Effects of Rising Gas Prices on Bus Ridership for Small Urban and Rural Transit Systems

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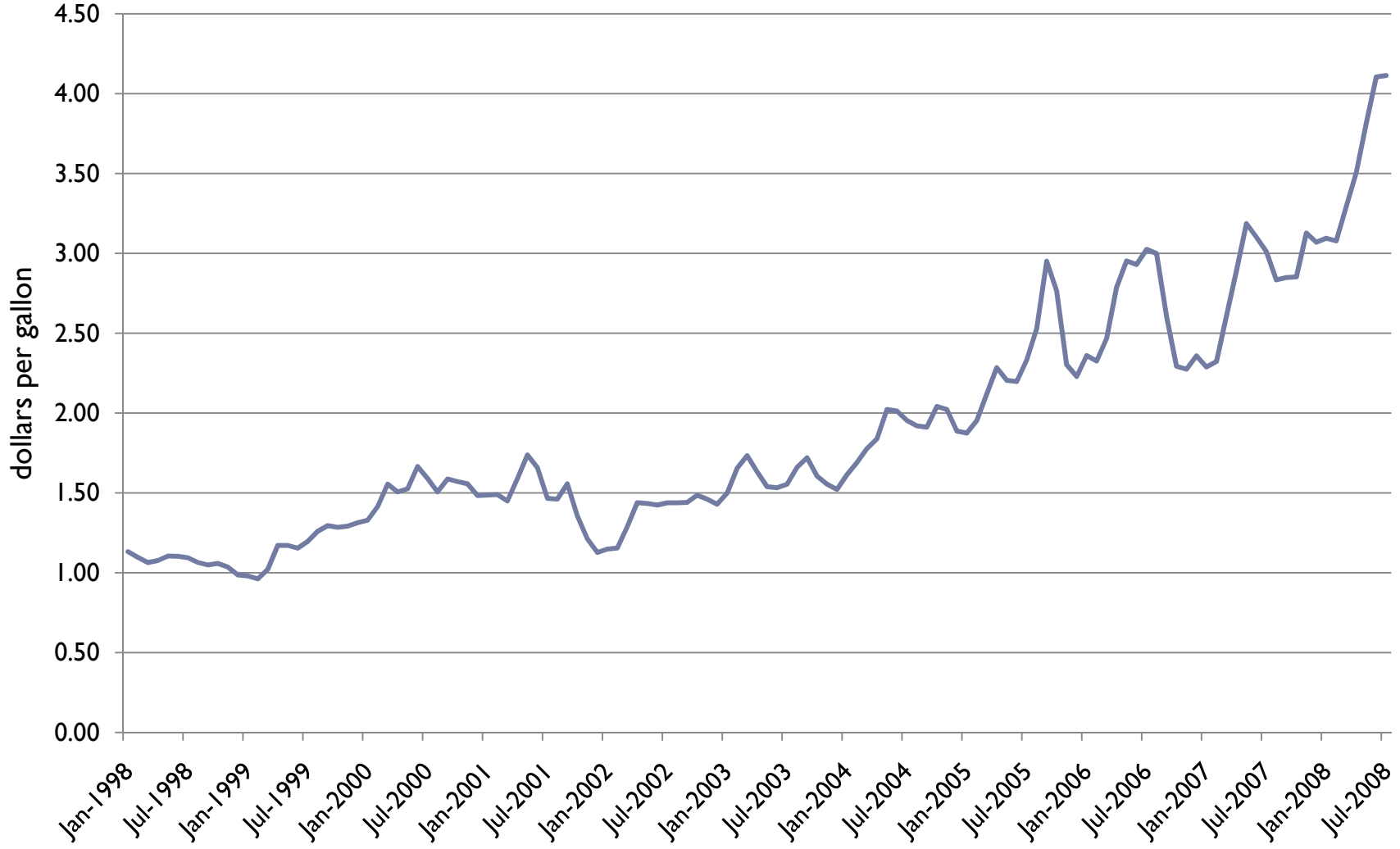
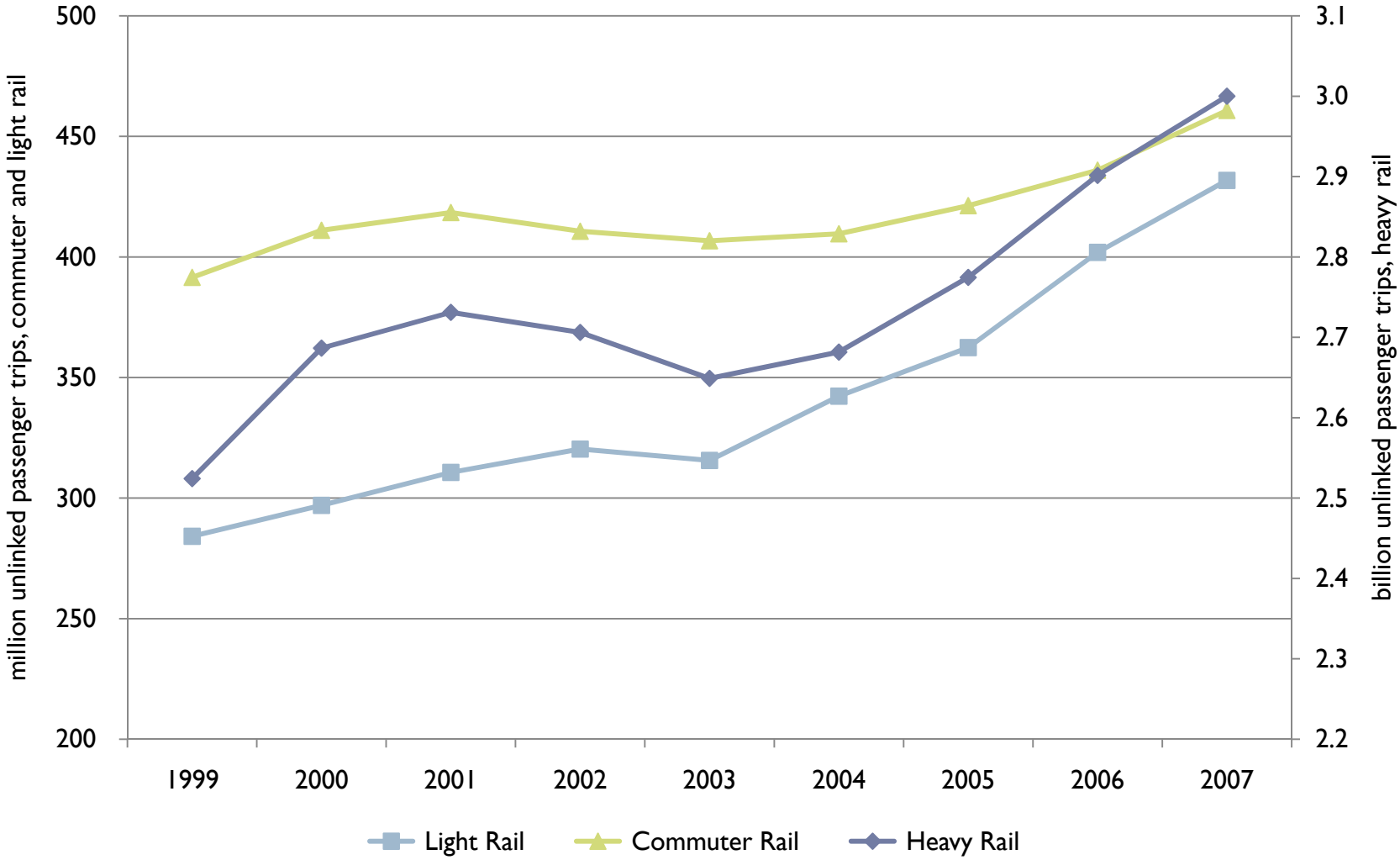
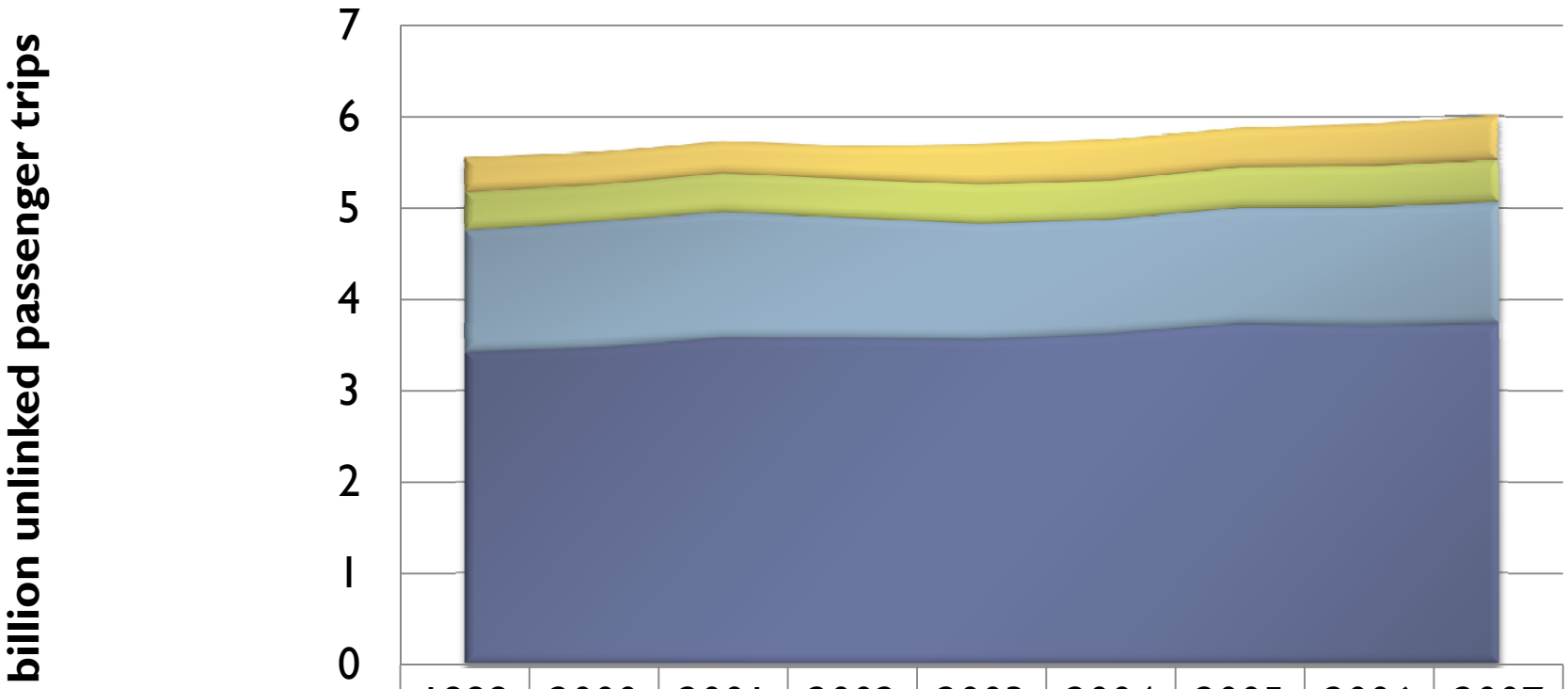
U.S. Average Gasoline Price



Trends in Rail Ridership

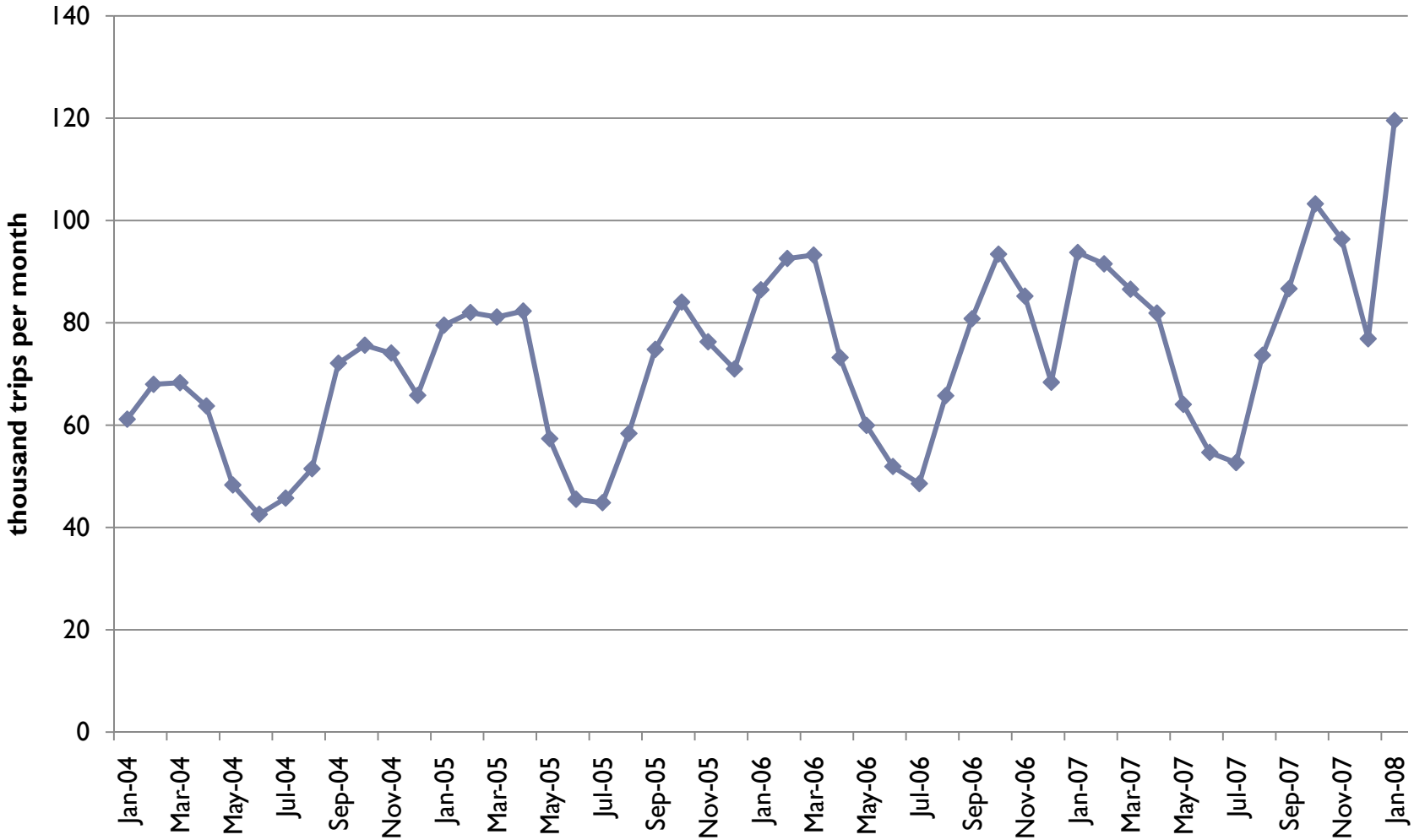


Trends in Bus Ridership

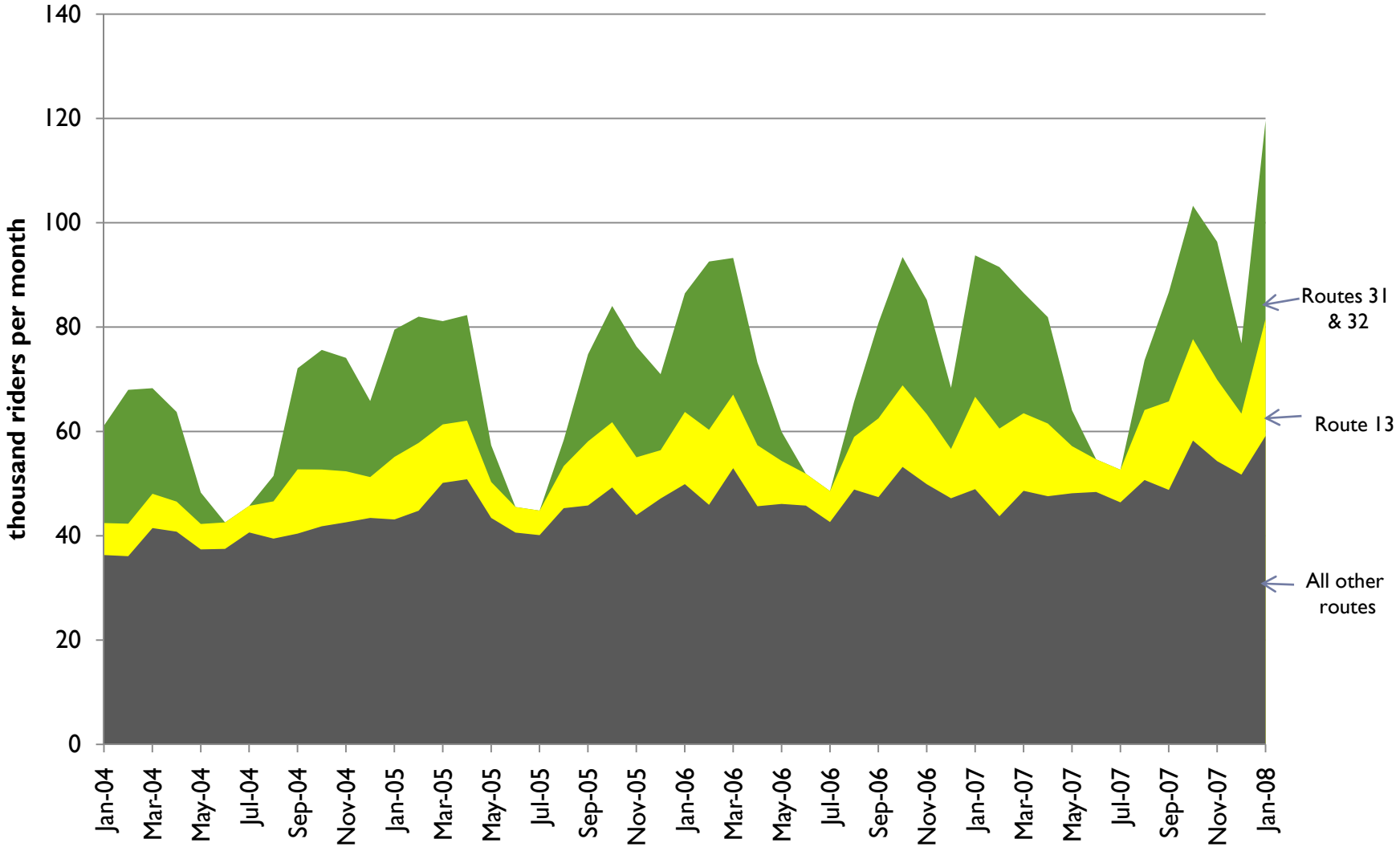


	1999	2000	2001	2002	2003	2004	2005	2006	2007
Below 100,000	0.38	0.35	0.34	0.36	0.44	0.44	0.42	0.45	0.48
100,000-499,999	0.42	0.41	0.42	0.42	0.43	0.43	0.44	0.45	0.46
500,000-1,999,999	1.33	1.37	1.38	1.32	1.27	1.25	1.27	1.30	1.32
2,000,000+	3.42	3.47	3.58	3.57	3.56	3.62	3.73	3.71	3.74

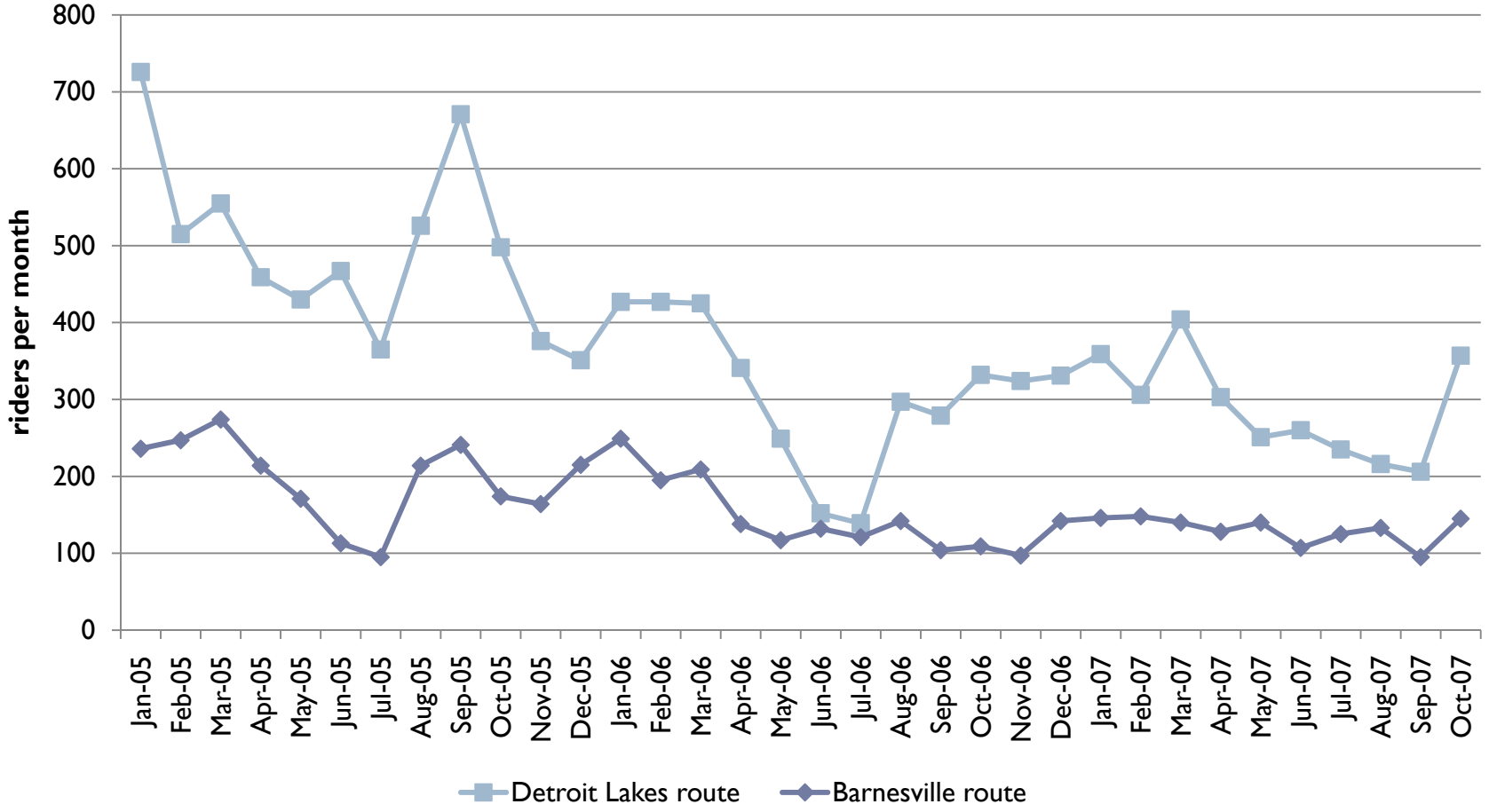
Fargo MAT Ridership



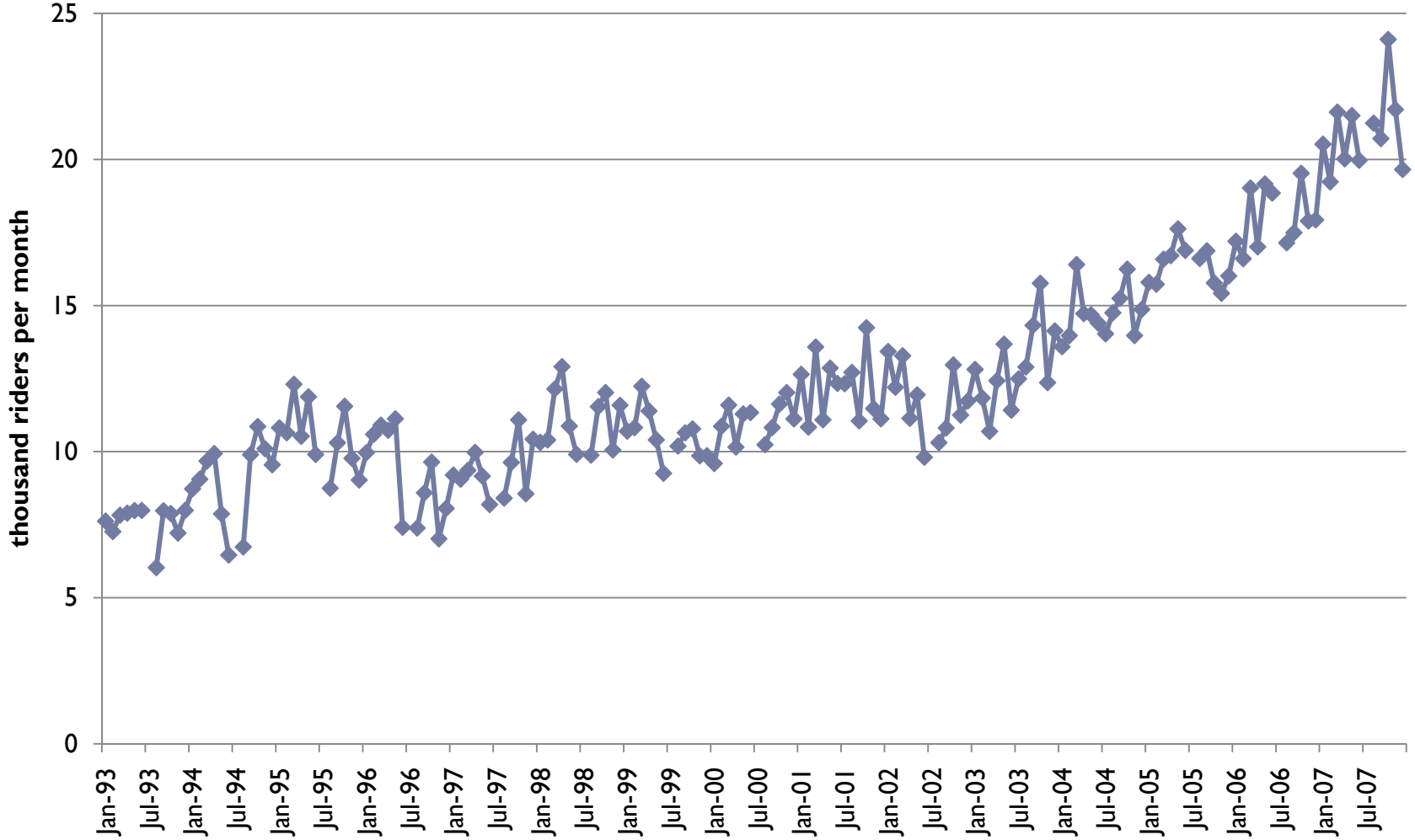
Fargo MAT Ridership



Ridership for Clay County Rural Transit Commuter Routes



The Cheyenne Transit Program Ridership



Factors Affecting Ridership

- Internal factors
  - Fares, service quantity and quality
- External factors
  - Gas price, socioeconomic factors (employment level, income level, car ownership), spatial factors (parking cost, population densities), and others

Previous Research on Gas Prices and Ridership

- Ridership has generally not been too responsive.
- Effects differ from city to city and system to system.
- Rail tends to be affected more.
- Demand for longer-distance transit trips is affected more.
- Commuters and students are more likely to switch to transit than shoppers or leisure travelers.
- Long-run effects differ from short-run effects.

Empirical Model

- Polynomial Distributed Lag Model
  - Applied to monthly data from APTA and three individual transit systems.
  - Ridership is estimated as a function of current gas price, previous gas prices, seasonality, trends, changes in fares or service levels, other community-specific variables.
- Panel Data Model
  - Applied to annual data from the National Transit Database for 11 small urban transit systems of the Upper Great Plains.
  - Ridership is estimated as a function of regional gas price, service quantity, fares, size of labor force, unemployment rate, time trend, cross section dummy variables, dummy variables for specific systems (e.g., implementation of U-Pass system in Fargo).

Results from Aggregate Bus Model

Size of City	Estimated Long-Run Elasticity	Time to Realize Full Effect
2 million +	0.12	3 months
500,000 – 2 million	0.13	3 months
100,000 – 500,000	0.16	8 months
Under 100,000	0.08	8 months

Results for Fargo MAT and the Cheyenne Transit Program

	Estimated Long-Run Elasticity	Time to Realize Full Effect
Fargo MAT	0.22	3 months
Cheyenne Transit Program	0.47	18 months

Results for Clay County Rural Transit

	Detroit Lakes Route	Barnesville Route
GP_t	0.065	0.042
GP_{t-1}	-	0.025
GP_{t-2}	-	0.012
GP_{t-3}	-0.035	-
Cumulative effect	0.03	0.074
Long-run elasticity	0.5	4

Other Results

- Significant seasonality in ridership.
- North Dakota State University has had a significant impact on ridership for Fargo's MAT.
- A decrease in service in Fall 2005 for CCRT had a large negative effect on ridership, and an increase in fares also had a negative, but much smaller, effect.
- Service changes have affected ridership in Cheyenne.
- Ridership is also trending upward in Cheyenne due to other factors.

Panel Data Model

- Annual data for 11 transit systems from the Upper Great Plains for 1997-2006
  - Duluth Transit Authority (Duluth, MN)
  - St. Cloud Metropolitan Transit Commission (St. Cloud, MN)
  - City of Rochester Public Transportation (Rochester, MN)
  - Sioux Falls Transit (Sioux Falls, SD)
  - Fargo-Moorhead Metro Area Transit (Fargo, ND/Moorhead, MN)
  - Billings Metropolitan Transit (Billings, MT)
  - Cities Area Transit (Grand Forks, ND)
  - Missoula Urban Transportation District (Missoula, MT)
  - Great Falls Transit District (Great Falls, MT)
  - Rapid Transit System (Rapid City, SD)
  - City of Cheyenne Transit Program (Cheyenne, WY)

Panel Data Results

	Estimate	t-value
Gas price	0.12	2.11**
Service miles	0.24	2.86**
Fare	-0.45	-5.73**
Labor force	0.01	0.01
Unemployment	-0.13	-2.50**

- Trend variables and dummy variables are also highly significant.

Average Annual Growth Rates for Fare Revenue and Fuel Costs, 2002-2006

	Fare Revenue	Fuel & Lube Costs
Duluth Transit Authority	7.7%	22.2%
St. Cloud Metro Transit Commission	6.2%	26.9%
Sioux Falls Transit	5.4%	32.3%
Fargo-Moorhead MAT	12.2%	40.3%
Billings Metropolitan Transit	4.9%	24.0%
Cities Area Transit	2.1%	24.7%
Missoula Transportation District	1.4%	17.8%
Great Falls Transit District	4.7%	23.1%
Rapid Transit System	4.5%	29.2%
Cheyenne Transit Program	2.9%	25.0%

Comparison of Fare Revenue and Fuel Expense Increases, 2002-2006

	Fare Revenue Increase	Fuel & Lube Expense Increase	Difference
	(thousand dollars)		
Duluth Transit Authority	487	497	-10
St. Cloud Metro Transit	166	342	-176
Sioux Falls Transit	76	154	-78
Fargo-Moorhead MAT	215	371	-156
Billings Metropolitan Transit	36	182	-146
Cities Area Transit	12	120	-109
Missoula Transportation District	19	113	-94
Great Falls Transit District	29	143	-115
Rapid Transit System	20	43	-23
Cheyenne Transit Program	9	65	-55

Conclusions

- Ridership has been increasing for transit systems of all types.
- Previous research shows that demand for transit with respect to gas prices has been very inelastic.
- Results from this study show elasticity estimates ranging from 0.08 to 0.5, averaging around 0.1-0.2.

Conclusions

- While the elasticities are small, there is still a measurable impact on ridership due to the substantial increases in gas prices.
- Further research with updated data could be needed to determine if the elasticities change as prices continue rising (do motorists have a tipping point?).

Conclusions

- Motorists in larger urban areas are quicker to switch to transit, possibly due to greater familiarity.
- Over time, the response in small urban and rural areas can be just as great.
- Ridership on long-distance commuter routes could benefit the most.

Conclusions

- The growth in fare revenues has not been enough to offset the large increases in fuel costs.
- Demand for service is increasing while operating costs are increasing.
- Transit agencies will have difficulties expanding service to meet the growing demand due to budget pressures caused by higher fuel costs.

Thank you.