ECONOMIC AND JOB CREATION ANALYSIS OF 2012 RTP/SCS

REGIONAL TRANSPORTATION PLAN
2012–2035 RTP
SUSTAINABLE COMMUNITIES STRATEGY
Towards a Sustainable Future

Southern California Association of Governments

DRAFT DECEMBER 2011

ECONOMIC AND JOB CREATION ANALYSIS OF 2012 RTP/SCS

Executive Summary **1**

Introduction 1

Southern California Economic Challenges 2

Economic Impact of SCAG's Policies and Strategies 3

Goods Movement, The Economy and Southern California's Transportation System 3

Project Expenditures – Mapping the RTP's Investment Plan 5

Methods 5

Long Term Impacts & Efficiency Improvements 7

How Transportation Improves Economic Competitiveness 8

References 10

Economic Advisors: *Wallace Walrod, PhD, Christine Cooper, PhD, John Husing, PhD and Marlon Boarnet, PhD*

Southern California's transportation infrastructure paves the way for economic recovery and job creation.

Executive Summary

Never before have the crucial linkages and interrelationships between the economy, the regional transportation system, and land use been as important as now. For the first time, the 2012 SCAG RTP includes a significant consideration of the economic impacts and opportunities provided by the transportation infrastructure plan set forth in the 2012 RTP, considering not only the economic and job creation impacts of the direct investment in transportation infrastructure, but also the efficiency gains in terms of worker and business economic productivity and goods movement. The 2012 RTP outlines a transportation infrastructure investment strategy that will beneficially impact Southern California, the state, and the nation in terms of economic development, competitive advantage, and overall competitiveness in the global economy in terms of attracting and retaining employers in the Southern California region.

Implementation of SCAG's RTP will create or sustain jobs today to build transportation infrastructure projects for tomorrow. SCAG's 2012 RTP totaling more than $500 billion in transportation investments will put thousands of Southern Californian's back to work in much needed jobs, not only in construction, but in a broad cross-section of industry clusters. Over the twenty-five year period, the plan will generate 4.2 million total jobs in the six-county region, or an annual average of 167,900. In addition, the rest of the state of California will benefit from spillover impacts of an additional 237,700 annual jobs, and an additional 306,500 annual jobs will accrue to other states.

The Goods Movement, Logistics & Distribution, Tourism, Manufacturing, and many other transportation reliant sectors, are heavily dependent on efficient transportation infrastructure and are key Southern California job generators for all six SCAG-region counties. Reductions in congestion also have a positive impact on regional employment and gross regional product (or output). A 10 percent reduction in travel time in the region produces 132,000 new annual jobs from 2012 through 2035, according to the REMI modeling. Without making the investments in Southern California's transportation system outlined in this plan, economic recovery and job creation will be markedly slower throughout the region. Longer term, failure to make sufficient regional transportation investments will cost Southern California economically and the region's business competitiveness will be at risk.

Introduction

Never before have the crucial linkages and interrelationships between the economy, regional transportation system, and land use been as apparent or important as now. For the first time, the 2012 SCAG RTP includes a significant consideration of the economic impacts and opportunities provided by the transportation infrastructure plan set forth in the 2012 RTP, specifically considering not only the economic and job creation impacts of the direct investment in transportation infrastructure, but also the efficiency gains in terms of worker and business economic productivity and goods movement. The Goods Movement, Logistics & Distribution, Tourism, Manufacturing, and many other transportation reliant sectors are heavily dependent on efficient transportation infrastructure and are key Southern California job generators for all six SCAG-region counties. To illustrate this, later in this chapter we drill down on the Goods Movement sector's importance to the SCAG region economy. Also, the 2012 RTP outlines a transportation infrastructure investment strategy that will beneficially impact Southern California, the state, and the nation in terms of economic development, competitive advantage, and overall competitiveness in the global economy in terms of attracting and retaining employers in the Southern California region.

During the 2007–2009 time period, the nation experienced the deepest and longest recession since the 1930's. Two years after the recession was officially determined to have ended, almost 14 million Americans are still out of work, including more than 6 million who have been jobless for over six months. Job seekers outnumber available jobs by more than four-to-one. Most economists forecast that the nation will not generate enough jobs to return the unemployment to 5 percent until the end of 2018, possibly 2020.

California has been hit even harder, enduring a jobs crisis not seen since the Great Depression. As the epicenter of the subprime mortgage industry and housing bubble,

California entered the Great Recession earlier than most states, suffers from the second highest unemployment rate in the country behind only Nevada, and is in the midst of one of the slowest economic and job recoveries in the nation. According to the state Employment Development Department (EDD), over 2 million Californians are officially unemployed, and the real number is likely much higher. California has 988,000 people who have been unemployed more than six months, with the majority of those out of work a year or longer.

Southern California Economic Challenges

In Southern California, job losses have been devastating. In the 6-county SCAG region, over 1 million residents are officially unemployed and the real unemployment rate is much higher. As of October 2011, unemployment levels for the 6 county SCAG region are as follows:

Imperial County	28.9%
Los Angeles County	11.9%
Orange County	8.5%
Riverside County	13.7%
San Bernardino County	12.8%
Ventura County	9.8%

Source: California Employment Development Department

Several factors have driven Southern California's slower growth coming out of the 2007–2009 recession:

- Housing markets are not rebounding due to the overhang of foreclosures, "shadow inventory," and weak demand. UCLA economists recently predicted that Southern California home prices will not reach previous peaks until the 2017–2020 time period
- Rising oil prices
- End of federal stimulus programs
- The prospect of Government layoffs

Muted demand from Southern California consumers (consumer spending represents at least two-thirds of economic activity) who are still worried about their individual employment, home values, and financial situations.

The consequences of the Great Recession have battered the Southern California economy and impacted major economic sectors which traditionally have been key job generators throughout the SCAG region:

- Construction, finance and insurance, and management; and the professional and business services group performed much worse than the nation.
- Manufacturing and employment agencies had large absolute declines, but their percentage job losses were only a little larger than the nation.
- The large logistics sector lost a significant number of jobs but that represented only a single digit percentage decrease.

Recovery has been slow and uneven through the SCAG region, resulting in both short and long term economic challenges facing Southern California.

- Significant job losses
- High unemployment rates
- Declining incomes
- Increased poverty

Most local and regional economic forecasts such as LAEDC, UCLA, Cal State Long Beach, Cal State Fullerton, and other leading institutions, do not project significant local/regional job growth until at least the 2014–2015 time period, and some particularly hard hit areas of Southern California will likely remain under economic pressure until the end of the decade.

Many ask when recovery finally takes hold, where will Southern California's jobs likely come from?

Implementation of SCAG's RTP will create or sustain jobs today to build transportation infrastructure projects for tomorrow. SCAG's 2012 RTP totaling over $500 billion in transportation investments will put thousands of Southern Californian's back to work in much needed jobs, not only in construction, but in a broad cross-section of industry clusters highlighted later in this chapter. Without making the investments in Southern California's

transportation system outlined in this plan, economic recovery and job creation will be markedly slower throughout the region. Longer term, failure to make sufficient regional transportation investments will cost Southern California economically and the region's business competitiveness will be at risk.

As of November 2011, the SCAG region is home to approximately 18 million people, and supplies nearly 7.75 million jobs—making the SCAG region California's largest population and economic center. Between now and 2035, SCAG forecasts project that job growth will increase nearly 1.2 percent a year, outpacing the rate of population growth over the same period. The SCAG region will grow to 22.1 million people by 2035, a 22.3 percent increase from 2010, or an average of 0.9 percent growth a year. Employment will grow to 9.4 million jobs by 2035, a 30.6 percent increase from 2010.

Economic Impact of SCAG's Policies and Strategies

As implementation of the 2012 RTP involves large financial investments in the region's transportation infrastructure, it has become increasingly important to understand both the short and long economic impacts that the plan will have on the SCAG region. Fundamentally, the 2012 RTP is designed to increase the efficiency and decrease the environmental impact of the region's transportation system. A sub-set of that effort is the SCAG Comprehensive Regional Goods Movement Plan and Implementation Strategy designed to deal with the specific impacts of logistics on the region's port, airport, rail and highway systems while maintaining the sector's economic competitiveness.

Goods Movement, The Economy and Southern California's Transportation System

Southern California's goods movement dependent sectors create considerable economic impact due to the wide variety of activities involved in moving goods within and through the region. According to analysis of EDD data, in 2011 this sector directly employed 638,252 workers in the area. The facilities involved include the region's four ports (Los Angeles, Long Beach, Port Hueneme, San Diego), its numerous airports led by Los Angeles International Airport (LAX), its two long-haul (Burlington Northern Santa Fe Railway; Union Pacific Railroad) and four short-haul rail lines, several intermodal rail yards, hundreds of cross-docks and thousands of warehouses. The system is largely tied together by trucks that move most goods the "last mile" to retailers or consumers. Trucks also transfer cargo from the ports and airports to the intermodal yards, cross-docks and warehouses.

CHALLENGES

While Southern California has the best logistics network in the United States, it does face two serious challenges. The first of these is the 2014 expansion of the Panama Canal. This doubling of capacity, will allow ships up to 13,000 TEUs versus the current 4,500 TEU's, to go directly from Asia to the East Coast rather than using West Coast ports. As a result, ports and corridors on the Gulf and East Coast are investing over $30 Billion in their infrastructure to draw cargo directly to them, bypassing Los Angeles and Long Beach. The local response has been the "Beat the Canal" strategy to ensure that Southern California's competitive position is retained, if not enhanced. This has included:

- Serious efforts by the ports to reach out to their beneficial cargo owners to make sure they are being responsive to their needs, and that those companies understand the cost savings of using Southern California's ports.
- Continuation of the Clean Truck Program at the ports which has significantly lowered the adverse environmental impact they have had on the surrounding communities.
- Continued planning and investment in landside infrastructure to allow cargo to efficiently move through the region. Most recently, efforts have included release of the Draft Environmental Impact Report for the Southern California International Gateway (SCIG) near-dock rail project of BNSF Railway. Also, the ports have been deepening their channels, building on-dock rail facilities and are about to replace the Gerald Desmond Bridge. The region has also undertaken considerable work (EIR/EIS underway) to provide for the expansion of the I-710 freeway.

Meanwhile, a second major difficulty for the logistics sector is the fact that Southern California's transportation infrastructure frequently becomes clogged by traffic congestion. This is a crucial problem for supply chain managers since the speed and reliability with which they can move their cargo to the appropriate national markets is the crucial determinant of where they choose to import, export and store their cargo.

To deal with that issue, SCAG has developed the Comprehensive Regional Goods Movement Plan and Implementation Strategy aimed at expanding the timeliness and efficiency of the region's goods movement throughput. In the long term, the implementation of that plan is a key economic development necessity. The plan includes port access

improvements, truck mobility improvements including a system of dedicated truck lanes, rail and intermodal terminal capacity expansion projects, grade separations and advanced technology deployment strategies.

MACRO-ECONOMIC IMPACT

In the SCAG region, goods movement-dependent industries comprise 34 percent of the region's GDP, and 34 percent of regional jobs, Five industries comprise the vast majority of these benefits: manufacturing, construction, retail trade, wholesale trade, and transportation and warehousing. These five industries dominate the region in terms of contribution to GDP, employment, and prospects for growth.

Regional GDP Contribution

In terms of GDP, goods movement-dependent industries contribute a total of $253 billion to the region's economy. The top five goods movement-dependent industries in terms of GDP contribution are:

- Manufacturing ($84 billion);
- Retail trade ($54 billion);
- Wholesale trade ($53 billion);
- Construction ($27 billion); and
- Transportation and warehousing ($21 billion).

Employment Contribution

In terms of employment, goods movement-dependent industries contribute a total of 2.96 million jobs to the region's economy. The top five goods movement-dependent industries in terms of employment are:

- Retail trade (950,000 jobs);
- Manufacturing (744,000 jobs);
- Construction (431,000 jobs);
- Wholesale trade (429,000 jobs); and
- Transportation and warehousing (330,000 jobs).

Even when isolating the sectors that rely solely on the movement of goods, the impacts are significant. For the seven Southern California counties (Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Ventura), the output of the sectors related to these industries totaled $130.1 billion out of the region's full output of $1.76 trillion in 2009.

Using the IMPLAN model to analyze the economic activity attributed to the $130.1 billion output associated with goods movement in Southern California, the model demonstrated the following results.

TABLE 1 Logistics Contribution to Southern California's Economy, 2009

Metric	Southern California	Logistics	Logistics Share
Gross Regional Product	$1,045,341,256,738	$146,699,940,876	14.0%
Total Employment	11,307,735	1,387,728	12.3%
Employee Compensation	$543,707,789,826	$86,753,281,440	16.0%
Proprietor Income	$92,433,783,666	$14,386,878,484	15.6%
Other Property Type Income	$330,967,058,325	$39,778,255,582	12.0%
Indirect Business Taxes	$78,232,624,920	$20,168,403,854	25.8%
Total Output	**$1,760,981,224,092**	**$238,503,892,404**	**13.5%**

Source: IMPLAN, analysis by Economics & Politics, Inc.

The next section proceeds to look at the quantitative impact the investments proposed in SCAG's Regional Transportation Plan will have on the region's economic performance, job creation, and prosperity.

Project Expenditures – Mapping the RTP's Investment Plan

A mix of transportation projects are planned in each of the six counties over the twenty-five year span of the plan.

Of the total RTP expenditures exceeding $500 billion, more than half will be spent on projects in Los Angeles County.

Not all expenditures will have an economic impact.

We have deducted expenditures estimated to be associated with debt service and right-of-way acquisition, which represent exchange of assets and are excluded from our analysis **TABLE 2**.

ECONOMIC AND JOB IMPACTS

Net expenditures are categorized by function into three broad industries: construction, transit operations, and architectural and engineering services. Highway operations and maintenance expenditures are included with construction given their similarity. The total employment impact of the transportation plan is shown in **TABLE 3**.

Over the twenty-five year period, the plan will generate 4.2 million total jobs in the six-county region, or an annual average of 167,900. Almost 54 percent of these will fall in Los Angeles County, with 21 percent in Orange County and 12.5 percent in Riverside County.

In addition to the SCAG region, the rest of the state of California will benefit from spillover impacts of an additional 237,700 annual jobs, and an additional 306,500 annual jobs will accrue to other states.

Methods

SHORT TERM IMPACT

The most commonly used tool for conducting economic impact analysis is input-output modeling. Using detailed data on the distribution of sales and purchases between industries and households (available from the U.S. Census Bureau and the Bureau of Economic Analysis), the regional economy is mathematically represented as a series of flows of employees, goods and services, and capital between economic agents.

Using this model, the analyst can provide an initial increase in activity, such as a new transportation infrastructure investment, and trace the route that the project expenditures make through the supply chain, from the construction contractor to his employees (direct impacts), to his suppliers and to their employees and suppliers (indirect impacts), and so on; and from the employees to their household purchases (induced impacts). The original spending is thus multiplied by the additional activity it motivates.

TABLE 2 Net Expenditures (in Millions of Nominal Dollars)

	FY2011–15	FY2016–20	FY2021–25	FY2026–30	FY2031–35	Total	% of SCAG Total
Total	$ 49,296.5	$ 63,464.0	$ 80,942.1	$ 119,547.1	$ 126,094.2	$ 439,343.9	100.0

TABLE 3 Total Employment Impact (Annual Jobs)

	FY2011–15	FY2016–20	FY2021–25	FY2026–30	FY2031–35	Total	% of SCAG Total
Imperial							
Total jobs	2,602	2,621	2,599	2,987	2,520	13,329	0.3
Annual average	520	524	520	597	504	533	
Los Angeles							
Total jobs	518,005	454,602	418,708	483,781	387,868	2,262,964	53.9
Annual average	103,601	90,920	83,742	96,756	77,574	90,519	
Orange							
Total jobs	182,344	171,319	165,424	196,609	163,315	879,011	20.9
Annual average	36,469	34,264	33,085	39,322	32,663	35,160	
Riverside							
Total jobs	98,226	100,740	101,709	119,675	104,049	524,399	12.5
Annual average	19,645	20,148	20,342	23,935	20,810	20,976	
San Bernardino							
Total jobs	75,784	75,931	75,859	89,270	76,681	393,525	9.4
Annual average	15,157	15,186	15,172	17,854	15,336	15,741	
Ventura							
Total jobs	25,773	24,451	23,609	27,455	22,312	123,600	3.0
Annual average	5,155	4,890	4,722	5,491	4,462	4,944	
SCAG REGION							
Total jobs	902,734	829,664	787,908	919,777	756,745	4,196,828	100.0
Annual average	180,547	165,933	157,582	183,955	151,349	167,873	
Rest of California							
Total jobs	45,856	46,353	45,286	53,001	47,170	237,666	
Annual average	9,171	9,271	9,057	10,600	9,434	9,507	
Rest of US							
Total jobs	212,267	96,438	25,438	20,188	(47,798)	306,533	
Annual average	42,453	19,288	5,088	4,038	(9,560)	12,261	

Of course, not all needs in the supply chain can or should be filled locally. A construction company that purchases specialized equipment may order this from a manufacturer in another state or country. It may also choose to buy supplies from other areas if more competitive prices are offered elsewhere. The workers themselves may commute from outlying suburbs, representing an import of labor. Similarly, not all household spending occurs locally. Employees may purchase home insurance from Connecticut, table wine from France, and cigars from Cuba. Spending that occurs outside of the economic region is a leakage from the system and reduces the local economic impact.

To simplify analysis, regional models that have already been constructed by analysts or consultants are reduced to their multipliers, which are then more easily used by planners, engineers or policymakers to estimate the job impacts of their proposed projects.

Users of such multipliers should be cautioned that the underlying models depend on the economic region that is defined and the vintage of the data used to construct the model. For example, multipliers for the Southern California region are quite different from multipliers for the nation as a whole, and can be different from year to year, particularly during periods of technological or structural change. This leads to a confusion of job creation estimates, some of which range dramatically.

Rather than rely on externally-sourced multipliers, we construct an input-output regional model using the most current data and IMPLAN software from MIG, Inc.

In our input-output analysis, we assume that the initial project spending occurs within the SCAG region, and allow the model to estimate the leakage from the region based on historical data and estimated trade flows among neighboring counties. In addition to the flows of goods and services, the model incorporates estimates of workers who commute from other regions—the household spending of these workers would in large part occur close to their residences as opposed to their place of employment.

Because supply chains differ across industries, the transportation project expenditure data is sorted by category, such as construction services, operations and maintenance for transit operations, and architectural and engineering services. The allocation of expenditures among these categories was estimated by knowledgeable transportation planners. Right-of-way acquisition costs are excluded since these represent a transfer of assets and are generally considered to have no economic impact. Each category of spending was modeled separately and their impacts summed. Employment estimates are measured on a job-count basis for wage-and-salary workers and for self-proprietors regardless of the number of hours worked, and are reported on an annual basis, i.e., the number of full and part time jobs generated in one year.

Input-output analysis is useful for estimating the immediate economic impacts of a project. However, because this modeling is based upon fixed production relationships and does not incorporate behavioral decisions made by households or businesses to price signals, it is incapable of estimating dynamic responses such as businesses substituting towards capital in the face of rising labor costs, or labor migrating into the region as wage rates rise. To capture these full general equilibrium impacts a more complex methodology is needed.

One tool used to do this is modeling software from Regional Economic Models, Inc. (REMI), which supplements input-output models with econometric estimates of behavioral relationships.

In our REMI analysis, we allocate the construction spending to counties in proportion to their relative output shares in the region. Expenditures for transit operations are expected to occur in the counties in which the projects are located.

Long Term Impacts & Efficiency Improvements

The short-term impacts shown in Exhibit 3 reflect how RTP expenditures create jobs. That job creation effect includes what are traditionally called direct, indirect, and induced effects. The direct effect is the jobs required to build or operate transportation infrastructure. The indirect effect is the jobs created by firms down the supply chain. For example, construction companies purchase heavy equipment, and architecture firms purchase design software and computers. The jobs created by companies that supply inputs to firms engaged in design, construction, operation and maintenance, or other direct roles is the indirect effect. The induced effect accounts for the fact that persons employed building or operating transportation projects in the SCAG region will buy products—their own food, housing, health care, recreation, and entertainment—creating employment opportunities that ripple throughout the regional economy.

All of these impacts flow from the building or operating of transportation infrastructure. Yet there is a second, and distinct, kind of economic impact. The infrastructure, once built, can enhance the economic competitiveness of a region. Projects that reduce

congestion might help firms produce at lower cost, or allow those firms to reach larger markets or hire more capable employees. An economy with a well-functioning transportation system can be a more attractive place for firms to do business, enhancing the economic competitiveness of the SCAG region. The RTP can boost employment in two ways—providing jobs for persons in highway and rail construction, operation, and maintenance, and boosting the economic competitiveness of the SCAG region by making it a more attractive place to do business. As an example, policies that could reduce congestion while creating no or minimal construction jobs can still increase the economic competitiveness of the region. Congestion pricing is one possible example.

How Transportation Improves Economic Competitiveness

Transportation can improve economic competitiveness in several ways. Canvassing the literature and available economic models gives five possible paths through which transportation improvements can increase regional economic competitiveness.

1. **Improved Labor Market Matching:** Reducing travel time allows firms to hire from a larger geographic catchment area. This effectively increases the firm's labor market—particularly so in a large urban area like the SCAG region, where reductions in commuting time can yield possibly many more potential employees. Increasing the size of the labor pool allows the firm to hire better employees, as the firm can find a better match for its needs. By hiring employees who better suit their needs, the firm can produce more (employees are more productive) for the same cost, allowing the firm to capture a larger market share. That, in turn, can lead to increased hiring if the increase in market share countervails the fact that the firm can produce more with fewer employees due to the improved employer-employee job match. (See, e.g., Kohlhase and Finney, 2008.)
2. **Firms Move into the SCAG Region in Response to Enhanced Economic Competitiveness:** This effect flows in part from the first effect. If the SCAG region's transportation system allows longer commutes and hence a larger labor market pool, and if that larger employee pool allows firms to hire better employees, eventually, firms will move into the region in response to those improved hiring prospects. Hence, the increases in firm productivity that initially result from improved labor market matching result in firms moving into the SCAG region from other locations over longer time horizons.
3. **Reduced Congestion Reduces Employees' Asking (or Reservation) Wage:** Employees have a reservation wage—a wage below which they will not work in a particular job. Congestion reductions can lower wages in two ways. First, metropolitan areas compete for mobile labor, and metropolitan regions with lower traffic congestion will, all else equal, lure more migrants into the region due to the amenity value of lower traffic congestion. This increases the supply of available labor, driving wages down. Second, employees typically have to be compensated for undesirable characteristics of particular locations. In metropolitan areas with high traffic congestion, the labor pool will have to be compensated either in the form of higher wages, lower house prices, or both (e.g. Roback, 1982). These two effects are one and the same—the higher wages in high congestion metropolitan areas reflect the need to lure in a labor pool that otherwise might choose to locate in lower congestion locales. Reduced congestion can attract more workers to a region, allowing a firm to hire quality workers at lower wages.
4. **Increased Market for Firms' Products:** Reductions in travel time can allow firms to supply a larger market area. If production is constant and returns to scale, this will not increase employment per se. Instead, local markets might be served by fewer, larger firms that can reach a larger customer base as congestion delays are reduced. The exception occurs when production is increasing returns to scale, which means that larger firms can produce at lower cost. For many locally serving products—eating establishments, consumer products, services—production is likely constant returns to scale, and larger firms likely have no particular cost advantage over smaller firms. An important exception might be the shipping traffic through the Ports of Los Angeles and Long Beach. Larger ports can build infrastructure that may allow faster and hence lower cost processing of freight movements. Reductions in landside freight shipping times from the ports to points within and beyond the SCAG region may contribute to shipping volumes that could allow lower costs and hence lead to higher productivity, making the SCAG ports more cost effective than other points of entry.
5. **Learning:** Cities are engines of economic innovation. Virtually all economic advances—in consumer products, electronics, biotechnology, consumer services, entertainment, and fine arts—are created in metropolitan areas. A large and growing literature argues that much of the economic advantage of cities is the learning that is possible when persons and firms are in close proximity (e.g., Puga, 2010,

Glaeser, 2011, Storper and Venables, 2004). The engineers in Silicon Valley interact regularly, within and across different firms, creating a hub of knowledge and innovation that is unrivaled in the computing industry. The movie industry in Los Angeles provides the same center for knowledge and learning. Such learning effects are central to many industries, including manufacturing processes and services that increasingly rely on innovations to remain competitive. (For empirical evidence on productivity gains that accrue to firms that locate in very close proximity to concentrations of employment in their own industry, often over distances of a few miles, see, e.g., Rosenthal and Strange, 2003.) Transportation investments that reduce traffic congestion can allow persons to interact more readily with a larger pool of like-minded experts, increasing the learning and innovation in a regional economy. That can allow local firms to innovate in ways that lowers costs, improves products, and leads to larger market share. Over time, improved innovation environment will attract mobile labor and capital (workers and firms) from other regions, further boosting economic activity.

Overall, these five effects paint a rich picture of the regional economy—one in which firms can access larger labor and product markets as congestion is reduced, and those effects can translate in the short-run into higher productivity, lower costs, larger market share, and higher employment and in the longer run new firms may move into the metropolitan region in response to that enhanced competitiveness. Beyond those "market size" effects, learning and innovation can be enhanced by policies that allow persons to interact more quickly and easily with a broad range of economic collaborators and competitors, reducing traffic congestion—the range of movement of workers and business owners—can enhance that learning environment. The nature of any one of these effects, and whether employment would increase or decrease in particular sectors or specific locations within the SCAG region, requires assessing complicated details of the magnitudes of each effect and the tradeoffs that ensue.

THE LITERATURE

While there is a large academic literature that studies the effect of transportation infrastructure on economic productivity, only a few of those studies draw links to congestion reduction and economic gains. The bulk of the academic literature is focused on estimating relationships between a region's stock of highway or transportation infrastructure and economic productivity. That larger strand of the literature cannot illuminate how transportation infrastructure relates to productivity gains, and the effect of congestion reduction in particular is not modeled. Because congestion reduction is a key path through which transportation investment in the SCAG region could improve economic competitiveness, we focus on the relatively few studies that have drawn links from congestion to regional economic performance. Note that those studies typically aimed to test a hypothesis using retrospective data, often asking whether measures of economic performance are statistically related to traffic congestion. The goal in the academic literature, to date, has not been to forecast magnitudes of economic impacts from future congestion reduction, but instead to use retrospective data to test for a relationship.

Boarnet (1997) estimated labor productivity and output in the 58 counties in California with annual data from 1977 to 1988. He developed a congestion measure for each county based on peak hour measures of traffic volume relative to highway capacity. Boarnet found that congestion is negatively associated with county output (or gross county product.) Converting the regression estimates into elasticities, Boarnet found an effect only for the most congested counties in the state, typically the counties that comprised the San Francisco Bay Area and SCAG region. During the time period being studies, those were typically the only counties that had highway networks with meaningful levels of congestion. The elasticity of output with respect to a measure of congestion suggested that a 10 percent reduction in highway congestion was associated with county output increases in a range from 2 percent to 5 percent.

Hymel (2009) used data from the 85 largest U.S. metropolitan areas from 1982 through 2003. He used regression analysis to examine how employment growth is influenced by several factors, including congestion. Highway congestion measures were drawn from annual reports produced by the Texas Transportation Institute. Hymel found that congestion reduces employment growth, and the effect is non-linear. More congested metropolitan areas experienced larger employment penalties for increases in congestion. Hymel's estimates imply an elasticity of employment growth, from 1990 to 2003, with respect to congestion of -0.466 for the Los Angeles-Orange County metropolitan area, suggested that a 10 percent reduction in traffic congestion is associated with a 4.66 percent increase in employment growth during that 14-year period. Note that the Los Angeles-Orange County elasticity is almost twice the size of the elasticity for San Diego, which is -0.248. In San Diego, during this time period, a 10 percent reduction in traffic congestion is associated with a 2.48 percent increase in employment growth. This illustrates the non-linear nature of congestion's economic penalty. Mildly congested regions experience

more moderate reductions in employment growth, but as congestion grows the reduction in employment, based on Hymel's estimates, grows faster than linearly.

Recently SCAG has used the REMI model to estimate the impact of 10 percent, 20 percent, and 30 percent reductions in congestion on regional employment and gross regional product (or output.) The REMI estimates model congestion reductions as reductions in travel time. A 10 percent reduction in travel time in the region produces 132,000 new annual jobs from 2012 through 2035, according to the REMI modeling.

Note that estimates of job growth from congestion reduction will be sensitive to the baseline level of job growth, and so the rough congruence between REMI output and Hymel's results—over two time periods of different lengths—should not be emphasized too much. Yet there is a ballpark correspondence.

The more important messages from the literature are twofold. First, congestion exacts an economic penalty, and that penalty grows non-linearly as congestion grows. In previous time periods, when congestion levels were lower, the impact of congestion on economic competitiveness was arguably not much of a policy issue and may have been difficult to detect using data from mostly uncongested urban areas. In current times, when congestion levels are high in urban areas across the country, the economic impacts of congestion and hence the economic gains from congestion reduction are likely larger. In short, historical experience will likely understate the gains from congestion reduction going forward.

Second, the estimates of employment or output gains from congestion reduction, in the literature and from the REMI model, likely understate the true gains. Economic gains from enhanced learning and innovation, and gains particular to transportation industries such as the ports and goods movement, are likely not captured by the existing REMI model. So while the REMI model gives insights into the economic gains from congestion reduction, the REMI estimates should be regarded as a lower bound or possibly an underestimate of the full economic gains.

References

Boarnet, Marlon G. 1997. Infrastructure Services and the Productivity of Public Capital: The Case of Streets and Highways. National Tax Journal 50(1): 39-57.

Glaeser, Edward L. 2011. The Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier. Penguin Press.

Hymel, Kent. 2009. Does traffic congestion reduce employment growth? Journal of Urban Economics 65: 127-135.

Kohlhase, Janet, and Miles Finney. 2008. The Effect of Urbanization on Labor Turnover. Journal of Regional Science, 48(2): 311-328.

Puga, Diego. 2010. The Magnitude and Causes of Agglomeration Economies. Journal of Regional Science 50,1: 203-220.

Rosenthal, Stuart S. and William C. Strange. 2003. Geography, Industrial Organization, and Agglomeration. Review of Economics and Statistics 85(2): 377-393.

Storper, Michael and Anthony J. Venables. 2004. Buzz: Face-to-Face Contact and the Urban Economy. Journal of Economic Geography 4: 351-370.

REGIONAL TRANSPORTATION PLAN
2012–2035
SUSTAINABLE COMMUNITIES STRATEGY
Towards a Sustainable Future

RTP

SOUTHERN CALIFORNIA
ASSOCIATION of GOVERNMENTS

818 West 7th Street, 12th Floor
Los Angeles, CA 90017
Phone: (213) 236-1800
Fax: (213) 236-1825
www.scag.ca.gov

REGIONAL OFFICES

Imperial County
1405 North Imperial Avenue
Suite 1
El Centro, CA 92243
Phone: (760) 353-7800
Fax: (760) 353-1877

Orange County
OCTA Building
600 South Main Street
9th Floor
Orange, CA 92863
Phone: (714) 542-3687
Fax: (714) 560-5089

Riverside County
3403 10th Street
Suite 805
Riverside, CA 92501
Phone: (951) 784-1513
Fax: (951) 784-3925

San Bernardino County
Santa Fe Depot
1170 West 3rd Street
Suite 140
San Bernardino, CA 92418
Phone: (909) 806-3556
Fax: (909) 806-3572

Ventura County
950 County Square Drive
Suite 101
Ventura, CA 93003
Phone: (805) 642-2800
Fax: (805) 642-2260

please recycle 2347 12.20.2011