of 32 percent to 5 percent. However, the effect on earnings per worker in the remaining 63 percent of the counties is indeterminate.

The effect of RLF loans on earnings per worker in the average county is to reduce it by a slight but statistically significant 0.29 percent. This nationwide effect on earnings per worker would be a little over a dollar in a $400 weekly wage. It reflects the creation

or retention of jobs paying below-average wages, not a literal reduction of existing wages.

Economic Stage

Of the four measures of economic structure considered in this study, economic stage is the least sensitive to the effects of RLF loans. *Nearly 80 percent of the 1,032 counties with RLF loan activity showed an indeterminate change in the economic stage index.*

Of counties indicating a significant change in the economic stage index, negative changes outweighed positive changes by more than 2 to 1: 152 negative-change counties compared to 60 positive-change counties. The effect on the economic stage index in the national average was negative, though not significantly so.

The effect of RLF loans on the economic stage of counties varied notably across EDA regions. The Denver region showed a greater number of significant positive changes in the economic stage index than significant negative changes, and it showed a slight positive change in its average-county economic stage index. The Denver region also shows one of the largest positive changes in the average composite index. Other regions mirrored the national tendency toward a negative change in the economic stage index.

The generally negative effect on economic stage of RLF loans suggests that these loans tend to favor lower-stage industries. It should be kept in mind, however, that the balance of significant negative and positive changes in the development index is closer than some of the other individual indices, and that more of the economic stage values are indeterminate than is the case with any of the other indices.

Import Dependence

A significant positive change in the import-dependence index, indicating a reduction in import dependence, occurs in 25 percent of the counties, compared to 10 percent of the counties showing a significant negative change. Indeterminate change in the import-dependence index occurs in 66 percent of the counties.

Individual EDA regions generally reflect the nationwide response in this index. The Chicago region is an exception, with more counties having positive change in the import-dependence index. In Chicago, significant positive change counties outnumber significant negative change counties by a margin of roughly 4 to 1, compared to just over 2 to 1 in the national case.

Composite Economic Structural Change

In considering the four indices together, as well as their individual impacts on the composite index, the following general picture of RLF loan impacts emerges. *RLF loans are too small relative to county size to cause significant economic structural change in approximately half of all counties where they occur. In the other half, significant positive change counties outnumber significant negative change counties roughly 4 to 1. Of the 1,032 counties with RLF loan activity, 42 percent evidenced significant positive structural change, whereas 12 percent evidenced significant negative change.*

The average county with RLF loan activity experiences significant positive economic structural change, as measured by the composite index and the level of significance chosen for this study. The six EDA regions generally follow the average-region pattern, with the exception of the Atlanta and Austin regions, where economic structural change impacts are indeterminate.

The two most predictable effects of RLF loans are to increase the economic diversity of counties and lower earnings per worker. This suggests that RLF loans

tend to bring new industries to regions, reducing dependence on any one or a handful of industrial sectors. At the same time, the new industries tend to pay wages that are lower than the county average. There is some peril, however, in judging too harshly the creation or retention of jobs simply because it reduces average earnings per worker. This subject is discussed further below.

Another predictable effect of RLF loans is a slight deterioration in economic stage, largely offset by improvement (i.e., reduction) in import dependence. It is important to emphasize that the impacts of RLF loans on economic stage and import dependence are less predictable than is the case with economic diversity and earnings per worker. The numbers of significant positive change counties and negative change counties are much closer in the case of economic stage and import dependence, and the number of indeterminate counties is generally higher: Nearly 80 percent of all counties show an indeterminate change in the economic stage index. Moreover, in the Denver region, more counties show a significant positive change rather than a negative change in the economic stage index.

Bearing in mind the small margin between negative change counties and positive change counties, the generally negative change in the economic stage index suggests that RLF loans tend to favor lower-stage industries—this may be a corollary to the negative effect RLF loans tend to have on earnings per worker. At the same time, the improvement in import dependence suggests that RLF loans tend to favor industries that help counties fill their need for business inputs and consumer goods—and this may be a corollary to the positive effect of RLF loans on economic diversity.

Limitations of the Analysis

Asymmetry of Positive and Negative Economic Structural Change

Most economists would agree that a positive change in any one of the four structural indices leaves the region better off than it was before. An increase in earnings per worker, for example, increases the incomes of at least some residents, while positive changes in the other indices enhance development prospects and position the region for growth. There is likely less agreement, however, on the degree to which negative index changes mark a reversal in a region's fortunes.

Consider the appearance of new jobs in an industry with below-average wages that lowers regional earnings per worker. The industry creates jobs and may also lower regional unemployment. Regional income per person may actually increase, while earnings per worker declines. It is unlikely that a new industry—even one paying lower than average wages—would be anything but welcome, particularly in the distressed counties RLF loans often target.

The same might be said for negative changes in other indices. It is less than clear how a positive change in jobs, though lowering the economic structural change indices developed for this analysis, can be viewed as an overall negative impact in a county. One could argue that employing job seekers is the top priority; technical quality issues are secondary.

Equal Weighting of Economic Structural Change Indices

In forming the composite index, the four individual component indices are equally weighted. It might, however, be appropriate to consider some indices more important than others, based on economic de-

velopment goals or objectives. For example, economic diversification might be given more weight. This could have a dramatic effect on overall findings by making the composite index more positive as a result of this weighting.

Economic Structural Change Index Refinement

The economic stage index is based on an approximate classification of industrial sectors as set forth by Parr (1999). The specific classifications appear in Appendix 2. These sectors might be recategorized to reflect economic structural change objectives, and even weighted to give more importance to some sectors than others, again to better reflect economic development objectives.

Economic Corroboration of Overall Job Impacts

The accompanying econometric analysis seeks to provide independent corroboration of the job effects reported by RLF loan recipients. As described earlier, the econometric analysis indicated a statistically significant effect of RLF loans on job creation in counties where loans were made. However, the general magnitude of the effect measured econometrically was somewhat less than that indicated by RLF loan recipients. In other words, costs per job were higher. This finding could be primarily caused by the data distribution's effect on mean averages employed in the econometric analysis.

Thus, it is difficult to relate the econometric results with the loan recipient results presented in this report other than to point out that they both recognize the significant and efficient impact of RLF lending on job creation.

Strengths of the Analysis

This analysis employs a comprehensive approach. It brings together a broad collection of structural change and economic development viewpoints, creating a set of comparable economic structural change measures. The composite index combines positive and negative changes in individual indices and reduces these to a single measure. The analysis is based on sector-specific data, including a sector-specific input-output estimate of indirect effects, and covers 1,032 counties and 23 years of RLF loan activity. This comprehensive approach provides descriptive accuracy that would not be possible with a narrower approach, such as a case study format.

Enhances Future Research

EDA can use the detailed county reports to target specific counties for more in-depth study. Interrelationships among the several indicators of economic structural change might be identified in this way, along with underlying county and loan characteristics that seem to have a bearing on economic structural change. A set of counties with archetypical development experiences might be identified and the results of the present analysis expanded.

Provides Current Policy Insights

The findings provide direction for improving the effectiveness of the EDA RLF loan program. For example, to better achieve economic structural change, loans might be targeted to higher-wage-paying sectors and higher economic stage industries. Similarly, more loans might be given to counties with smaller employment bases. Conversely, a small number of loans targeting traditional sectors in large counties should not be expected to achieve dramatic economic structural change results.

Appendix 1— Methods and Results of an Econometric Analysis

In this report, an econometric model and a pooled cross-section/time-series data set is used to examine the effectiveness of EDA Revolving Loan Fund (RLF) loans in creating new jobs or retaining existing jobs in regional economies. The analysis begins with a description of the data set. From there it moves to the specification of an econometric model, describing some interim model formulations and choosing a preferred model. In a final section, model results and their implications are discussed. Dollar measures in this appendix reflect a 1990 base year. Conversions are made to the last loan year to account for inflation.

Overview

EDA requires RLF grantees to collect data on RLF loans. Rutgers University's CUPR has assembled this information into a large data set, 11,600 loans issued by 426 grantees over a period of 23 years. These loans were made between 1976 and 1998 to applicants in approximately one-third (1,032) of all U.S. counties. The data set includes information on RLF loan amounts, the term of loans, interest rates, and other funds leveraged by the RLF activity.

EDA's cost to conduct the RLF program is the annual federal interest on treasury bills for the period of the outstanding loan. This interest is summed for each loan in a given year and expressed in constant dollars.

The analysis contained in this report involved regressing a time series of total employment data for U.S. counties against a collection of explanatory variables, including the calculated EDA cost of the RLF program in a county for a particular year. The analysis finds significance in the relationship between RLF expenditures and county employment, and provides a multiplier indicating the job creation/retention that might be expected given county attributes and a dollar value of RLF expenditure.

The Data Set

Data on total employment and government employment for 1976 to 1998 are collected for the approximately 3,100 U.S. counties. The regressions use total nongovernment employment as the dependent variable. The principal independent variable is the present value of RLF expenditures. The single-year subsidy is equal to the annual federal treasury interest rate applied to the EDA share of the loan. The present value of the expenditure (i.e., as of the year of loan commencement) is simply the string of single-year expenditures discounted for inflation. For this analysis, an imputed rate of inflation equal to the Consumer Price Index is used.

The analysis included a specific collection of control variables. A single observation on 1983 total employment captures the effect of county size, i.e., the association of large counties and large RLF subsidies. Racial and demographic characteristics are captured by the inclusion of 1990 data on percent urban, percent black, and median housing values (from the 1998

U.S. Counties CD, U.S. Department of Commerce, Bureau of the Census) (see Haughwout 1999). Finally, a dummy variable for each of the 50 states is included to capture other assorted statewide environmental characteristics, and a year dummy variable to shift the model over years.

The Econometric Model

Several econometric formulations were tried before settling on the preferred model structure. A linear model with lagged subsidies was tried, where the *percentage change* in employment was made a function of RLF expenditures in previous years. This formulation had the drawback of truncating data in earlier years to accommodate the model's lagged structure, and the formulation produced statistically insignificant results. A second formulation expressed the log of total county employment as a function of the log of cumulative RLF expenditures. This model was rejected because it indicated a constant elasticity of employment to expenditure, i.e., the percentage change in employment to percentage change in expenditures. A constant elasticity would imply that underlying regional multiplier effects are invariant across counties—contrary to accepted economic base and regional input-output theory.

The preferred formulation is shown in (1), presenting the log of county employment as a linear function of the cumulative RLF expenditures.

$$(1)\quad \ln E_{r,t} = b_0 + b_1 \ln E83_r + b_2 \frac{CS_{r,t}}{E83_r} + \sum_{s=1}^{55} b_s \delta_s + \sum_{\tau=84}^{97} b_\tau \delta_\tau + b_3 HV90_r + b_4 \%Ur90_r + b_5 \%B90_r + b_6 \%Un90_r + \varepsilon_{r,t}$$

where:

r = index of U.S. counties, 1 through 3,100

t = years of the data set used in the regression, 1983 through 1997 (Note that 95 percent of the 11,027 EDA Loans in the data set were granted in or after 1983.)

$E_{r,t}$ = total nongovernment employment in county r in year t

$E83_r$ = total employment in 1983 in county r

$CS_{r,t} = \sum_{t=77}^{t} Expenditure_{r,t}$ = cumulative expenditure in county r as of year t

$HV90_r$ = mean value of housing in county r in 1990

$\%Ur90_r$ = percent of population living in urban areas in county r in 1990

$\%B90_r$ = percent black population in county r in 1990

$\%Un90_r$ = percent unemployment county r in 1990

$$\delta_s = \begin{cases} 1 \text{ if } r \in s \\ 0 \text{ otherwise} \end{cases}$$ that is, one dummy for each state except the first

$$\delta_\tau = \begin{cases} 1 \text{ if } t \in \tau \\ 0 \text{ otherwise} \end{cases}$$ and one dummy for each year except 1983

Variable	Mean	Variable	Mean
E83	8,855	% Urban	36.17
Cumulative Expenditure	$42,746	% Black	8.6
House Value	$53,497	% Unemployment	6.2
Dummy Coefficient	**Mean**	**Dummy Coefficient**	**Mean**
State	0.1424	Year	-0.1483

The ordinary least squares estimates of this model are:

$$(2)\ \ln E_{r,t} = \underset{(4.64)}{-0.05723} + \underset{(923.29)}{1.00658}\ \ln E83_r + \underset{(1.98)}{0.000128}\ \frac{CS_{r,t}}{E83_r} + \sum_{s=1}^{55}\hat{b}_s\delta_s + \sum_{\tau=84}^{97}\hat{b}_\tau\delta_\tau$$

$$+ \underset{(61.26)}{0.0000023}\ HV90_r + \underset{(10.81)}{0.04857}\ \%Ur90_r + \underset{(47.83)}{-0.38184}\ \%B90_r + \underset{(2.46)}{0.06791}\ \%Un90_r$$

where the numbers in parentheses are t statistics. With 46,071 degrees of freedom, the coefficient estimates are all significant at the 95 percent confidence level. The R^2 is 0.9878, indicating that the model fits the data very well.[1]

$$(3)\ \hat{E}_{r,t} = e^{d_0 + b_1 \ln E83_r + b_2 \frac{CS_{r,t}}{E83_r}}$$

where d_0 represents the effects of the intercept, the state and year dummies, and the other explanatory variables:

$$(4)\ d_0 = b_0 + \sum_{s=1}^{55} b_s\delta_s + \sum_{t=84}^{97} b_t\delta_t + b_3 HV83_r + b_4 \%Ur83_r + b_5 \%B83_r + b_6 \%Un83_r + \varepsilon_{r,t}$$

$$(5)\ \frac{\partial \hat{E}_{r,t}}{\partial CS_{r,t}} = b_2 \left. \hat{E}_{r,t} \middle/ E83_r \right. = 0.00014258$$

EDA Implications of the Model Results

How well do these model results conform to expectations and what do they indicate about the performance of the EDA RLF program?

For notational simplicity, the exponential of both sides of model expression is taken in equation (1). The result is a predictor of total nongovernment county employment:

Differentiating (3) with respect to the cumulative expenditure subsidy provides an estimate of RLF performance—the number of jobs created per dollar of EDA expenditure. The estimated regression coefficients and the means of the regression variables and the estimated dummy coefficients are inserted into equations (3) and (5) to compute a value for this derivative at the mean of the data. The resulting estimate of the derivative is 0.00014258. This is the "employment response coefficient" and indicates that for every $10,000 in EDA expenditure, a net of 1.4 jobs are created in that county. After adjustment to a year 2000 price level, this translates to roughly $9,000 per total job, and nearly double that in terms of direct jobs.[2]

[1] Note that much of high R^2 can be attributed to having base year employment as an independent variable.

[2] This is a very severe estimation of costs per job because only the EDA opportunity cost was used to calculate costs and additionally only the net growth of jobs in a county was used to credit job growth. This raises costs and lowers the number of jobs created thus increasing the cost per job.

The value of the employment response coefficient is not a constant, but varies according to the value of the other control variables in the model. For example, differentiating (5) with respect to %Urban provides the following:

$$(6)\quad \frac{\partial^2 \hat{E}_{r,t}}{\partial CS_{r,t}\,\partial \%Ur83_{r,t}} = b_2 b_4 \hat{E}_{r,t} \Big/ E83_r = 0.06925$$

The sign of (6) is that predicted by economic base and regional input-output theory: Urban areas are characterized by greater industrial diversity and self-sufficiency, and these are reflected in increased inter-industry linkages and increased multiplier effects. The results indicate that the 1.4 jobs per $10,000 expenditure figure will be higher by 0.006925 jobs for each 10 percent more urban the county.

Differentiating (5) with respect to %Black provides:

$$(7)\quad \frac{\partial^2 \hat{E}_{r,t}}{\partial CS_{r,t}\,\partial \%Black_{r,t}} = b_2 b_5 \hat{E}_{r,t} \Big/ E83_r = -0.54441$$

The sign of (7) likely mirrors a number of factors related to poverty and even discrimination. Poor families exhibit consumption bundles weighted more heavily in necessities, e.g., food, rent, and utilities. These are more likely associated with imports, and thus with lower in-region economic multiplier effects. On top of the household consumption effect, predominantly black areas have significantly less industry, and this is directly associated with a lower regional multiplier effect. These numbers indicate that the 1.4 jobs per $10,000 subsidy figure will be lower by 0.054441 jobs for each 10 percent more black the county.

Equation (8) shows the partial differentiation of (3) with respect to mean housing value in 1990. The positive effect indicated here reflects the reverse of theoretical principles behind the sign of the partial (7). The results indicate that the 1.4 jobs per $10,000 EDA RLF expenditure will be higher by 0.03244 jobs for each $10,000 higher the average housing value in the county.

$$(8)\quad \frac{\partial^2 \hat{E}_{r,t}}{\partial CS_{r,t}\,\partial \%HV90_{r,t}} = b_2 b_3 \hat{E}_{r,t} \Big/ E83_r = 0.000003244$$

One would also expect the unemployment rate to be an important determinant of the effects of EDA subsidies. Equation (9) shows that the 1.4 jobs per $10,000 EDA expenditure figure will be higher by 0.096825 jobs for each 1 percent higher the unemployment rate in the county.

$$(9)\quad \frac{\partial^2 \hat{E}_{r,t}}{\partial CS_{r,t}\,\partial \%Un83_{r,t}} = b_2 b_6 \hat{E}_{r,t} \Big/ E83_r = 0.096825$$

The change in (3) with respect to employment in 1983 is intended as a measure of the effect of size of place. The derivative of (3) with respect to $E83_r$ is a rather complex equation because of the way $E83_r$ enters twice into the equation, once as a log equation, and once in the denominator:

$$(10)\quad \frac{\partial^2 \hat{E}_{r,t}}{\partial CS_{r,t}\,\partial \%E83_r} = b_2 \frac{\hat{E}'_{r,t} E83_r - E83'_r \hat{E}_{r,t}}{E83_r^{\,2}}$$

$$= b_2 \frac{\left(\frac{b_1}{E83_r} - \frac{b^2 CS_{r,t}}{E83_r^{\,2}}\right)\hat{E}_{r,t} E83_r - \hat{E}_{r,t}}{E83^2}$$

$$= b_2 \frac{\left(\left(b_1 - \frac{b^2 CS_{r,t}}{E83_r}\right) - 1\right)\hat{E}_{r,t}}{E83_r^{\,2}} = 0.0000009592$$

Derivative (10) indicates that, other things equal, larger county economies generate larger RLF multiplier effects. The 1.4 jobs per $10,000 EDA expenditure is higher by 0.000960 jobs for each 1,000 more employment in the county. This agrees with economic base and regional input-output theory, which also suggest that as county size increases, so too does the diversity of industry and the depth of interindustry linkages, and these are reflected in larger multiplier effects.

Appendix 2— Economic Stage Sectors

Classification Definitions

Primary: Primary industry

Secn-1: Secondary industry 1, process manufacturing

Secn-2: Secondary industry 2, fabricative manufacturing limited to traditional industrial-age products

Secn-3: Secondary industry 3, fabricative manufacturing limited to electronic and computer-related products

Tert-1: Tertiary industry 1, consumer-oriented services

Tert-2: Tertiary industry 2, producer-oriented services

IMPLAN Sector Number	Stage Index Classification	IMPLAN Sector Name
1	Primary	Dairy Farm Products
2	Primary	Poultry and Eggs
3	Primary	Ranch Fed Cattle
4	Primary	Range Fed Cattle
5	Primary	Cattle Feedlots
6	Primary	Sheep, Lambs and Goats
7	Primary	Hogs, Pigs and Swine
8	Primary	Other Meat Animal Products
9	Primary	Miscellaneous Livestock
10	Primary	Cotton
11	Primary	Food Grains
12	Primary	Feed Grains
13	Primary	Hay and Pasture
14	Primary	Grass Seeds
15	Primary	Tobacco
16	Primary	Fruits
17	Primary	Tree Nuts
18	Primary	Vegetables
19	Primary	Sugar Crops
20	Primary	Miscellaneous Crops
21	Primary	Oil Bearing Crops
22	Primary	Forest Products
23	Primary	Greenhouse and Nursery Products
24	Primary	Forestry Products
25	Primary	Commercial Fishing
28	Primary	Iron Ores
29	Primary	Copper Ores
30	Primary	Lead and Zinc Ores
31	Primary	Gold Ores
32	Primary	Silver Ores
33	Primary	Ferroalloy Ores, Except Vanadium
35	Primary	Uranium-radium-vanadium Ores
36	Primary	Metal Ores, NEC
37	Primary	Coal Mining
38	Primary	Natural Gas & Crude Petroleum
39	Primary	Natural Gas Liquids
40	Primary	Dimension Stone
41	Primary	Sand and Gravel
42	Primary	Clay, Ceramic, Refractory Minerals, NEC
43	Primary	Potash, Soda, and Borate Minerals
44	Primary	Phosphate Rock
45	Primary	Chemical, Fertilizer Mineral Mining, NEC
46	Primary	Nonmetallic Minerals (Except Fuels) Service
47	Primary	Misc Nonmetallic Minerals, NEC
58	Secn-1	Meat Packing Plants
59	Secn-1	Sausages and Other Prepared Meats
60	Secn-1	Poultry Processing
61	Secn-1	Creamery Butter
65	Secn-1	Fluid Milk
66	Secn-1	Canned Specialties
67	Secn-1	Canned Fruits and Vegetables
70	Secn-1	Frozen Fruits, Juices and Vegetables
71	Secn-1	Frozen Specialties
72	Secn-1	Flour and Other Grain Mill Products
74	Secn-1	Rice Milling
76	Secn-1	Wet Corn Milling
77	Secn-1	Dog, Cat, and Other Pet Food
78	Secn-1	Prepared Feeds, NEC
81	Secn-1	Sugar
85	Secn-1	Salted and Roasted Nuts & Seeds
86	Secn-1	Cottonseed Oil Mills
87	Secn-1	Soybean Oil Mills
88	Secn-1	Vegetable Oil Mills, NEC
89	Secn-1	Animal and Marine Fats and Oils

IMPLAN Sector Number	Stage Index Classification	IMPLAN Sector Name
90	Secn-1	Shortening and Cooking Oils
91	Secn-1	Malt Beverages
92	Secn-1	Malt
93	Secn-1	Wines, Brandy, and Brandy Spirits
97	Secn-1	Canned and Cured Sea Foods
98	Secn-1	Prepared Fresh or Frozen Fish or Seafood
99	Secn-1	Roasted Coffee
100	Secn-1	Potato Chips & Similar Snacks
101	Secn-1	Manufactured Ice
104	Secn-1	Cigarettes
105	Secn-1	Cigars
106	Secn-1	Chewing and Smoking Tobacco
107	Secn-1	Tobacco Stemming and Redrying
108	Secn-1	Broadwoven Fabric Mills and Finishing
109	Secn-1	Narrow Fabric Mills
133	Secn-1	Logging Camps and Logging Contractors
134	Secn-1	Sawmills and Planing Mills, General
161	Secn-1	Pulp Mills
162	Secn-1	Paper Mills, Except Building Paper
163	Secn-1	Paperboard Mills
202	Secn-1	Nitrogenous and Phosphatic Fertilizers
203	Secn-1	Fertilizers, Mixing Only
235	Secn-1	Clay Refractories
244	Secn-1	Ready-mixed Concrete
245	Secn-1	Lime
246	Secn-1	Gypsum Products
247	Secn-1	Cut Stone and Stone Products
250	Secn-1	Minerals, Ground or Treated
251	Secn-1	Mineral Wool
254	Secn-1	Blast Furnaces and Steel Mills
255	Secn-1	Electrometallurgical Products
259	Secn-1	Iron and Steel Foundries
260	Secn-1	Primary Copper
261	Secn-1	Primary Aluminum
262	Secn-1	Primary Nonferrous Metals, NEC
263	Secn-1	Secondary Nonferrous Metals
264	Secn-1	Copper Rolling and Drawing
265	Secn-1	Aluminum Rolling and Drawing
266	Secn-1	Nonferrous Rolling and Drawing, NEC
267	Secn-1	Nonferrous Wire Drawing and Insulating
268	Secn-1	Aluminum Foundries
269	Secn-1	Brass, Bronze, and Copper Foundries
270	Secn-1	Nonferrous Castings, NEC
62	Secn-2	Cheese, Natural and Processed
63	Secn-2	Condensed and Evaporated Milk
64	Secn-2	Ice Cream and Frozen Desserts
68	Secn-2	Dehydrated Food Products
69	Secn-2	Pickles, Sauces, and Salad Dressings
73	Secn-2	Cereal Preparations
75	Secn-2	Blended and Prepared Flour
79	Secn-2	Bread, Cake, and Related Products
80	Secn-2	Cookies and Crackers
82	Secn-2	Confectionery Products
83	Secn-2	Chocolate and Cocoa Products
84	Secn-2	Chewing Gum
94	Secn-2	Distilled Liquor, Except Brandy
95	Secn-2	Bottled and Canned Soft Drinks & Water
96	Secn-2	Flavoring Extracts and Syrups, NEC
102	Secn-2	Macaroni and Spaghetti
103	Secn-2	Food Preparations, NEC
110	Secn-2	Women's Hosiery, Except Socks
111	Secn-2	Hosiery, NEC
112	Secn-2	Knit Outerwear Mills
113	Secn-2	Knit Underwear Mills
114	Secn-2	Knit Fabric Mills
115	Secn-2	Knitting Mills, NEC
116	Secn-2	Yarn Mills and Finishing of Textiles, NEC
117	Secn-2	Carpets and Rugs
118	Secn-2	Thread Mills
119	Secn-2	Coated Fabrics, Not Rubberized
120	Secn-2	Tire Cord and Fabric
121	Secn-2	Nonwoven Fabrics
122	Secn-2	Cordage and Twine
123	Secn-2	Textile Goods, NEC
124	Secn-2	Apparel Made from Purchased Materials
125	Secn-2	Curtains and Draperies
126	Secn-2	Housefurnishings, NEC
127	Secn-2	Textile Bags
128	Secn-2	Canvas Products
129	Secn-2	Pleating and Stitching
130	Secn-2	Automotive and Apparel Trimmings
131	Secn-2	Schiffi Machine Embroideries
132	Secn-2	Fabricated Textile Products, NEC
135	Secn-2	Hardwood Dimension and Flooring Mills
136	Secn-2	Special Product Sawmills, NEC
137	Secn-2	Millwork
138	Secn-2	Wood Kitchen Cabinets
139	Secn-2	Veneer and Plywood
140	Secn-2	Structural Wood Members, NEC
141	Secn-2	Wood Containers
142	Secn-2	Wood Pallets and Skids
143	Secn-2	Mobile Homes
144	Secn-2	Prefabricated Wood Buildings
145	Secn-2	Wood Preserving
146	Secn-2	Reconstituted Wood Products
147	Secn-2	Wood Products, NEC
148	Secn-2	Wood Household Furniture
149	Secn-2	Upholstered Household Furniture
150	Secn-2	Metal Household Furniture
151	Secn-2	Mattresses and Bedsprings
152	Secn-2	Wood TV and Radio Cabinets
153	Secn-2	Household Furniture, NEC
154	Secn-2	Wood Office Furniture
155	Secn-2	Metal Office Furniture
156	Secn-2	Public Building Furniture
157	Secn-2	Wood Partitions and Fixtures
158	Secn-2	Metal Partitions and Fixtures
159	Secn-2	Blinds, Shades, and Drapery Hardware
160	Secn-2	Furniture and Fixtures, NEC
164	Secn-2	Paperboard Containers and Boxes
165	Secn-2	Paper Coated & Laminated Packaging
166	Secn-2	Paper Coated & Laminated NEC
167	Secn-2	Bags, Plastic
168	Secn-2	Bags, Paper
169	Secn-2	Die-cut Paper and Board
170	Secn-2	Sanitary Paper Products
171	Secn-2	Envelopes
172	Secn-2	Stationery Products
173	Secn-2	Converted Paper Products, NEC
177	Secn-2	Book Printing
179	Secn-2	Commercial Printing
180	Secn-2	Manifold Business Forms

IMPLAN Sector Number	Stage Index Classification	IMPLAN Sector Name
181	Secn-2	Greeting Card Publishing
182	Secn-2	Blankbooks and Looseleaf Binder
183	Secn-2	Bookbinding & Related
184	Secn-2	Typesetting
185	Secn-2	Plate Making
186	Secn-2	Alkalies & Chlorine
187	Secn-2	Industrial Gases
188	Secn-2	Inorganic Pigments
189	Secn-2	Inorganic Chemicals, NEC
190	Secn-2	Cyclic Crudes, Interm & Indus Organic Chem
191	Secn-2	Plastics Materials and Resins
192	Secn-2	Synthetic Rubber
193	Secn-2	Cellulosic Man-made Fibers
194	Secn-2	Organic Fibers, Noncellulosic
196	Secn-2	Soap and Other Detergents
197	Secn-2	Polishes and Sanitation Goods
198	Secn-2	Surface Active Agents
199	Secn-2	Toilet Preparations
200	Secn-2	Paints and Allied Products
201	Secn-2	Gum and Wood Chemicals
204	Secn-2	Agricultural Chemicals, NEC
205	Secn-2	Adhesives and Sealants
206	Secn-2	Explosives
207	Secn-2	Printing Ink
208	Secn-2	Carbon Black
209	Secn-2	Chemical Preparations, NEC
210	Secn-2	Petroleum Refining
211	Secn-2	Paving Mixtures and Blocks
212	Secn-2	Asphalt Felts and Coatings
213	Secn-2	Lubricating Oils and Greases
214	Secn-2	Petroleum and Coal Products, NEC
215	Secn-2	Tires and Inner Tubes
216	Secn-2	Rubber and Plastics Footwear
217	Secn-2	Rubber and Plastics Hose and Belting
218	Secn-2	Gaskets, Packing and Sealing Devices
219	Secn-2	Fabricated Rubber Products, NEC
220	Secn-2	Miscellaneous Plastics Products
221	Secn-2	Leather Tanning and Finishing
222	Secn-2	Footwear Cut Stock
223	Secn-2	House Slippers
224	Secn-2	Shoes, Except Rubber
225	Secn-2	Leather Gloves and Mittens
226	Secn-2	Luggage
227	Secn-2	Women's Handbags and Purses
228	Secn-2	Personal Leather Goods
229	Secn-2	Leather Goods, NEC
230	Secn-2	Glass and Glass Products, Exc Containers
231	Secn-2	Glass Containers
232	Secn-2	Cement, Hydraulic
233	Secn-2	Brick and Structural Clay Tile
234	Secn-2	Ceramic Wall and Floor Tile
236	Secn-2	Structural Clay Products, NEC
237	Secn-2	Vitreous Plumbing Fixtures
238	Secn-2	Vitreous China Food Utensils
239	Secn-2	Fine Earthenware Food Utensils
240	Secn-2	Porcelain Electrical Supplies
241	Secn-2	Pottery Products, NEC
242	Secn-2	Concrete Block and Brick
243	Secn-2	Concrete Products, NEC
248	Secn-2	Abrasive Products
249	Secn-2	Asbestos Products
252	Secn-2	Nonclay Refractories
253	Secn-2	Nonmetallic Mineral Products, NEC
256	Secn-2	Steel Wire and Related Products
257	Secn-2	Cold Finishing of Steel Shapes
258	Secn-2	Steel Pipe and Tubes
271	Secn-2	Metal Heat Treating
272	Secn-2	Primary Metal Products, NEC
273	Secn-2	Metal Cans
274	Secn-2	Metal Barrels, Drums and Pails
275	Secn-2	Cutlery
276	Secn-2	Hand and Edge Tools, NEC
277	Secn-2	Hand Saws and Saw Blades
278	Secn-2	Hardware, NEC
279	Secn-2	Metal Sanitary Ware
280	Secn-2	Plumbing Fixture Fittings and Trim
281	Secn-2	Heating Equipment, Except Electric
282	Secn-2	Fabricated Structural Metal
283	Secn-2	Metal Doors, Sash, and Trim
284	Secn-2	Fabricated Plate Work (Boiler Shops)
285	Secn-2	Sheet Metal Work
286	Secn-2	Architectural Metal Work
287	Secn-2	Prefabricated Metal Buildings
288	Secn-2	Miscellaneous Metal Work
289	Secn-2	Screw Machine Products and Bolts, Etc
290	Secn-2	Iron and Steel Forgings
291	Secn-2	Nonferrous Forgings
292	Secn-2	Automotive Stampings
293	Secn-2	Crowns and Closures
294	Secn-2	Metal Stampings, NEC
295	Secn-2	Plating and Polishing
296	Secn-2	Metal Coating and Allied Services
297	Secn-2	Small Arms Ammunition
298	Secn-2	Ammunition, Except for Small Arms, NEC
299	Secn-2	Small Arms
300	Secn-2	Other Ordnance and Accessories
301	Secn-2	Industrial and Fluid Valves
302	Secn-2	Steel Springs, Except Wire
303	Secn-2	Pipe, Valves, and Pipe Fittings
304	Secn-2	Miscellaneous Fabricated Wire Products
305	Secn-2	Metal Foil and Leaf
306	Secn-2	Fabricated Metal Products, NEC
307	Secn-2	Steam Engines and Turbines
308	Secn-2	Internal Combustion Engines, NEC
309	Secn-2	Farm Machinery and Equipment
310	Secn-2	Lawn and Garden Equipment
311	Secn-2	Construction Machinery and Equipment
312	Secn-2	Mining Machinery, Except Oil Field
313	Secn-2	Oil Field Machinery
314	Secn-2	Elevators and Moving Stairways
315	Secn-2	Conveyors and Conveying Equipment
316	Secn-2	Hoists, Cranes, and Monorails
317	Secn-2	Industrial Trucks and Tractors
318	Secn-2	Machine Tools, Metal Cutting Types
319	Secn-2	Machine Tools, Metal Forming Types
320	Secn-2	Industrial Patterns
321	Secn-2	Special Dies and Tools and Accessories
322	Secn-2	Power Driven Hand Tools
323	Secn-2	Rolling Mill Machinery
324	Secn-2	Welding Apparatus
325	Secn-2	Metalworking Machinery, NEC
326	Secn-2	Textile Machinery

IMPLAN Sector Number	Stage Index Classification	IMPLAN Sector Name
327	Secn-2	Woodworking Machinery
328	Secn-2	Paper Industries Machinery
329	Secn-2	Printing Trades Machinery
330	Secn-2	Food Products Machinery
331	Secn-2	Special Industry Machinery NEC
332	Secn-2	Pumps and Compressors
333	Secn-2	Ball and Roller Bearings
334	Secn-2	Blowers and Fans
335	Secn-2	Packaging Machinery
336	Secn-2	Power Transmission Equipment
337	Secn-2	Industrial Furnaces and Ovens
338	Secn-2	General Industrial Machinery, NEC
344	Secn-2	Typewriters and Office Machines NEC
345	Secn-2	Automatic Merchandising Machine
346	Secn-2	Commercial Laundry Equipment
347	Secn-2	Refrigeration and Heating Equipment
348	Secn-2	Measuring and Dispensing Pumps
349	Secn-2	Service Industry Machines, NEC
350	Secn-2	Carburetors, Pistons, Rings, Valves
351	Secn-2	Fluid Power Cylinders & Actuators
352	Secn-2	Fluid Power Pumps & Motors
353	Secn-2	Scales and Balances
354	Secn-2	Industrial Machines NEC
355	Secn-2	Transformers
356	Secn-2	Switchgear and Switchboard Apparatus
357	Secn-2	Motors and Generators
358	Secn-2	Carbon and Graphite Products
359	Secn-2	Relays & Industrial Controls
360	Secn-2	Electrical Industrial Apparatus, NEC
361	Secn-2	Household Cooking Equipment
362	Secn-2	Household Refrigerators and Freezers
363	Secn-2	Household Laundry Equipment
364	Secn-2	Electric Housewares and Fans
365	Secn-2	Household Vacuum Cleaners
366	Secn-2	Household Appliances, NEC
367	Secn-2	Electric Lamps
368	Secn-2	Wiring Devices
369	Secn-2	Lighting Fixtures and Equipment
370	Secn-2	Radio and TV Receiving Sets
371	Secn-2	Phonograph Records and Tape
372	Secn-2	Telephone and Telegraph Apparatus
373	Secn-2	Radio and TV Communication Equipment
374	Secn-2	Communications Equipment NEC
375	Secn-2	Electron Tubes
379	Secn-2	Storage Batteries
380	Secn-2	Primary Batteries, Dry and Wet
381	Secn-2	Engine Electrical Equipment
382	Secn-2	Magnetic & Optical Recording Media
383	Secn-2	Electrical Equipment, NEC
384	Secn-2	Motor Vehicles
385	Secn-2	Truck and Bus Bodies
386	Secn-2	Motor Vehicle Parts and Accessories
387	Secn-2	Truck Trailers
388	Secn-2	Motor Homes
389	Secn-2	Aircraft
390	Secn-2	Aircraft and Missile Engines and Parts
391	Secn-2	Aircraft and Missile Equipment
392	Secn-2	Ship Building and Repairing
393	Secn-2	Boat Building and Repairing
394	Secn-2	Railroad Equipment
395	Secn-2	Motorcycles, Bicycles, and Parts
396	Secn-2	Complete Guided Missiles
397	Secn-2	Travel Trailers and Campers
398	Secn-2	Tanks and Tank Components
399	Secn-2	Transportation Equipment, NEC
400	Secn-2	Search & Navigation Equipment
401	Secn-2	Laboratory Apparatus & Furniture
402	Secn-2	Automatic Temperature Controls
403	Secn-2	Mechanical Measuring Devices
404	Secn-2	Instruments to Measure Electricity
405	Secn-2	Analytical Instruments
406	Secn-2	Optical Instruments & Lenses
407	Secn-2	Surgical and Medical Instruments
408	Secn-2	Surgical Appliances and Supplies
409	Secn-2	Dental Equipment and Supplies
410	Secn-2	X-Ray Apparatus
411	Secn-2	Electromedical Apparatus
412	Secn-2	Ophthalmic Goods
413	Secn-2	Photographic Equipment and Supplies
414	Secn-2	Watches, Clocks, and Parts
415	Secn-2	Jewelry, Precious Metal
416	Secn-2	Silverware and Plated Ware
417	Secn-2	Jewelers Materials and Lapidary Work
418	Secn-2	Musical Instruments
419	Secn-2	Dolls
420	Secn-2	Games, Toys, and Children's Vehicles
421	Secn-2	Sporting and Athletic Goods, NEC
422	Secn-2	Pens and Mechanical Pencils
423	Secn-2	Lead Pencils and Art Goods
424	Secn-2	Marking Devices
425	Secn-2	Carbon Paper and Inked Ribbons
426	Secn-2	Costume Jewelry
427	Secn-2	Fasteners, Buttons, Needles, Pins
428	Secn-2	Brooms and Brushes
429	Secn-2	Signs and Advertising Displays
430	Secn-2	Burial Caskets and Vaults
431	Secn-2	Hard Surface Floor Coverings
432	Secn-2	Manufacturing Industries, NEC
518	Secn-2	Used and Secondhand Goods
195	Secn-2	Drugs
339	Secn-3	Electronic Computers
340	Secn-3	Computer Storage Devices
341	Secn-3	Computer Terminals
342	Secn-3	Computer Peripheral Equipment
343	Secn-3	Calculating and Accounting Machines
376	Secn-3	Printed Circuit Boards
377	Secn-3	Semiconductors and Related Devices
378	Secn-3	Electronic Components, NEC
26	Tert-1	Agricultural, Forestry, Fishery Services
27	Tert-1	Landscape and Horticultural Services
34	Tert-1	Metal Mining Services
48	Tert-1	New Residential Structures
49	Tert-1	New Industrial and Commercial Buildings
50	Tert-1	New Utility Structures
51	Tert-1	New Highways and Streets
52	Tert-1	New Farm Structures
53	Tert-1	New Mineral Extraction Facilities
54	Tert-1	New Government Facilities
55	Tert-1	Maintenance and Repair, Residential
56	Tert-1	Maintenance and Repair, Other Facilities
57	Tert-1	Maintenance and Repair, Oil and Gas Wells
433	Tert-1	Railroads and Related Services
434	Tert-1	Local, Interurban Passenger Transit
435	Tert-1	Motor Freight Transport and Warehousing

IMPLAN Sector Number	Stage Index Classification	IMPLAN Sector Name
436	Tert-1	Water Transportation
438	Tert-1	Pipe Lines, Except Natural Gas
439	Tert-1	Arrangement of Passenger Transportation
440	Tert-1	Transportation Services
443	Tert-1	Electric Services
444	Tert-1	Gas Production and Distribution
445	Tert-1	Water Supply and Sewerage Systems
446	Tert-1	Sanitary Services and Steam Supply
447	Tert-1	Wholesale Trade
448	Tert-1	Building Materials & Gardening
449	Tert-1	General Merchandise Stores
450	Tert-1	Food Stores
451	Tert-1	Automotive Dealers & Service Stations
452	Tert-1	Apparel & Accessory Stores
453	Tert-1	Furniture & Home Furnishings Stores
454	Tert-1	Eating & Drinking
455	Tert-1	Miscellaneous Retail
456	Tert-1	Banking
457	Tert-1	Credit Agencies
458	Tert-1	Security and Commodity Brokers
460	Tert-1	Insurance Agents and Brokers
461	Tert-1	Owner-occupied Dwellings
462	Tert-1	Real Estate
463	Tert-1	Hotels and Lodging Places
464	Tert-1	Laundry, Cleaning and Shoe Repair
465	Tert-1	Portrait and Photographic Studios
466	Tert-1	Beauty and Barber Shops
467	Tert-1	Funeral Service and Crematories
468	Tert-1	Miscellaneous Personal Services
470	Tert-1	Other Business Services
471	Tert-1	Photofinishing, Commercial Photography
472	Tert-1	Services to Buildings
473	Tert-1	Equipment Rental and Leasing
474	Tert-1	Personnel Supply Services
476	Tert-1	Detective and Protective Services
477	Tert-1	Automobile Rental and Leasing
478	Tert-1	Automobile Parking and Car Wash
479	Tert-1	Automobile Repair and Services
480	Tert-1	Electrical Repair Service
481	Tert-1	Watch, Clock, Jewelry and Furniture Repair
482	Tert-1	Miscellaneous Repair Shops
483	Tert-1	Motion Pictures
484	Tert-1	Theatrical Producers, Bands, Etc.
485	Tert-1	Bowling Alleys and Pool Halls
486	Tert-1	Commercial Sports Except Racing
487	Tert-1	Racing and Track Operation
488	Tert-1	Amusement and Recreation Services, NEC
489	Tert-1	Membership Sports and Recreation Clubs
490	Tert-1	Doctors and Dentists
491	Tert-1	Nursing and Protective Care
492	Tert-1	Hospitals
493	Tert-1	Other Medical and Health Services
494	Tert-1	Legal Services
495	Tert-1	Elementary and Secondary Schools
499	Tert-1	Child Day Care Services
500	Tert-1	Social Services, NEC
501	Tert-1	Residential Care
502	Tert-1	Other Nonprofit Organizations
503	Tert-1	Business Associations
504	Tert-1	Labor and Civic Organizations
505	Tert-1	Religious Organizations
507	Tert-1	Accounting, Auditing and Bookkeeping
510	Tert-1	Local Government Passenger Transit
511	Tert-1	State and Local Electric Utilities
512	Tert-1	Other State and Local Govt Enterprises
513	Tert-1	U S Postal Service
514	Tert-1	Federal Electric Utilities
515	Tert-1	Other Federal Government Enterprises
523	Tert-1	State & Local Government - Noneducation
174	Tert-2	Newspapers
175	Tert-2	Periodicals
176	Tert-2	Book Publishing
178	Tert-2	Miscellaneous Publishing
437	Tert-2	Air Transportation
441	Tert-2	Communications, Except Radio and TV
442	Tert-2	Radio and TV Broadcasting
459	Tert-2	Insurance Carriers
469	Tert-2	Advertising
475	Tert-2	Computer and Data Processing Services
496	Tert-2	Colleges, Universities, Schools
497	Tert-2	Other Educational Services
498	Tert-2	Job Training & Related Services
506	Tert-2	Engineering, Architectural Services
508	Tert-2	Management and Consulting Services
509	Tert-2	Research, Development & Testing Services
522	Tert-2	State & Local Government - Education
519	Tert-2	Federal Government - Military
520	Tert-2	Federal Government - Nonmilitary

Appendix 3—Location-Quotient Approach for Estimating Import Dependence

Location quotients (LQs) are commonly used to determine the export and import orientation of regions. LQs are calculated formed on the basis of regional and national employment. A LQ estimate of regional requirements for a given commodity i is given as follows:

$$(1) \quad R_i = \frac{E_i^N}{E^N} E^R$$

where

R_i = regional requirements expressed in terms of annual jobs
E_i^N = national employment in sector i
E^N = total national employment
E^R = total regional employment

An export orientation in commodity i is indicated when

$$(2) \quad R_i < E_i^R$$

and an approximate estimate of regional exports is given by

$$(3) \quad X_i^R = \begin{cases} E_i^R - R_i \; if > 0 \\ 0 \; otherwise \end{cases},$$

where

X_i^R = regional exports of commodity i, expressed in terms of annual jobs.

Alternatively, an import orientation in commodity i is indicated when

$$(4) \quad R_i > E_i^R,$$

and an approximate estimate of regional imports is given by

$$(5) \quad M_i^R = \begin{cases} R_i - E_i^R \; if > 0 \\ 0 \; otherwise \end{cases},$$

where

M_i^R = regional imports of commodity i, expressed in terms of annual jobs.

Regional exports and imports estimated in accordance with (3) and (5) entail a collection of occasionally extreme simplifying assumptions, see for example Isserman (1980).

The import-dependence index appearing in the tables and in the main body of this report are computed as follows:

$$(6) \quad import - dependence \; index = \frac{\sum_i M_i^R}{\sum_i R_i}$$

where summations range across all sectors i in the county.

Import-dependence indices as calculated in accordance with (6) are estimated after and before EDA RLF loans and compared.

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Research Team and Acknowledgments

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Dr. Burchell has served as principal or co-principal investigator on more than 60 research contracts in a 30-year career at Rutgers University. He has conducted studies for the Federal Transit Administration, the U.S. Department of Agriculture, Fannie Mae, the U.S. Department of Housing and Urban Development, and other federal, state, and local agencies. For the last five years, his work has been concentrated in the areas of economic impacts and costs of infrastructure development.

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Dr. Robison brings nearly 20 years of experience in applied regional modeling to the project; he led the effort to assess the impact of EDA RLF loans on economic structural change. As principal of Economic Modeling Specialists, Inc. (EMSI), Robison has conducted a wide array of economic impact assessments in the areas of state and federal land management planning, transportation planning, and public-sector cost-benefit analysis. His professional publications focus on the estimation of regional economic impacts and their applications to public policy.

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Dr. Hamilton led the econometric effort contained in this report, designing the model and supervising of the analysis. He is Professor of Agricultural Economics at the University of Idaho, where he has taught graduate-level econometrics for more than 25 years. He is widely published in the area of economic impact assessment and public policy, and has twice testified as an expert witness on economic impacts in cases under the jurisdiction of the U.S. Supreme Court.

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William R. Dolphin is a computer specialist at Rutgers University's CUPR. He has been the programmer and database manager at CUPR and its predecessor organization for close to 35 years. Mr. Dolphin has developed and overseen the modeling efforts for numerous impact evaluations of alternative growth patterns conducted by Rutgers University in New Jersey, South Carolina, Delaware, Michigan, Maryland, Kentucky, and Florida.

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Dahk Muhammad is a research associate at the CUPR. She was responsible for assembling the document.

Research Organizations

Center for Urban Policy Research (CUPR), Edward J. Bloustein School of Planning and Public Policy, Rutgers University.

For nearly three decades, CUPR has conducted a broad spectrum of urban research. In particular, CUPR has concentrated its efforts in the analysis of infrastructure, public finance, economic impacts and forecasting, land use, environmental policy, and geographic information systems.

CUPR has undertaken economic impact and infrastructure studies for the National Academy of Sciences, the National Trust for Historic Preservation, the Environmental Protection Agency, the New York Metropolitan Transportation Commission, the states of South Carolina and New Jersey, the Southeast Michigan Council of Governments, and the North Jersey Transportation Planning Authority.

Economic Modeling Specialists Incorporated (EMSI)

EMSI is a consulting firm specializing in regional economic modeling and analysis. EMSI has constructed semi-survey economic models in a variety of settings from small rural communities to large, and interconnected multistate regions. EMSI has analyzed issues pertaining to energy and natural resource policy, transportation policy, fiscal impacts, and firm siting, and a wide variety of issues pertaining to regional economic development and land-management planning. EMSI's clients have included the states of Hawaii, Utah, and Idaho; the U.S. Forest Service; the U.S. Department of the Interior; county and city governments; and private firms.

Independent Consultants

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Note: The individual county profiles appearing on pages 69 through 340 of the printed report have been omitted from this PDF version in order to facilitate downloading of the remaining general portions that would be of interest to most readers. Limited quantities of the printed report are available from EDA.