Workpaper A: Forecasting Aggregate VMT in an Era of Massive Disruption

Researchers have used a variety of approaches to forecasting VMT, most often over moderate time horizons and often to explore the strength of explanatory relationships such as those in Figure TB1. For example, Kweon and Kockelman (2004) use nonparametric techniques to show that individual household VMT is predicted well by the number of household vehicles, income, the number of workers in the home, retirement, the availability of transit options, and whether the home is urban or rural.

In contrast, transportation planners and energy agencies tend to focus on long-term VMT trends. The National Energy Modeling System of the U.S. predicts VMT growth through 2050 as a function of last year’s VMT, the fuel costs of driving, disposable income per capita, and the number of vehicles per licensed driver. Similar analyses appear to have led the World Energy Council to forecast 3.4% growth in passenger VMT through 2050 in a 2011 paper. These “macro” forecasting approaches are designed to measure aggregate VMT for countries and states, ignoring the many factors that differentiate between travelers and their choices.

Relying on either of these approaches to forecast VMT in 2050 presents a host of challenges. To use granular equations predicting VMT use by category of traveler, we must first forecast the population within each category and then forecast each explanatory variable out three decades. For example, if we have separate forecasts for urban singles, urban families, rural families, and other types of households, and VMT for each is a function (as in Kweon and Kockelman) of seven parameters, a lifelong research projects awaits us. It is certainly challenging to forecast the demographic categories or market segments that each demonstrate a relatively common statistical relationship predicting VMT, but then the explanatory variables must also be forecasted.

Worse still, the oncoming disruptions in transportation are likely to invalidate these relationships, and invalidate them quite differently for different demographic categories. For example, there is much debate over the impact shared autonomous vehicles (SAVs) will have on the travel demand of young families in urban areas. We will discuss many current analyses of this question below, but none of these analyses forecast long-term demand using explanatory variables because the mode is too small and new to have generated any usable forecasting data sets. And while a traditional VMT forecast for
urban families is likely to be off in a large, unpredictable manner, rural households are likely to use SAVs much less, and current VMT relationships might not change too much.

The use of aggregate forecasting equations also raises many challenges. Macroeconomic forecasts such as the NEMS equation simply embed within the model the effects of all of the underlying explanatory variables with no transparency into the distinct effects of each one. Accordingly, within EIA’s prediction that US LDV VMT will grow to 3.5 trillion miles by 2050 are the explicit historic relationships between driving, income, fuel costs, and vehicle ownership and the unobserved secondary relationships between these variables and population growth, household size and composition (e.g. no. of workers and licensed drivers), urban form and the availability of transit, etc. All of these relationships are likely to be dislodged by the industry’s massive disruption between now and 2050.

Without questioning the magnitude of this disruption, our premise is that we can use the emerging literature and some heuristics to bound the aggregate change in personal and freight VMT. The U.S. will have an estimated 420 million inhabitants by 2050, overwhelmingly in urban areas. They will spend a large fraction of their time going places, but certainly not all of it. Urban density will either increase or decrease, but the simple time and cost required to change density on a national scale place logical limits on this shift. Similarly, autonomous vehicles will introduce travel options for families and seniors that simply don’t exist today, but there are limits on how much frail, elderly people will want to travel even if no driver is needed to ferry them about.