Macroeconomic impacts of proposed climate change mitigation strategies for transportation in Southern California

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Abstract

We evaluate the potential regional macroeconomic impacts of a set of eighteen greenhouse gas (GHG) mitigation policy options intended to enable the Southern California Association of Governments (SCAG) to comply with the California’s emission reduction targets related to transportation and land use. The Regional Economic Models, Inc. (REMI) Policy Insight Plus (PI+) and TranSight (TS) Models were applied in the analysis by carefully linking technical and microeconomic aspects of each mitigation option to the workings of the regional economy. We account for key considerations, such as the extent to which investment in mitigation options would be generated from new revenue sources or would displace ordinary private business investment. Our results indicate that the combined eighteen policies could generate an employment gain of almost 14 thousand jobs per year and result in an increase in GDP of $22 billion over the entire planning period from now to 2035. Sensitivity analyses of key assumptions and parameters for the transportation and land use policies indicate that the results are robust.

1. Introduction

In recent years, the majority of the regulatory initiatives in the U.S. to reduce greenhouse gas (GHG) emissions have been at local, state, and regional levels. Thus far, 33 states have passed or are formulating climate action plans (CAPs) (CCS, 2015). One major issue in the larger states is the need to consider significant differences within their sub-regions in designing these plans. This is especially poignant in a state as diverse in its geography and culture as California. A prime example relates to transportation, where the southern part of the state is much more motor vehicle-intensive, in terms of both passengers and freight, than the state as a whole. Accordingly, California legislation calls for collaboration between state and regional authorities in designing and implementing its CAP.

In California, this shared responsibility is assigned to regional and local planning authorities, such as the Southern California Association of Governments (SCAG). SCAG consists of the six counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino and Ventura, and excludes San Diego County, for which another MPO (SANDAG) carries out similar planning responsibilities. The region contains 191 municipalities and over 18 million people, making it the largest formal regional planning jurisdiction in the US. In 2010, total GHG emissions in the SCAG Region were 225 million metric tons (MMt) of CO₂e. The transportation sector contributed the largest share, or about 41% of the total, which was significantly higher than the national average level of 26%, and also much higher than the average level in rest of California, which is about 34% in 2010 (CCS, 2012; ARB, 2014).

Given the transportation sector’s large contribution to GHG emissions, the Transportation Research Board (TRB) Special Report 307 (TRB, 2011) has identified major policy strategies for reducing energy use and GHG emissions from the transportation sector. These strategies fall into three broad categories: 1) increased vehicle fuel efficiency; 2) accelerated adoption of alternative fuels
that have low or zero carbon dioxide emissions; 3) altered travel patterns and activities by optimizing the transportation system and encouraging smarter travel. In TRB Special Report 299 (TRB, 2009), two fundamental research topics were identified. The first is the measurement and estimation of the cost-effectiveness, as well as co-benefits, of individual strategies and their combined effects. The second is modeling of travel behavior changes due to demographic, land use, and goods movement changes (see also Meyer, 2010).

In 2012, SCAG initiated the Climate and Economic Development Project (CEDP), which brought together a group of diverse stakeholders coming from government agencies, key industries, environmental groups, academic institutions, and other entities to identify regional and local strategies and policies to reduce GHG emissions and identify positive co-benefits for Southern California (SCAG, 2012). The process followed a four-step evaluation to analyze the micro- and macro-economic impacts of transportation and land use policies: 1) selection of potential policies; 2) analysis of policy direct implementation costs and savings (Microeconomic impacts) and emissions reductions; 3) evaluation of the macroeconomic impacts of policies; and 4) conducting sensitivity analysis with alternative assumptions and results being peer reviewed by an external panel of economic experts.

The State of California has committed through legislation and regulation to reduce future GHG emissions in the state from all sources. The required Sustainable Communities Plans detail the methods and policies regional and local governments will follow to achieve these regional and statewide goals. These policies can impose or reduce costs on government, businesses and households. It is important that the policy makers understand the potential positive and negative impacts of each policy and the combination of policies. Afforded this information they can select policies that minimize the burden on the California economy while providing the maximum stimulus for economic development and growth.

This paper provides an analysis of the potential macroeconomic impacts associated with the policies identified as priorities for analysis by the Transportation System and Investments (TSI) and Transportation and Land Use (TLU) Technical Work Groups (TWGs)2 of the CEDP. It refines two advanced macroeconomic models and applies them to detailed data on individual policies to estimate the impacts on regional GDP and employment over long-term planning horizon.

The rest of the paper is organized as follows. Section 2 provides the legislative background of this study, an introduction of the SCAG economy, as well as a literature review of the economic impact analysis of GHG reductions from transportation sources. Section 3 briefly presents the methodology and results of the microeconomic impacts of the eighteen transportation system investment and land use policy options. In Section 4, the detailed methodology for analyzing the macroeconomic impacts of these policy options and major data inputs of the modeling are presented. In Section 5, we present the modeling results of the macroeconomic impacts of the recommended policy options on the SCAG Region. The section also includes the sensitivity analyses in terms of the sources of private and public funding, and discusses the spillover economic impacts of these policy options to regions outside of the SCAG Region. Section 6 concludes with highlights of major findings.

2 A third group of policies, developed by the Energy, Commerce, and Resources (ECR) Technical Work Groups, were formulated as well (see SCAG, 2012) and further analyzed in Wei and Rose (2014).

2. Background

2.1. Legislative background

Senate Bill (SB) 375 (known as The Sustainable Communities and Climate Protection Act of 2008) (Chapter 728, Statutes of 2008) directs the California Air Resources Board to set regional targets for reducing GHG emissions. The law establishes a “bottom up” approach to ensure that cities and counties are involved in the development of regional plans to achieve those targets. AB 32, California’s Global Warming Solutions Act of 2006, grants the California Air Resources Board authority over sources of GHG emissions, including cars and light trucks. SB 375 further directs the Air Resources Board to set regional targets for the reduction of GHG emissions. Aligning these regional plans is intended to help California achieve GHG reduction goals for cars and light trucks under AB 32. SB 375 establishes a collaborative process between regional and state agencies to set regional GHG reduction targets, and provides California Environmental Quality Act (CEQA) incentives for development projects that are consistent with a regional plan that meets those targets. Cities and counties, however, maintain their existing authority over local planning and land-use decisions.

2.2. The SCAG region economy

The total Gross Regional Product (GRP) in the SCAG Region in 2012 was $930 billion (IMPLAN, 2014). Based on the U.S. Census Bureau 5-Year estimates for 2009–2013, median household income in the SCAG Region ranged from a low of $41,807 in Imperial county to a high of $76,544 in Ventura County (U.S. Census, 2015). In 2010, the unemployment rate in the SCAG Region reached its highest level in the past 30 years at 12.4%, but dropped to 10.6% in 2012 (SCAG, 2013).

The various service sectors combined form the largest share of the Regional Economy. Manufacturing accounts for about 15% of regional total gross output, and Real Estate accounts for 13%. The next nine largest sectors (in descending order) are: Professional and Technical Services, Retail Trade, Wholesale Trade, Construction, Monetary Authorities, Motion Picture/Video/Sound Recording, Administrative and Support Services, Broadcasting and Telecommunication, and Health Care. Altogether these sectors account for about 50% of the total gross output in the Region (REMI, 2012).

SCAG (2013) has projected increases in population, number of households and employment in the Region. Population is expected to increase by 23% by 2035 compared to the Year 2008 base-year Regional Transportation Plan (RTP) level. The number of households is expected to increase by 26%, and employment is expected to increase by 22% by 2035. The SCAG GRP is projected to reach $1.57 trillion by 2035, representing an average annual growth rate of 2.6% (REMI, 2012).

2.3. Literature review

Planned GHG emissions reductions will require lower emissions in all sectors of the economy. Transportation is a major contributor to GHG emissions, accounting for about 26% of emissions nationally and 41% of emissions in California (CCS, 2012; ARB, 2014). California Governor Edmund G. Brown Jr. issued an executive order in 2015 to establish a California GHG reduction target of 40 percent below 1990 levels by 2030. These levels are not achievable without major reductions in transportation GHG emissions, and the SCAG RTP envisions many investments and programs designed to achieve these by reducing travel and improving travel efficiency (SCAG, 2011).
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