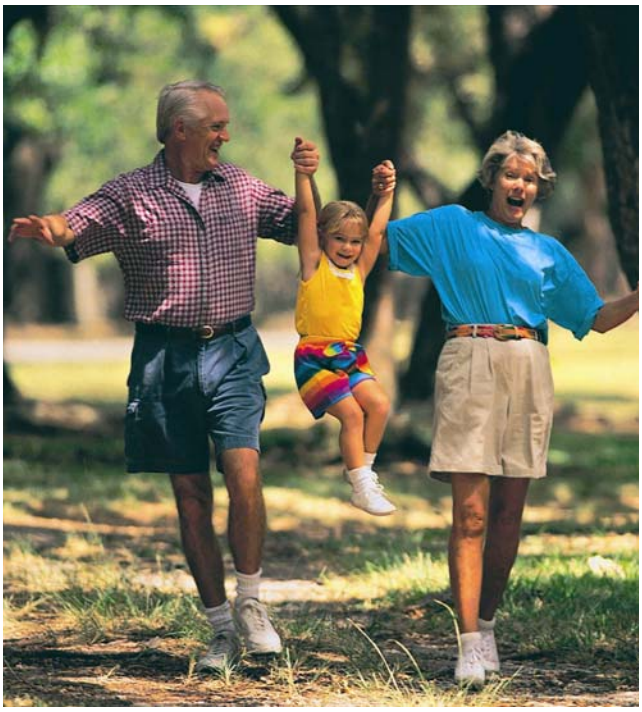
Informing the Debate

Attitudes of Michigan Residents towards Using and Funding Public Transportation



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In the past few years, several important trends have combined to increase the desire of Americans to conserve energy. First, the increasing public belief about the urgency of controlling climate change produced widespread support among Americans for some policies requiring greater energy efficiency is necessary (see Leiserowitz 2007).

Second, for geo-political reasons, there is especially great concern about America's consumption of oil. A large proportion of the oil produced in the world comes from regimes that are unfriendly to America and/or unstable. NY Times columnist Thomas Friedman has frequently argued that it is contrary to America's national interest to have its energy needs dependent on these regimes and send so much money to them from our purchases.

Finally, the sharp increases in and general volatility of the prices of crude oil and fuel in the recent past have placed a great strain on the finances of ordinary Americans. Consequently, as the price of gasoline peaked in the spring and summer of 2008, in many cities, use of public transportation greatly increased (often by over 20% from the previous year) and sometimes approached capacity. In this context, attitudes toward using and improving public transportation service are of interest, given the potential of increased use in helping to address the oil consumption-related problems.

Michigan cities and the state in general are well behind much of the United States in providing comprehensive quality public transportation. Currently, ten US metropolitan areas have rapid transit systems. If light rail is also considered, there are over twenty additional US metropolitan areas with rail systems that are either operational or under construction (Wikipedia). No Michigan community is on either list, even though the Detroit metropolitan area is the eighth most populous metropolitan area in the US. However, a number of business and government leaders in Michigan have agreed (see e.g., Detroit Free Press 2008) that improving public transportation may be useful in solving the economic distress that the state has been experiencing.

A survey of Michigan adults in 2006 (MDOT 2006) showed that public transportation was a fairly low priority for most Michiganders at that time. A substantial majority (61%) of Michiganders preferred that the state emphasize building and maintaining highways as compared to 27% who favored emphasis on alternative modes of transportation such as busses, trains, bicycle lanes, or vans for senior citizens. When respondents were given a list of 19 aspects of the transportation system, and asked to prioritize them, the top five priorities all involved improving the highways. More availability of public transportation options was tied for sixth and greater availability of intercity passenger rail and busses was tied for eighth.

However, gasoline prices increased considerably from the time of that survey to the summer of 2008. Moreover, not only does it appear that concerns with global climate change increased during that period, Congress (also in 2008) passed the first increase in automobile fuel economy standards since the 1970s. Hence, it would be interesting to see how statewide attitudes toward transportation investment have changed.

The first goal of this paper is to analyze the level of support for public transportation in Michigan and to see whether it has noticeably changed from 2006. Is there now support for substantial investment in modes of transportation other than the use of private vehicles?

There are several distinct aspects to such support. One aspect is *interest in using* public transportation. The other aspect is *willingness to pay* for such support, either by paying fares, or by having tax dollars used for this purpose.

Aside from gauging the overall level of support, we want to learn the factors associated with different levels of support. Hence, we explore the association between the costs, in time and money, of using public transportation versus private vehicles as well as how concern about global climate change influences attitudes towards public transportation.

While there is a general need for improvements in both long- and short-distance public transportation, the focus here is on public transportation for traditional commuting and other daily trip-making (e.g., for getting to work, shopping, accessing medical services) since such travel accounts for the majority of traffic and transportation needs. However, the survey had some questions which measured interest in using rail transportation between metropolitan areas and this is also examined.

Methods

The data are from Michigan State University's "State of the State Survey" Fall 2008, Round 50. This was a phone survey of a random sample of the non-institutionalized, English-speaking adult population of Michigan, age 18 and over. The total sample size was 953.

The cases were weighted to make the sample more representative of the Michigan population. . Since the survey was conducted by telephone, only persons who lived in households that had landline telephones had a chance to be interviewed. This introduces a potential bias in that those who opt out of landline use in favor of cellular use may be disproportionately younger (than those who use landlines). However, according to Hembroff (2009), the weighting procedure adjusts for the different probability of selecting people of different ages, thereby minimizing such bias. (also see Blumberg and Luke, 2009). For all analysis, except for that using the AMOS software program, (which ignores weights), we used the final weights for statewide analysis.

Interviewing began on October 13, 2008 and continued through December 29, 2008. While the survey questions were developed at a time when the price of gasoline was approximately $4 per gallon, the survey was actually carried out while the price was rapidly falling, reaching well below $2 per gallon by the time the survey ended.

The results below are organized roughly along the lines of the questions that were asked.

Results

How people commute, and how they prefer to commute

All respondents were asked "How do you usually get to and from work or school each day?" Out of 953 respondents, 613 answered, 3 did not, and 337 respondents indicated that the question was inapplicable because they do not commute to work or school. Among all who answered, only 1.1% use the bus or other public transportation. As shown in Table 1, while urban communities show higher percentages of public transportation use, even there, the percentage is only slightly over 3%. Thus, despite the fact that the price of gasoline was recently higher than any time in American history, the use of public transportation (limited to the bus in Michigan) is quite low.

Table 1: Percentage Who Have Public Transportation Available Within A 10 Minute Walk and Percentage Who Use Public Transportation by Community Type

Community Type	% with bus avail-	% Who use bus to
Rural Community (N= 155)	30.55	2.01
Small City, Town, Village (N= 171)	29.97	0.53
A Suburb (N= 202)	58.50	0.16
Urban Community (N=81)	96.61	3.24
Total (N=611)	48.36	1.51

Availability of Public Transportation. All respondents who commute to work or school were also asked "Is a bus stop or other form of public transportation available within a ten-minute walk from your home?" Slightly under half (48.3%) of the total sample said "yes." However as shown in Table 1, almost all who live in urban communities and over half of those in suburbs said "yes" while only about 30% of others said "yes." Availability, at least in urban areas; is quite high.

Willingness to use public transportation and extra time involved. Since one of the typical disadvantages of using public transportation is that it often takes more time than driving, we wanted to see how much increased travel time affected people's willingness to use it. Commuters who have public transportation available were asked "Would you seriously consider taking public transportation to work or school if the door-to-door time was the same as now?" An overwhelming majority 80.0% said "yes." (None of these respondents currently takes public transit.)

Those who answered "yes" were next asked "Suppose taking public transportation took *longer* than your current travel time. How much more time, in minutes, would you be willing to spend getting back and forth to work or school in order for you seriously to consider using public transportation?" A large majority (70.7%) would be willing to use public transportation if it took no more than 10 minutes more per round-trip (see table 2). However, if the extra time required was 15 minutes, less than half (47.8%) would be willing to use it, and if it required 20 minutes extra, only 31.5% would be willing to use it.

Table 2. Number Willing To Take Public Transportation if it Takes Various Amount of Extra Time Compared to Auto

	Number	percent	cumulative %
40 minutes or more	34	7.0%	7.0%
25 or 30 minutes	62	12.8%	19.8%
20 minutes	57	11.8%	31.5%
12 or 15 minutes	79	16.3%	47.8%
10 minutes	111	22.9%	70.7%
3 to 5 minutes	12	2.5%	73.2%
0 minutes (no extra time)	32	6.6%	79.8%
Not at all	98	20.2%	100.0%
total	**485**		

We also examined these answers as a percentage of the current commute time. Over half (52.1%) would be willing to spend 25% more time. Almost a third (30.5%) would be willing to spend 50% more time, but only 10.9% would be willing to spend twice as much time. In summary, a majority of the sample claim that they would be willing to spend 25% more time commuting in order to take public transportation.

Willingness to Pay Fares. Those willing to use public transport were also asked "Suppose you could take the bus or other public transportation to work or school instead of driving, how much would you be willing to pay for a *round trip* fare?" Among those who were willing to pay and to give an answer, the median response was $3.00. However, almost half (47.6%) were willing to pay no more than $2 and less than 25% (24.2%) were willing to pay as much as $5. The median *one-way* commute distance of these respondents was 10 miles.

On the one hand, the fares that respondents say they are willing to pay **are higher** than the fares actually being charged by some public transportation systems. For example, a round-trip full fare on Lansing's CATA bus system for regular users is $2.00, when bought in packs of 10. Moreover, students and senior citizen pay only $1.20 for a single round trip CATA ride. (see http://www.cata.org/Fares/tabid/58/Default.aspx). Thus, CATA fares are below the median fare that our respondents are willing to pay. On the other hand for CATA, the average one-way mileage per passenger trip was approximately three (3) miles for FY 2008 (Oudsema 2009)—much less than respondents' median commute of 10 miles.

Moreover, the fare that respondents are willing to pay is considerably less than actual fares on many big city transit systems. While some transit systems (see table 3), have fares below $3 per round trip, two of the largest cities (New York and Chicago) have fares that are considerably higher. In addition, certain other Metro rail lines,(e.g. DC Metro and Bay Area Rapid Transit [BART]), charge fares that depend on the distance traveled. These fares are often much higher than a $3 round trip. In fact, even for the relatively short rides that stay entirely within San Francisco, BART costs $3.50 for a round trip, and within city DC Metro round trip fares can go as high $6.00.

Table 3. Typical Round-Trip Transit Fares* For Many Communities

City	Type	Round trip	Comments
Chicago - CTA	Bus	$4.30	Based on 30 day pass, with 20 round trips (additional charges may apply for express lines)
	Rail	$4.30	Based on 30 day pass, with 20 round trips (additional charges may apply for express lines)
New York - MTA	Bus	$4.45	Based on 30 day pass, with 20 round trips (additional charges may apply for express lines)
	Subway	$4.45	Based on 30 day pass, with 20 round trips (additional charges may apply for express lines)
San Francisco - SFMTA	Bus	$2.75	Based on 30 day pass, with 20 round trips (additional $5.00 per trip for special service line)
	Rail	$2.75	Based on 30 day pass, with 20 round trips (additional $5.00 per trip for special service line)
San Francisco BART	Rail	$3.50	Based on single day fare and **entirely within SF.** Rides outside SF can be much more expensive
Phoenix - Vally Metro	Bus	$2.75	Based on 31 day pass, with 20 round trips (additional charges may apply for express lines)
	Rail	$2.75	Based on 31 day pass, with 20 round trips (additional charges may apply for express lines)
Boston - MBTA	Bus	$2.00	Based on 31 day pass, with 20 round trips (additional charges may apply for express lines)
	Bus / sub-way	$2.95	Based on 31 day pass, with 20 round trips (additional charges may apply for express lines)
Detroit - DDOT	Bus	$2.35	Based on 31 day pass, with 20 round trips (additional charges may apply for express lines)
Detroit - SMART	Bus	$3.30	Based on 31 day pass, with 20 round trips (additional charges may apply for express lines)
Detroit - DDOT/ SMART	Bus	$2.48	Based on 31 day pass, with 20 round trips (Regional Pass)
Washington DC Metro	Rail	$3.30 to $6.00	**Regular** fare for rides **within DC** . Longer rides cost up to $9.00
Washington DC Metro	Rail	$2.70 to $3.70	**Reduced (**off peak) fare for rides **within DC**. Longer rides cost up to $4.70

* fares based on information from transit system websites

*Factors influencing the amount of fare one is willing to pay***.** Economists often assume that people are rational actors, with good information and choose their course of action after comparing the benefits and costs of various alternatives. Unless the public transportation system is very good, or traffic congestion is very severe (as

in some large cities) using public transportation takes considerably more time than driving, especially when the times to access the system, waiting, and getting from the stop to the ultimate destination are considered. In fact, the time to wait for and access the system is considered to be two to three times as costly as the time spent in the line-haul vehicle (see McCarthy 2001: pp. 113-114).

Even though the cost in time and convenience are often less for driving, whether the traveler believes that his/her total economic costs are less for public transportation or driving depends on several factors. While the fare for public transport is easy to determine, the real cost of driving depends on several components, some of which are not obvious to many drivers. First are the most obvious costs, those that are frequently paid and clearly related to how much one uses their car. These are the costs of fuel, and in some cases, the cost of parking. Second is the less expensive, and less frequent, cost of maintenance and equipment like tires. Lastly, there is what AAA refers to as the *ownership* costs of a car: insurance, license, registration, finance charges, and depreciation costs. Most of these annual ownership costs are independent of the number of miles a car is driven. While depreciation depends partly on the amount driven, it also contains a component related to the vehicle's age.

Let us now consider the cost of a typical 20 mile roundtrip commute. If one drives a car that gets 25 miles per gallon, then at $3 per gallon, the fuel cost is $2.40 ([$3/gal x 20 miles]/25 mpg). If one adds the AAA's (2008) estimate of 5 cents per mile as the average cost of maintenance and tires, this adds $1 to the commuting cost for a total of $3.40. If parking is free, this total cost is not very different from what the average respondent is willing to pay for public transportation.

In some large cities, like New York and Chicago, parking downtown costs over $20 per day (though somewhat less if one has a monthly permit). Driving is prohibitively costly for many and public transportation is a more attractive choice. (In such situations public transport is also likely to come more frequently and driving to take a long time.)

However, the parking situation is very different in Michigan. Downtown parking costs range from $20 to 170/month in Lansing (depending on lot location and distance from the center of downtown) and in Detroit from $65 to 175/month. Data from the current survey indicate that only 7.6% of Michigan commuters pay to park where they work or go to school (11.3% in urban communities and 3.4% elsewhere). Moreover, only 1.4% pay at least $100 per month. So free or lower cost parking is another significant reason why so few in Michigan are interested in public transportation as compared to some other areas with large cities.

The economic advantage of public transportation is pronounced if commuting via public transportation would permit one to do with one less car (a real possibility in some multiple-car families). For here, one is saving not just the per-mile operating costs discussed above, but also the ownership costs, which AAA (2008) estimates at $5,404 per year for a car driven 10,000 miles per year and which, by extrapolation, we estimate at $5,214 per year. Even if one used public transportation every day of the year, and paid $14 per day in fares, it would cost less than the ownership cost alone.

However, there is one important caveat to all of this. The option of doing with one less car requires that walking to public transportation be a reasonable option. Table 1 indicates that for people in urban communities, this is almost universal but for others, it is frequently not the case. Nonetheless, there are many Michiganders who could walk to public transportation and still choose not to use it (perhaps because it takes more time).

Support for Public Funding of Public Transportation. All respondents were asked whether they agreed with the statement "It is better for Michigan's economy to improve public transportation than to *lower* taxes." A substantial majority (61.6%) agreed or strongly agreed while 37.7% disagreed agreed or strongly disagreed.

While advocates of public transportation might be somewhat encouraged by this response, the fact that a majority was *not* inclined to *lower* taxes does *not* mean that they would be willing to *raise* taxes. Indeed, answers to other questions in the survey show considerable resistance to tax increases.

While 82.8% of the sample rated the condition of Michigan's roads "fair" or "poor" in approximately equal numbers, there was little support for an increase in the state's gasoline tax for the purpose of bringing Michigan roads up to the level of those in Ohio (offered as a reference point). Over half (55.6%) would *not* support *any* tax increase for this purpose and only 21.5% would support an increase of more than 5 cents per gallon.

How should the Michigan government spend transportation money? All were asked "I'm going to read you three different ways that the state could spend money set aside for transportation. Please tell me which one should be the state's top priority." Results are in Table 4 below.

Table 4. Respondent's View of Best Use of State Transportation Funds

	Frequency	Percent
Expanding The Current Highway System	213	23.7
Improving Public Transportation	373	41.4
Establishing High Speed Rail Systems	315	34.9
Total	901	100.0

Here again, at first glance, there is a high level of support for public transportation. Of the valid responses, over three-quarters (76.3%) want to improve *public transportation* either within a metropolitan area or between cities. Less than one quarter want to *expand* the current *highway system*. But again, these encouraging results conceal as much as they reveal. It is not clear how responses would have changed if additional choices had been offered. For example, the MDOT 2006 report, cited earlier, found that most people regarded *improving* the *highway* system as the highest priority for public expenditures. The question in this survey was concerned with "expansion" of highways and may have masked the respondents' true preferences.

Contributions of Tax Funding. All respondents were asked "Public transportation is generally funded through a combination of fares paid by users and tax dollars from the government. What percentage of funding for public transportation do you think should come from tax dollars?" Of the 58.7% of the sample who answered this question, the median response was that taxes should pay for only 10% of the cost. At the upper end of support, 12.4% said taxes should pay for 50% of the cost and 6.7% propose that taxes pay more than that. In fact, taxes and federal grants (from federal taxes) pay much more than 10% of the cost of most transit systems While it is difficult to find accurate estimates of subsidies per rider or trip taken, some researchers (Ennis 2008; Mallinckrodt 2007) have estimated this figure to be as high as 75% of the overall *operating* costs (which does not even consider any of the *capital* costs). The responses here imply that respondents probably know very little about the true costs of providing public transportation and who pays it.

Interest in Commuter Rail Service. In addition to questions about existing public transportation, respondents were also asked whether they would use commuter rail service (if it was available) between cities in Michigan. Note that the survey questions were not designed to provide a demand estimate per se, but rather to provide an indication of the level of general support for commuter rail. That caveat notwithstanding, two-thirds of those responding to the question indicated that they would use commuter rail service—certainly a very strong endorsement of the concept. However, respondents were also asked to identify "[between what] two cities would you most likely use a commuter rail line" and "realistically, about how many times per month you would be likely to use" such a system between the two cities mentioned.

The responses to these questions were far less supportive of commuter rail. The map in Figure 1 shows the Michigan cities that were identified and the frequency of travel per month. The map is accompanied by Table 4, showing trip frequencies for selected city pairs. The map shows that the identified cities are well scattered across the state although the expected corridors (e.g., Ann Arbor-Detroit) are more often named. However, the geographical dispersion (and lack of high "trip frequencies") indicates that many respondents do not have any notion of how commuter rail service could be realistically provided in the state.

The tables showing the trip frequencies involving Ann Arbor, Detroit, Grand Rapids, and Lansing provide even less compelling support. What is telling about these tables is that these are "realistic" expected trip frequencies by respondents who said they would use commuter rail—yet the stated frequencies of travel per month consistently show that the respondents would NOT use commuter rail to commute. The latter would require frequencies consistently on the order of 16-20 trips per month or higher. This is not the case; the vast majority of the respondents indicated that they would use such service less than 5 times a month. It can also be argued that responses to such survey questions tend to elicit optimistic assessments and that true trip frequencies would actually be less.

Our conclusion from these responses, is that while respondents felt fairly positively about using commuter rail, when pressed for details they revealed that they neither had a firm understanding of what commuter rail really is nor were very likely to use it for commuting.

Concern about Global Warming and Energy Conserving Behaviors. Respondents were asked to respond to the statement "Life on earth will continue without major disruptions only if we take immediate and drastic action to reduce global climate change. Would you say you strongly agree, somewhat agree, somewhat disagree, or strongly disagree?"

Over three quarters (75.8%) either somewhat or strongly-agreed. The exact question was also asked of a national US sample in July 2007 with only 62% agreeing (Leiserowitz (2007). However, it is not clear how much of the difference in responses is a result of the different times or the different populations (Michigan vs. national) surveyed at these times.

We also asked two questions, about energy conservation behaviors, that are not directly related to attitudes towards public transportation: "Have you combined running errands thus eliminating trips around town?" and "Have you switched some of your light bulbs to fluorescent light bulbs?" The vast majority of respondents responded positively to both—92.1 and 72.1%, respectively.

Statistical Analysis

Multivariate Analysis of Attitudes Towards Public Transportation. We now present a statistical analysis of a multivariate causal model predicting various attitudes towards public transportation. The analysis was done via structural equation modeling (SEM) using AMOS 17.

The analysis found that the following three attitudes towards public transportation are distinct from one another, and cannot be regarded as different indicators of a smaller number (one or two) of attitudes towards public transportation. They are: a) how much fare one is willing to pay for public transportation; b) what proportion of cost of public transportation should be paid by tax funds; and c) how much extra time (as a proportion of current commute time) one would be willing to spend to use public transportation. Models that assumed that these were indicators of a smaller number of factors did not satisfactorily fit the data.

Hypotheses to be tested. We tested the following hypotheses regarding attitudes toward public transportation:

H1: A more positive attitude towards energy conservation increases the favorability of all three attitudes towards public transportation. In other words, a positive attitude towards energy conservation is associated with willingness to: a) spend extra time to take public transportation; b) pay a higher fare; and c) support more tax money being spent on public transportation.

H2: Greater parking cost per year increases favorability of all three attitudes toward public transportation (by increasing the motivation to use public transportation).

H3: Greater commuting distance increases willingness to pay a higher fare (because greater distance increases the cost of driving).

H4: Greater fuel consumption by one's car increases willingness to pay for public transportation (because the cost of driving increases).

H5: Having a greater number of children increases fuel consumption (by causing people to drive a larger car).

H6: More pro-conservation attitudes lead to driving a more fuel-efficient car.

H7: Greater income leads to more willingness to pay a higher fare but less willingness to spend extra time on public transportation. (As compared to less wealthy people, more wealthy people can better afford the dollar cost of higher fares, but are likely view their time as more valuable.)

Variable construction. An assumption in structural equation modeling is that all variables are normally distributed. In order to satisfy this assumption, those variables which were highly skewed were logarithmically transformed to approximate normality. These were: commuting distance, fare that one is willing to pay, parking cost per year, and gallons of fuel used per 100 miles (which better reflects the costs of commuting than does miles per gallon).

The amount of time one is willing to spend on public transportation was operationalized by combining

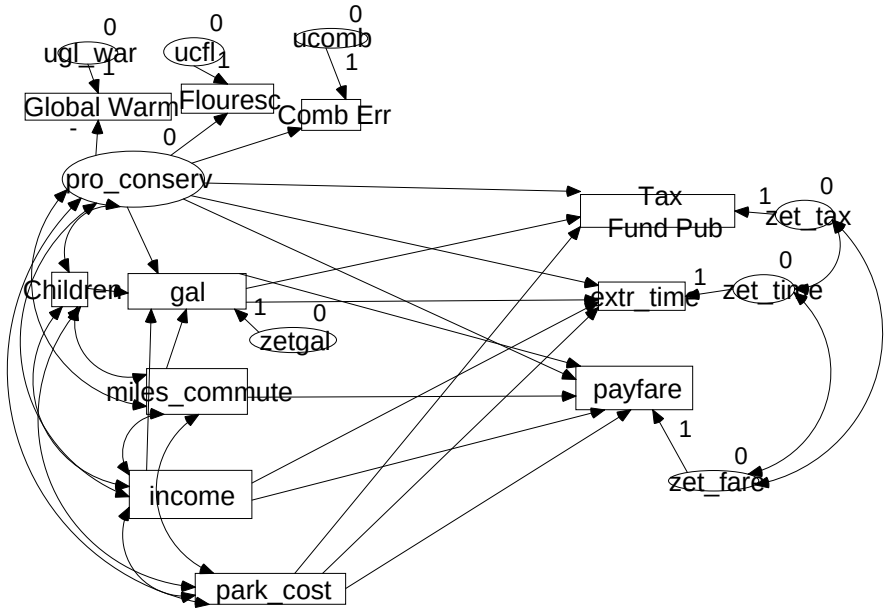
two variables (answers to survey questions): a) would you seriously consider public transportation if it took the same time as your current commute; and b) how much *extra* time would you be willing to spend? The proportion of the original commute that the respondents would tolerate as an added time cost was used as the indicator. For those who said they would *not* use public transportation, if it took the *same* amount of time, we assumed that they would require public transportation to take substantially less time (30%) in order for them to use it. To reduce skew for this variable, we used the following transformation:

$$\text{if } x \geq 0,\ x^* = \sqrt{x},\ \text{if } x < 0,\ x^* = -\sqrt{-x}.$$

We used three indicators of attitudes toward energy conservation: a) concern about global warming; b) switching lights to fluorescents; and c) combining errands. While the correlations among these three variable were very modest (less than 0.2), for the obvious reason that these energy-saving behaviors may reflect a desire to save money even more than a desire to protect the environment, a model which treats these variables as indicators of an underlying common factor fits very well

Tests of the Model. The model used is in figure 2. The model is highly overidentified with 23 degrees of freedom (23 more empirical covariances than parameters to estimate). The model fits extremely well: χ^2 (23) =23.2 , p =.44; CFI =.997. RMSEA = .003, and its 90% CI is from .000 to .027.

Figure 2. Causal Model Predicting attitudes towards public transportation. Note that variables that start with *zet* and *u* are unobserved error terms.



Confirmatory Factor Analysis. The standardized loadings of indicators of concern with energy conservation are in Table 5. These loadings are small, but none-the-less fit a model treating them as loading on one factor. Using these variables as indicators of a common attitude provides an estimate of reliability which SEM uses to correct for attenuation from unreliability.

Table 5. Frequencies of trips/month for selected two-way city pairs

Orgin city	Destination city	Dist. (mi.)	Freq-uency	Trips/month 0-2	3-5	6-10	11-15	16-20	20+	Average
Ann Arbor	Ypsilanti	7	1		1					5.0
	Detroit	44	11 (26)*	6 (16)	3 (4)	(3)	1		(2)	3.6 (4.8)
	Pontiac	45	1 (4)		1 (1)	(1)			(2)	5.0 (18.0)
	Royal Oak	46	2 (1)	1	1 (1)					2.5 (4.0)
	Flint	57	1				1			15.0
	Lansing	66	2 (2)	2	(1)	(1)				1.0 (6.0)
	Unknown	N/A	0	1						0.0

Orgin city	Destination city	Dist. (mi.)	Freq-uency	Trips/month 0-2	3-5	6-10	11-15	16-20	20+	Average
Detroit	Owosso	4	1		1					3.0
	Groose Pointe	9	1 (1)					(1)		N/A (20.0)
	Dearborn	12	5 (2)	(1)	1		2	1		12.8 (2.0)
	Detroit Suburbs	12	1	1						2.0
	Harper Woods	13	1			1				8.0
	Allen Park	14	2	1				1		10.0
	Southfield	17	12 (2)	1 (1)	5	1	3	(1)	1	8.5 (11.0)
	Roseville	18	1		1					5.0
	Livonia	20	2 (1)	1			1	(1)		8.5 (20.0)
	Romulus	21	1		1					3.0
	Sterling Heights	22	1 (3)	(2)		1 (1)				7.0 (5.3)
	Troy	23	2						1	31.0
	Bloomfield	25	1		1	1				4.5
	Plymouth	25	1						1	31.0
	Westland	26	3	1	1				1	8.3
	Mount Clemens	27	1	1						2.0
	Rochester	28	2						2	31.0
	Pontiac	31	4 (4)	1	1 (1)	(1)	1		1 (2)	9.3 (18.0)
	New Baltimore	36	1		1					3.0
	Ann Arbor	44	26 (11)	16 (6)	4 (3)	3	(1)		2	4.8 (3.6)
	Toledo	59	3 (1)	2	(1)				1	11.0 (3.0)
	Port Huron	62	1 (2)	(1)	(1)	1				8.0 (3.5)
	Flint	70	5 (10)	5 (6)	(3)			(1)		1.4 (3.8)
	Lansing	93	18 (16)	12 (8)	2 (7)		1		1	3.7 (2.3)
	Saginaw	104	1 (5)	1 (3)	(2)					1.0 (2.6)
	Grand Rapids	160	10 (15)	7 (14)	2 (1)					1.6 (1.4)
	Muskegon	199	1 (1)	(1)	1					3.0 (1.0)
	Traverse City	255	1 (1)	(1)		1				10.0 (1.0)
	Chicago	282	11 (3)	9 (2)	1 (1)					1.4 (2.7)
	Unknown	N/A	1 (1)	(1)						N/A (0.0)

Orgin city	Destination city	Dist. (mi.)	Freq-uency	Trips/month 0-2	3-5	6-10	11-15	16-20	20+	Average
Grand Rapids	Dorr	20	1		1					4.0
	Belding	27	1			1				10.0
	Holland	29	4 (1)	1	2	1 (1)				3.8 (10.0)
	Muskegon	40	1 (6)	1 (3)	(2)			1		1.0 (5.3)
	Kalamazoo	51	8 (6)	4 (5)	1	1	1	(1)		4.3 (4.2)
	Portage	57	1	1						1.0
	Lansing	69	13 (7)	9 (4)	4 (1)					1.7 (2.0)
	East Lansing	71	1		1					4.0
	Battle Creek	75	2 (1)	1	1 (1)					2.0 (4.0)
	Saginaw	114	1	1						2.0
	Flint	115	1	1						2.0
	Ann Arbor	132	3	2	1					1.3
	Farmington Hills	135	1	1						1.0
	Pontiac	144	1	1						1.0
	Detroit	160	15 (10)	14 (7)	1 (2)					1.4 (1.6)
	Chicago	178	1 (1)	(1)						N/A (1.0)

Orgin city	Destination city	Dist (mi.)	Freq-uency	Trips/month 0-2	3-5	6-10	11-15	16-20	20+	Average
Lansing	Bath	13	1	1						0.0
	Williamston	14	1					1		20.0
	Jackson	47	3 (3)	1 (2)	1 (1)		1			6.0 (2.3)
	Flint	57	2	1				1		11.0
	Ann Arbor	65	2 (2)	(2)	1	1				6.0 (1.0)
	Grand Rapids	68	7 (13)	4 (9)	1 (4)					2.0 (1.7)
	Kalamazoo	76	1 (3)	1(2)						1.0 (0.5)
	Detroit	93	16 (18)	8 (12)	7 (2)		(1)		(1)	2.3 (3.7)
	Port Huron	121	1 (1)	1 (1)						2.0 (1.0)
	Traverse City	195	2	2						1.0

* Trip frequencies are shown in both directions based on city named first--e.g., for the Ann Arbor-Detroit pair, 11 respondents named Ann Arbor first and indicated that they would travel from Ann Arbor to Detroit, and (26) named Detroit first and indicated that they would travel from Detroit to Ann Arbor

The correlations among the three errors of predictions for dependent variables (those which start with *zet*) are estimates of the degree to which the dependent variables influence each other. The largest, and the only one that is statistically significant, is the correlation between zet_time and zet_fare, which is -.161, $p < .001$. In short, all else being equal, those willing to spend more time on public transportation are less willing to pay higher fares. This is surprising, and cannot be explained by the effects of income, as income is one of the predictors being controlled.

Tests of hypothesis. Table 6 contains the coefficients predicting the three attitudes towards public transportation. These coefficients provide the tests of all hypotheses stated above except for hypotheses 5 and 6. While none of these dependent variables is explained very well, the variable that is best explained, in terms of R^2, is willingness to use tax dollars for public transportation. Results of the tests of our hypotheses are reported below.

Table 6. Standardized loadings of indicators of concern with energy conservation

Observed Variable	Standardized Loading on
concern with global warming	.464***
combining errands	.334***
switching to fluorescent lights	.275***

*** $p < .001$

Table 7. Standardized Regression Coefficients of Predictors of Attitudes Towards Public Transportation

Predictor	Dependent Variable=	Dependent Variable=	Dependent Variable=
gallons used commuting	-.029	.040	.022
pro-conservation of en-	.310 **	.196*	.183^{+}
parking cost	.134*	.074	.025
income	0[a]	-.053	.021
commuting distance	0[a]	.163**	0[a]
R^2	.112	.063	.041

Coefficient has been set to be equal zero, rather than estimated.

+ $p < .10$, * $p < .05$, **, $p < .01$

H1: A more positive attitude towards energy conservation increases the favorability of all three attitudes towards public transportation. In other words, a positive attitude towards energy conservation is associated with willingness to: a) spend extra time to take public transportation; b) pay a higher fare; and c) support more tax money being spent on public transportation.

This is confirmed for all three attitudes. For two of the three attitudes (tax subsidies for public transportation and willingness to spend extra time), the result is significant at $p < .05$ and for the third it is significant at $p < .10$. The table also indicates that attitude towards energy conservation is the best predictor of all three dependent variables.

H2: Greater parking cost per year increases favorability of all three attitudes toward public transportation. This hypothesis is supported ($p < .05$) for the dependent variable percentage of tax funds that may be used. For the other two dependent variables, the coefficients are quite small and not significant.

H3: Greater commuting distance increases willingness to pay a higher fare. This is supported at $p < .001$.

H4: Greater fuel consumption by one's car increases willingness to pay for public transportation. This is not supported—the predictor has a trivial and insignificant effect on the dependent variable.

H5: Having a greater number of children increases fuel consumption.
Results, not shown in this table, show that the standardized coefficient is trivial (.050) and insignificant.

H6: More pro-conservation attitudes lead to owning a more fuel-efficient car. This is supported. Results, not shown in this table, show that the standardized coefficient of pro-conservation attitudes on fuel consumption per mile by one's car is -.236, $p = .02$.

H7: Greater income leads to more willingness to pay a higher fare but less willingness to spend extra time on public transportation. This is not supported; income has no significant effect on either variable.

Summary and Discussion

Only a tiny proportion of Michigan residents currently commute via public transportation. Indeed, only about half of the residents claim to have public transportation available within a ten-minute walk of their home but that percentage is much higher for those living in urban areas.

There is some good news and some bad news for public transportation advocates. The good news is that a large majority (80%) say that they would seriously consider taking public transportation to work or school if the door-to-door time was the same as now. Moreover, most of those who were willing to use public transportation if it took the *same* amount of time, said that they would be willing to spend up to 10 minutes more on their round trip commute in order to use public transportation.

The bad news is that the likelihood that public transportation can achieve more widespread coverage any time soon is not great. This is especially true, given the limited amount of financial support that people are willing to provide to public transportation. The median fare that people are willing to pay is $3, for a round trip which averages about ten miles each way. As indicated earlier, such fares are lower than many of the actual fares in large public transportation systems and those systems receive substantial subsidies. Not only are respondents unwilling to pay a fare that would cover the full cost of transportation, most do not favor an adequate subsidy to support public transportation—the median respondent favored a tax subsidy of only 10% of the total cost, a small fraction of the typical subsidies for transit systems.

We suspect that such weak support for public transportation in Michigan is because the daily *operating* cost of commuting by car is quite low. The cost of *owning* a car for commuting is, of course, much higher. But until traffic congestion further increases the time cost of driving, or higher fuel prices, and/or parking costs considerably increase the dollar cost of driving, or better public transportation reduces the time cost of that alternative, we expect that almost all Michiganders will continue to see a car as essential for commuting.

The variable that has the greatest association with the willingness to use and support public transportation is attitude towards energy conservation. This effect however is quite modest.

It is no surprise that being concerned about conserving energy is associated with being favorable to supporting public transportation. It is, however, striking that our other predictors have such a *weak* association with attitudes towards public transportation.

However, the finding that this effect is larger than the effects of other predictors may, at least in part, be a statistical artifact. This variable, and only this one, has multiple indicators. Hence, only for this variable can we estimate reliability and only for this variable, will the coefficients be increased by correcting for attenuation for unreliability. On the other hand, the other predictors (amount paid for parking, income, personal vehicle fuel efficiency, and commuting distance) are all variables for which the respondents' reports may be highly accurate and reliable. If so, the correction for unreliability for those variables may not be very great and our finding may *not* be a statistical artifact.

The data regarding interest in commuter rail service indicate that while respondents support such services in the abstract, there is little evidence that they have a clear understanding of what commuter rail service really is. In addition, their predictions of how often they would use it suggest that only a tiny fraction of those "supporting" commuter rail would actually use it for regular commuting. Moreover, many of the respondents chose city- pairs in a way that suggested that they were confusing commuter rail with intercity rail. Combined with other indications of the respondents reluctance to pay realistic fares for transit and the lack of support for investing public money (i.e., tax revenues), a bleak picture emerges for the possibility of having commuter rail any time soon.

In summary, it appears that substantial increases in the use of public transportation will require some combination of the following: a) increases in the dollar cost of driving; b) congestion increasing the time cost of driving and c) increased housing density, which can make possible more frequent public transportation.

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