Gasoline Price Changes and Residential Relocation: Evidence from the American Housing Survey, 1995–2009

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Statement of Problem

A large body of literature across a variety of disciplines has examined residential relocation and its influential factors, including life course events and household structure changes, the housing market, the job market, and access to work or school. Gasoline prices, one of the economic factors, have not yet been linked to residential relocation. Populations more vulnerable to gasoline price increases may move closer to their workplace. However, the linkage between gasoline prices and residential relocation has not been investigated. The primary objective of this study is to examine the possible relationship of gasoline prices to residential relocation within the framework of time geography. Specifically, gasoline prices are measured in current time and as changes and moving averages in several time lags and are linked to residential relocation due to moving closer to work or school.

Literature Review

This research will investigate the effects of gasoline prices on residential relocation by building upon two bodies of literature. The first body of literature relates to residential relocation and its influential factors. Early studies of residential relocation discuss the link between changing residence and life course events, particularly those that affect family structure (Clark and Onaka 1983; Lee 1966; Mincer 1977; Rossi 1955), while others distinguished between endogenous factors (e.g., change in family structure) and exogenous factors (Brown and Moore 1970). Exogenous factors linked to residential relocation include the housing market and the ability to find suitable housing, the journey to work usually measured as travel time and distance to work where households with greater distance more likely to move closer to the workplace, and the job market (Clark and Burt 1980; Clark, Huang and Withers 2003; Clark and Onaka 1983; Giuliano and Small 1993; Levinson 1998; van Ommeren et al. 1999).

Given our emphasis on gasoline prices, we specifically focus on some of the exogenous conditions motivating residential relocation, namely the economic push and pull factors of residential relocation. The economic approach focuses on the costs of relocating, household and community preferences, and the motivations for moving. Economic push and pull factors include family income, expected earnings, wage rates, the housing market, unemployment rates, and commuting and transportation costs (Clark and Burt 1980; Clark and Dieleman 1996; Clark et al. 2003; DaVanzo 1976; Greenwood 1975; Lee and Waddell 2010; Lee and Myers 2003; Rouwendal and Meijer 2001). Economic factors essentially stress opportunity costs and wealth maximization, referring to residential relocation motivations that lead to increased earnings at destination relative to those at origin (Sjaastad 1962). A notable exception to this notion is for persons who prefer living in rural communities (Fuguitt and Brown 1990). From our point of view, rising gasoline prices increase transportation costs, possibly hindering accessibility to work or school. Thus, households may relocate in order to minimize commuting and transportation costs, particularly if family income and expected earnings at destination are believed to increase. The availability of satisfactory and affordable housing at destination function as pull factors, as the decision to relocate or stay is dependent upon suitable housing choices (Brown and Moore 1970; Clark and Dieleman 1996; Van Der Vlist et al. 2002). A depressed job market and unemployment at origin function as push factors, particularly pushing the unemployed to seek residence in an area with greater job opportunities (DaVanzo 1976). We will control the economic factors of unemployment and housing prices to examine the effects of gasoline price changes on residential relocation as economic conditions have direct effects on residential relocation.

The second body of literature provides a summary of gasoline price studies, including the link of gasoline prices to transportation mode choice and traffic safety. Current literature linking gasoline price changes to transportation mode choice tends to focus mainly on the effects of gasoline price changes on public transportation ridership. A couple of studies have determined a statistically significant causal

relationship between gasoline prices and demand for public transportation (Currie and Phung 2007; Haire and Machemehl 2007). Both studies found that increases in gasoline prices lead to increases in public transportation demand, although the demand varied by mode of transportation (e.g., light rail, heavy rail, bus). We will build upon this literature to examine the effects of gasoline price changes on residential relocation due to accessibility to public transportation.

A limited number of gasoline price studies focus on the relationship between gasoline price changes and traffic safety, specifically traffic crashes and traffic fatalities. Studies shaping knowledge on the relationship between gasoline prices (or taxes) and traffic crashes outline six perspectives: gasoline price effects on total traffic crashes; gasoline price effects on fatal crashes; gasoline price effects on drunk-driving crashes; gasoline price effects on motorcycle crashes; the effects by demographic characteristics; and the short-term or long-term effects (Chi et al. 2010, 2011; Grabowski and Morrisey 2004, 2006; Huang and Levinson 2010; Hyatt et al. 2009; Leigh and Geraghty 2008; Leigh and Wilkinson 1991; Wilson, Stimpson and Hilsenrath 2009).

We also examined literature on our selected framework of time geography. Time geography theory emphasizes the link between the behavioral possibilities of individuals and the various spatial and temporal constraints on those behaviors (Shaw and Yu 2009). In other words, according to time geography theory, an individual's way of life and activities are limited by spatial and temporal attributes (Pred 1977). Time geography theory has previously been applied to transportation accessibility, such as commute modes and times (Burns 1979) and bus services (Lenntorp 1977). It has also proven to be an important organizing principle for modeling travel behavior as a set of linked activity and travel decisions subject to constraints on resources such as time (Kitamura and Fujii 1998). We argue that time geography theory can also provide explanation for the effects of gasoline price changes on residential relocation, as we understand gasoline prices as one type of capability constraint. We expect that as gasoline prices increase – and the capability constraint becomes stronger – people will move closer to their workplace in order to reduce gasoline expenditures, leading to smaller space-time prisms. Increased gasoline prices could also induce workers, especially low- and medium-income automobile commuters who live far from their workplaces, to relocate closer to their workplaces (shorter space-time paths), and may encourage low-wage, younger, and part-time workers to find jobs nearer their residence (shorter space-time paths) (Graham and Glaister 2004).

Data

Residential relocation data were obtained from the American Housing Survey, a national level survey conducted by the U.S. Bureau of the Census for the Department of Housing and Urban Development, from 1995 to 2009. We constructed four measures of residential relocation and used them for dependent variables. The first dependent variable is calculated as the proportion of movers who responded that their primary reason for leaving their previous residence was to be closer to work, school, or other important locales divided by the total number of movers each month. The second dependent variable is calculated as the proportion of movers who responded that they chose their new residence due to its convenience to work divided by the total number of movers each month. The third dependent variable is calculated as the proportion of movers who responded that they chose their new residence due to its convenience to public transportation divided by the total number of movers each month. Finally, the fourth dependent variable is calculated as the proportion of movers who cited that they chose their new residence due to the convenience to either work or to public transportation divided by the total number of movers each month.

The gasoline price data were obtained from the U.S. Department of Energy's Energy Information Administration. We use three sets of independent variables based on the price of gasoline adjusted for inflation. The first set of independent variables simply consists of the current price of gasoline adjusted for inflation. The second set of independent variables consists of four variables, each reflecting the change in gasoline prices for one, two, three, and four year time lags. The third set of independent variables also consists of four variables, each reflecting the twelve month moving average of gasoline prices for one, two, three, and four year time lags.

Control variables in our models include the monthly national unemployment rate, as well as the national median and average housing prices by month. The monthly national unemployment rates were obtained

from the Bureau of Labor Statistics. Monthly data on the national median and average housing prices were obtained from the National Association of Realtors.

Research Design

We will then conduct a two-part analytic strategy consisting of descriptive statistics and ordinary least squares (OLS) regression analysis, presenting the results in a number of figures and tables. First, we present the overall trend in regards to the monthly gasoline prices, the proportion of the population moved per year, the monthly unemployment rate, and the monthly mean and median housing prices. Next, we depict the relationship between gasoline prices and the proportion of movers who left their previous residence in order to be closer to work, school, or other important locales, as well as also show the descriptive statistics of each reason respondents left their previous residence. We also illustrate the relationship between gasoline prices and the reasons movers chose their new residence, plus we present the descriptive statistics of each reason movers selected their new residence. Lastly, we show the descriptive statistics and the correlations for all variables used in the analysis.

We use OLS regression to examine the effects of gasoline prices on residential relocation. For each of the four dependent variables, we will construct eight models, resulting in a total of 32 models. Table 1 illustrates the results table for just one dependent variable (a similar table will be produced for each dependent variable). A second set of results, per dependent variable, will exclude the control variables. Model 1 will show the current gasoline price (adjusted for inflation), control variables, and time ID variables (seasonality). Model 2 will show the current gasoline price, the four time lag variables, control variables, and time ID variables. Model 3 will show the current gasoline price, the four moving averages variables, control variables, and time ID variables. Model 4 will include all variables in the analysis.

Table 1: Illustration of Results (Replicated for Each Dependent Variable)

	Model 1	Model 2	Model 3	Model 4
Current gasoline price	X	X	X	X
Gas price lags (4)		X		X
Gas price moving averages (4)			X	X
Control variables	X	X	X	X
Time ID/Season (4)	X	X	X	X

Potential Contributions and Policy Implications

The results will have important implications for addressing the impacts of recent volatility in gasoline prices on housing policies and transportation planning. Additionally, this study will expand the application of time geography theory to residential relocation research.

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