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Efficient Demand Responsive Transit

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Project Funded by PATH



Project Objective

**Benchmark the impact of
Advanced Technologies and
Management Practices on the
Productivity,
Cost Efficiency, and
Effectiveness of
Demand Responsive Transit Systems**

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Advanced Technologies

- **Advanced Communications**
- **Automated Vehicle Location**
- **Automated Fare Payment**
- **Automated Transit Information**
- **Paratransit CAD System**



Management Practices

- **Financial Incentives**
- **Financial Penalties**
- **Ridesharing**
- **Agency Administration**
- **Contracted Administration**
- **Consumer Choice**



DRT Benchmarking Study

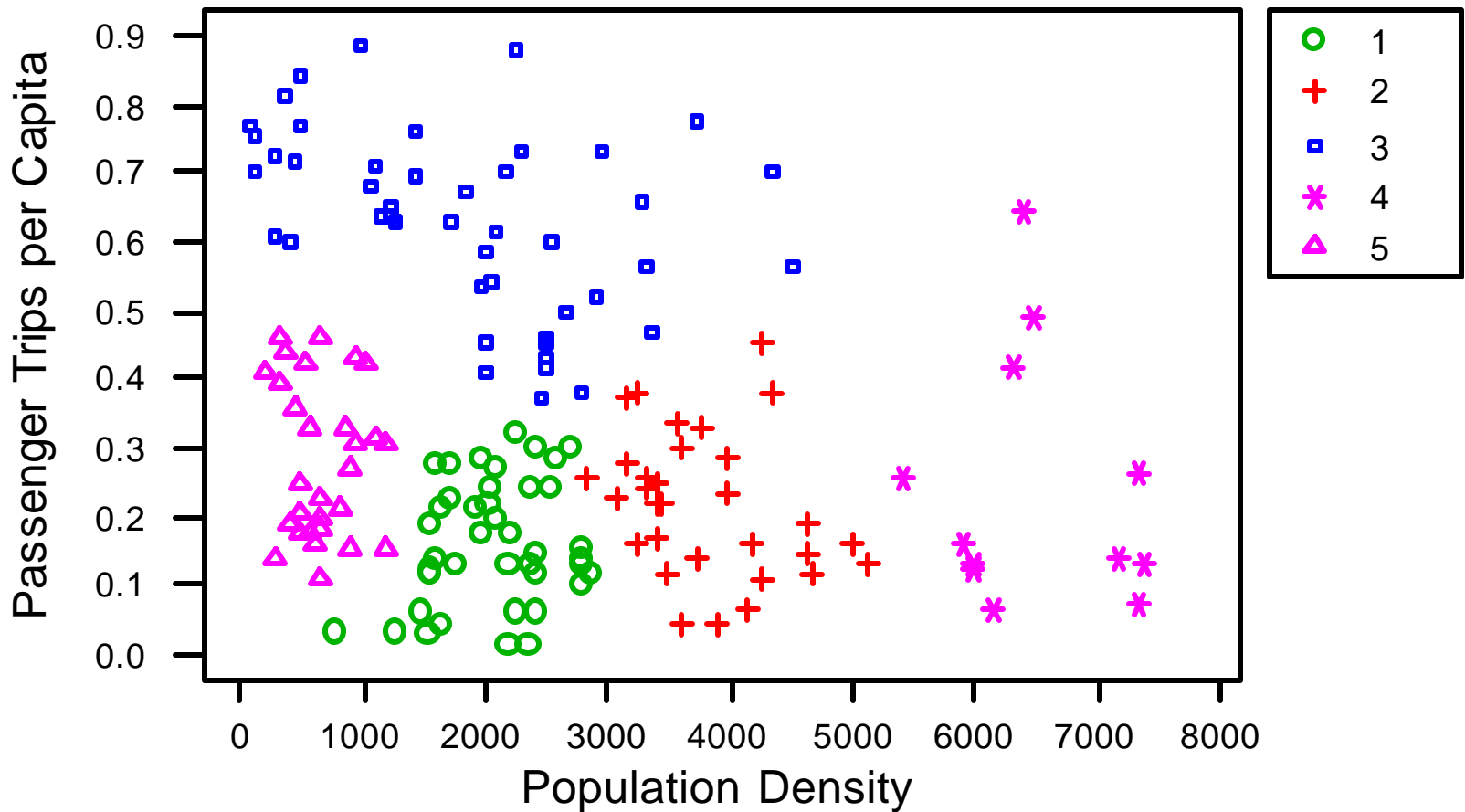
- **Surveyed**
 - 180 agencies listed in 1999 NTD as serving populations larger than 200,000
 - 25 agencies from California serving populations smaller than 200,000
- **Responses**
 - 62 large national agencies
 - 13 small California agencies
- **Performance Data**
 - NTD years: 1997, 1998, and 1999

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Demographic Variables

- **Population Density**
- **Passenger Trips per Capita**
- **Passenger Trips per Vehicle**

Demographic Clusters





Demographic Segmentation

	Surveyed	Responses
Cluster 1	41	15
Cluster 2	29	9
Cluster 3	48	20
Cluster 5	29	9
Cluster 4 & Others	33	9
Small CA Agencies	25	13



Management Practices

(Responding National Agencies)

	No	Yes	Implemented 96-99
Financial incentives	36	26	12
Financial penalties	25	37	14
Ridesharing	25	37	2
Agency administration	19	43	7
Contracted administration	37	25	1
Consumer choice	57	5	1



Advanced Technologies

(Responding National Agencies)

	No	Yes	Implemented 96-99
Advanced communications	33	29	8
Automated vehicle location	57	5	2
Automated fare payment	58	4	3
Automated transit information	61	1	0
Paratransit CAD system	29	33	16



Performance Measures

- **System Productivity**
 - Revenue Miles per Vehicle
 - Revenue Miles per Total Vehicle Mile
 - Passenger Miles per Revenue Mile
 - Passenger Trips per Revenue Mile
- **Cost Efficiency**
 - Operating Expense per Passenger Trip
 - Operating Expense per Revenue Mile
 - Operating Expense per Passenger Mile
- **System Effectiveness**
 - Passenger Trips per Capita



Average Mileage Productivity

Revenue Miles per Vehicle

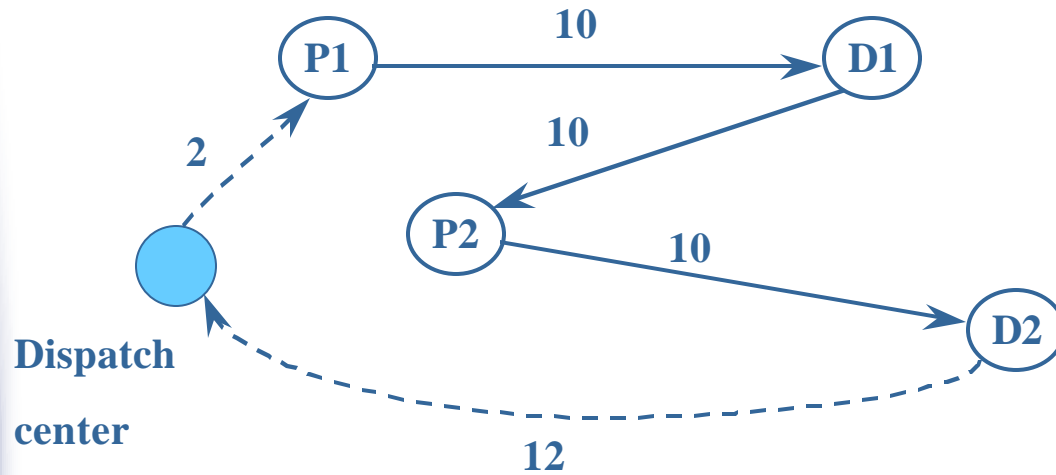
Revenue Miles per Total Vehicle Mile

Related to

Ridesharing **negative** (all years)

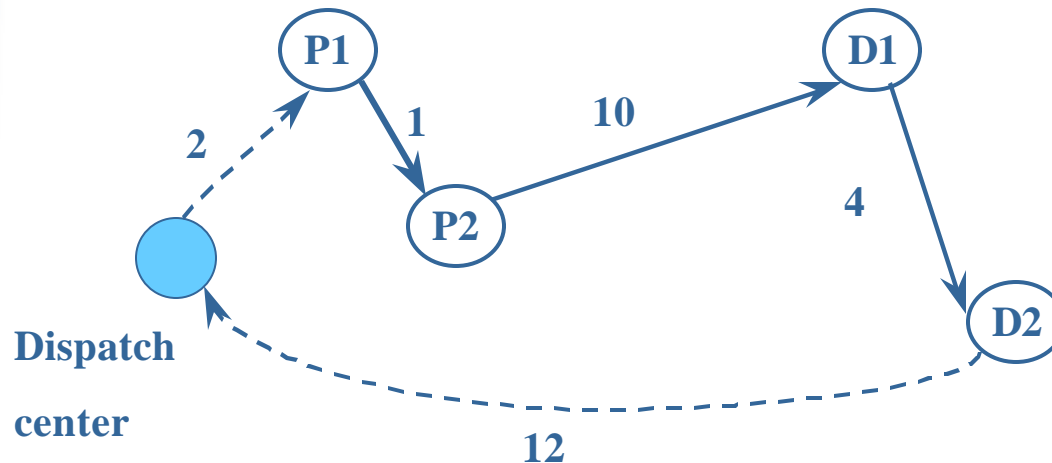
Revenue Miles Explanation

No Rideshare:



Revenue	30
Total	44
<hr/>	
Fraction	0.682

With Rideshare:



Revenue	15
Total	29
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Fraction	0.517



Revised Performance Measures

- **System Productivity**
 - Passenger Miles per Vehicle
 - Passenger Trips per Total Vehicle Mile
- **Cost Efficiency**
 - Average Cost Efficiency
 - Operating Expense per Passenger Trip
 - Operating Expense per Passenger Mile
- **System Effectiveness**
 - Passenger Trips per Capita



Passenger Miles per Vehicle

Related to

Paratransit CAD **positive** (1999,1998)

National average: 40,000 PassMil/Veh

Average benefit: 12,000 PassMil/Veh



Passenger Trips per Total Vehicle Mile

Related to

Financial Penalties **negative** (1999,1998)

National average: 0.150 Trips/VehMil

Average detriment: 0.024 Trips/VehMil



Average Cost Efficiency

Operating Expense per Passenger Trip

Operating Expense per Passenger Mile

Related to

Financial Penalties **positive** (1999,1997)

National average: 18.60 \$/Trip

2.44 \$/Mile

Average detriment: 3.60 \$/Trip

0.50 \$/Mile



Passenger Trips per Capita

Related to

Agency Admin. **positive** (1999,1998)

Contracted Admin. **negative** (1999,1998)

National average: 0.39 Trips/Cap

Average benefit: 0.25 Trips/Cap

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Summary of Preliminary Results

- **Revenue Mile problematic for Productivity assessment**
- **Paratransit CAD Systems beneficial for Productivity**
- **Financial Penalties detrimental to Productivity and Cost Efficiency**
- **Agency Administration beneficial for Effectiveness**



Future Work

- **Investigate impact of Agency vs. Contracted Service Delivery**
- **Investigate performance of small CA agencies**