MIT-CTL Study on the EPA SmartWay Program

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MIT CENTER FOR TRANSPORTATION & LOGISTICS

Massachusetts Institute of Technology

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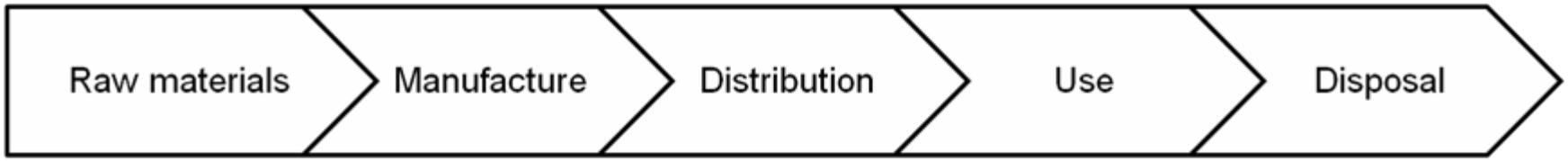
Carbon-Efficient Supply Chains

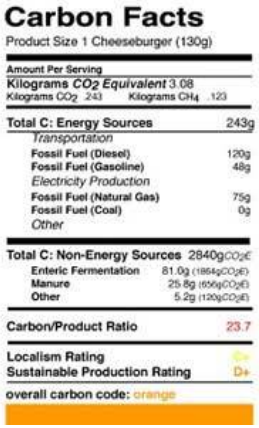
- Challenges facing our society
  - Rising energy demand and decreasing supply
  - Impacts of climate change
- Strategies to reduce greenhouse gas emissions
- Addressing issue from supply chain perspective



Carbon-Efficient Supply Chains

- Research has focused on:
  - Methodology and strategies
  - Reporting and labeling

CO2 Labels Proposed for Beer Cans by '09



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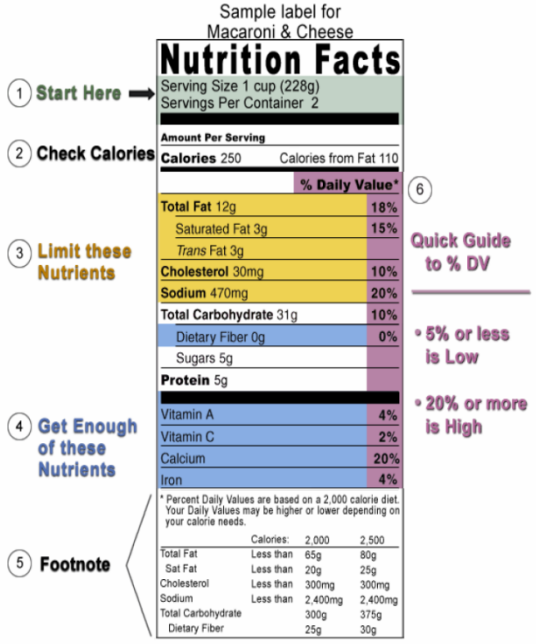
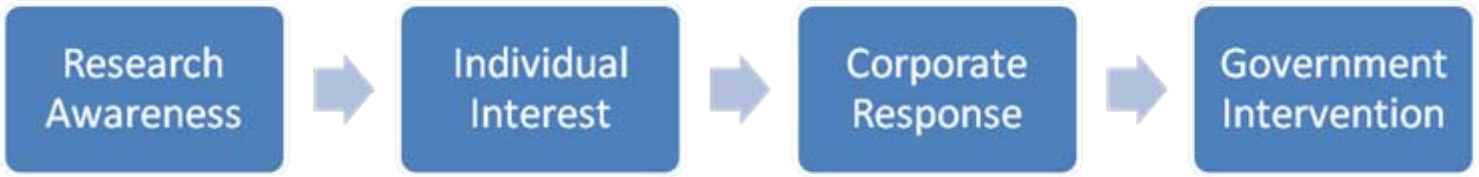




Model of events leading up to mandatory nutritional labeling

Objectives of Study

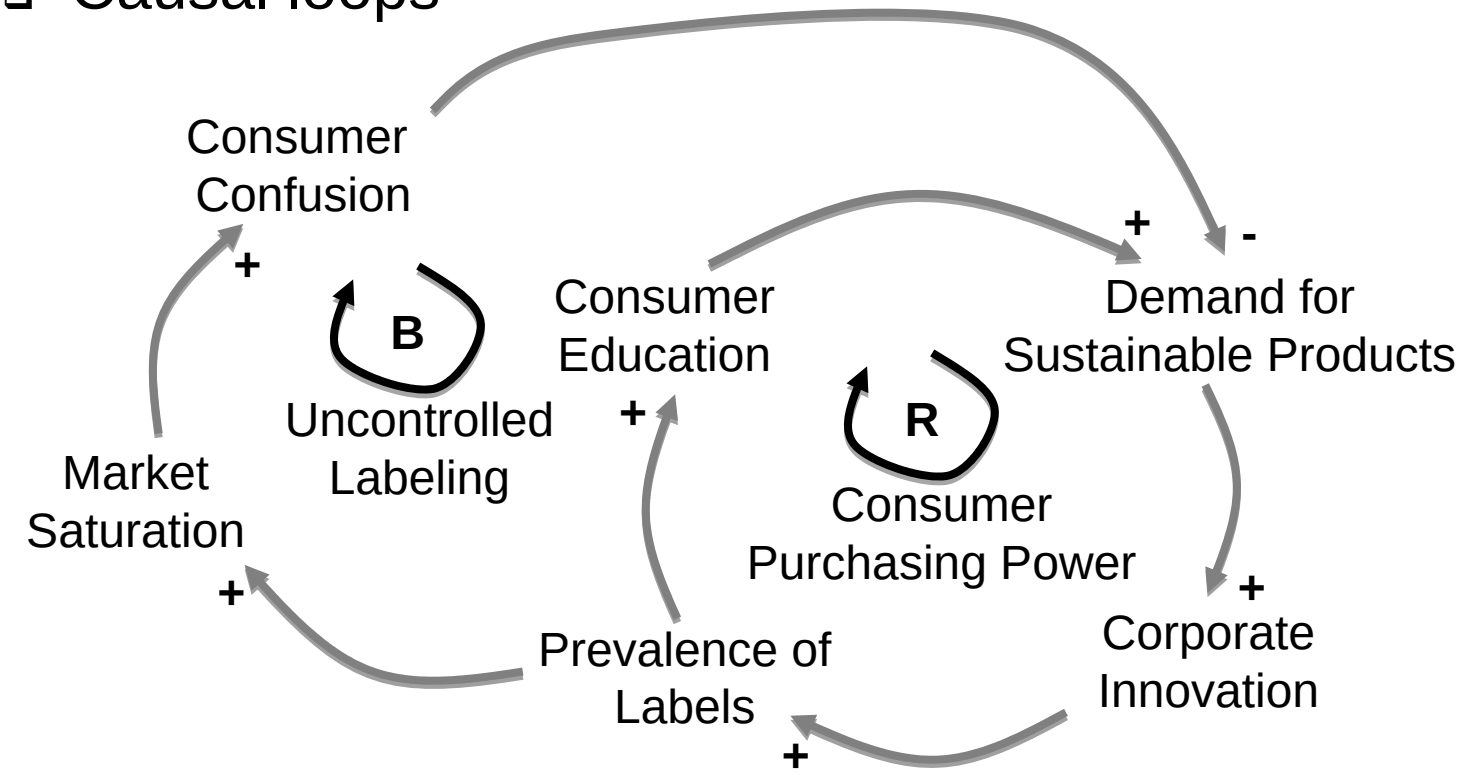
- Understanding factors contributing to success of the SmartWay program
- Possible implementations in other countries or in broader scopes
- Policies to ensure that success is sustained over the long run

System Dynamics

- Approach to studying complex systems
  - Non-linear responses
  - Internal feedback loops
  - Time delays
- Developing model structure
- Performing simulations to test policies and understanding change over time

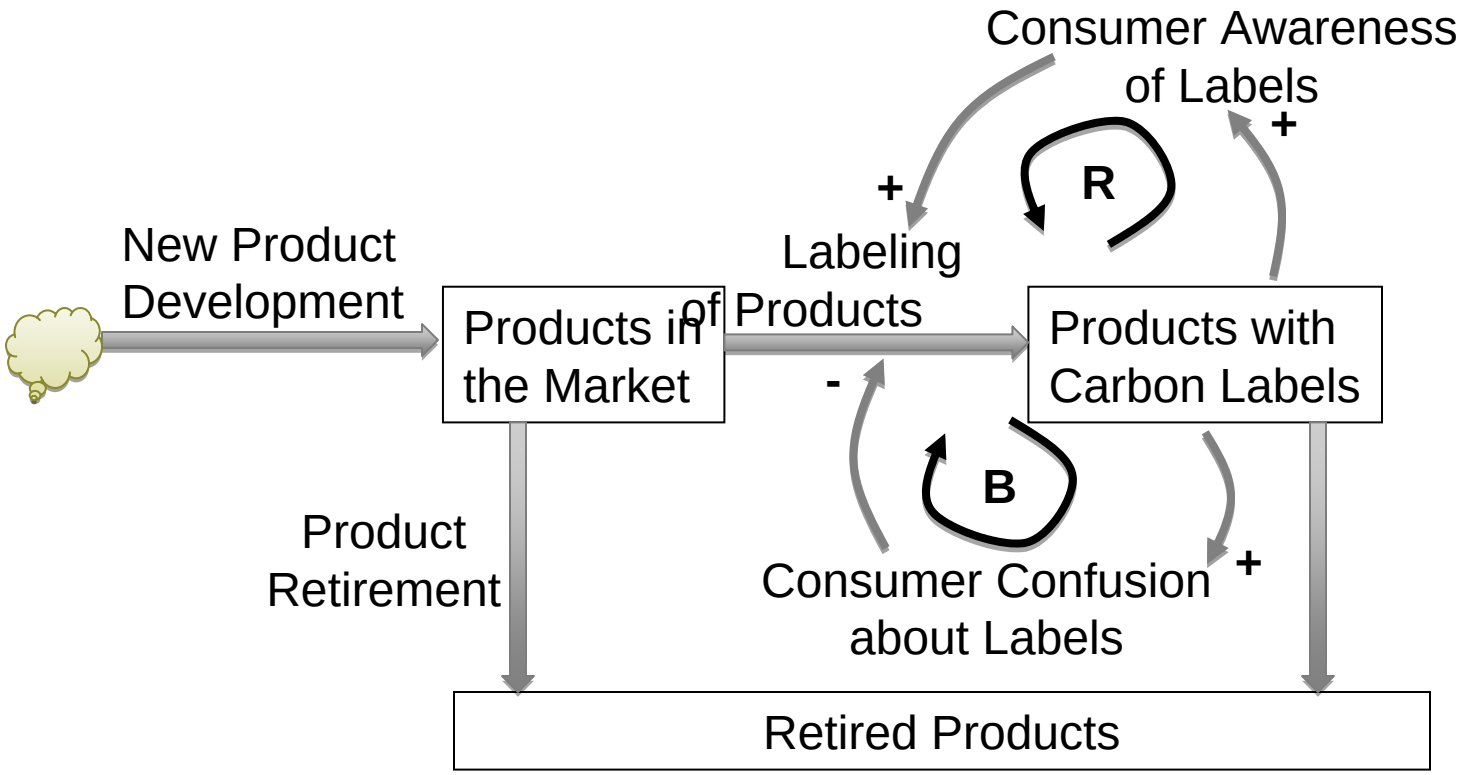
System Dynamics

- Approach to studying complex systems
  - Causal loops



System Dynamics

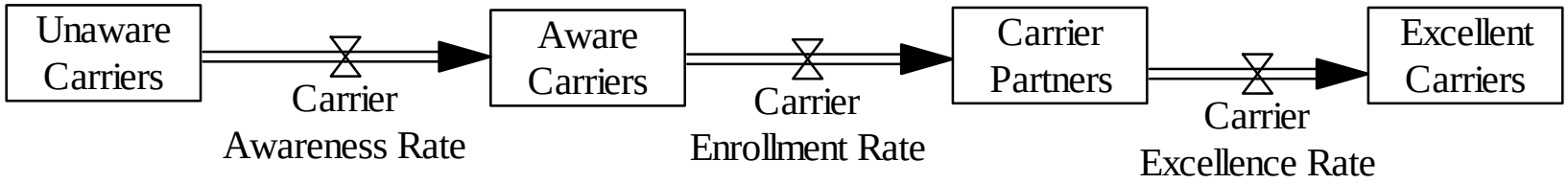
- Approach to studying complex systems
  - Stock and flow diagrams



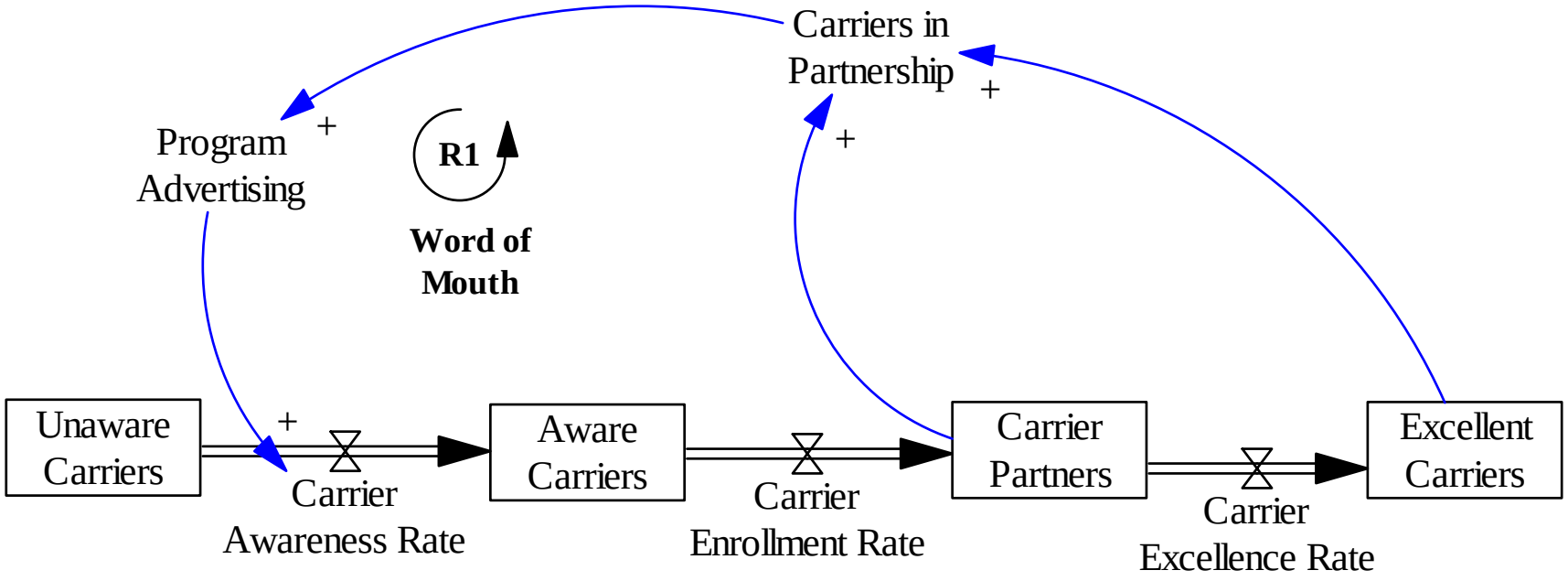
SmartWay Model

- Work in progress
- Reiterative process
  - Initial framework developed in May
  - Visit to SmartWay team in June
  - Interviews with partners in Sep/Oct

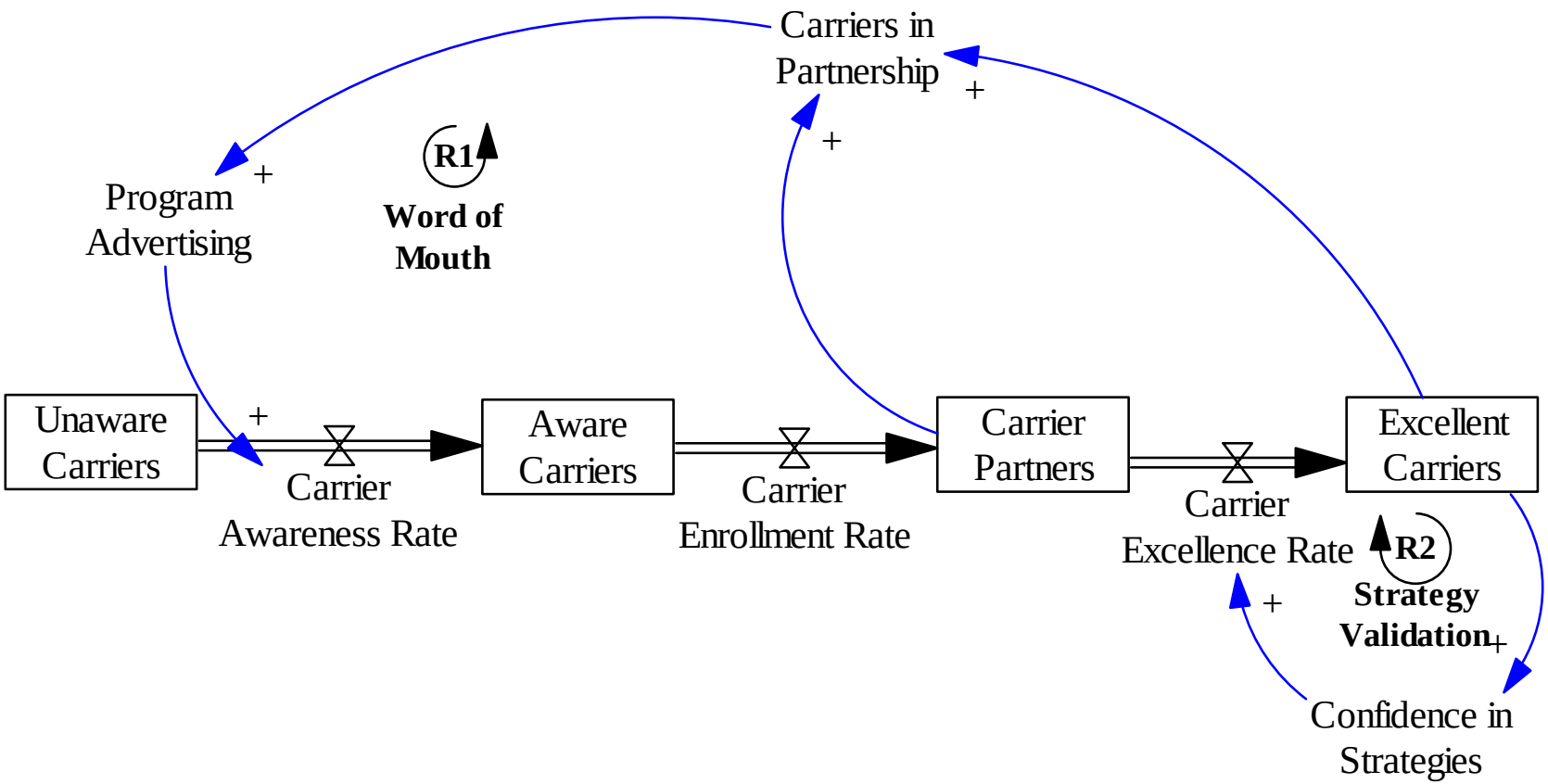
Carrier Stocks and Flows



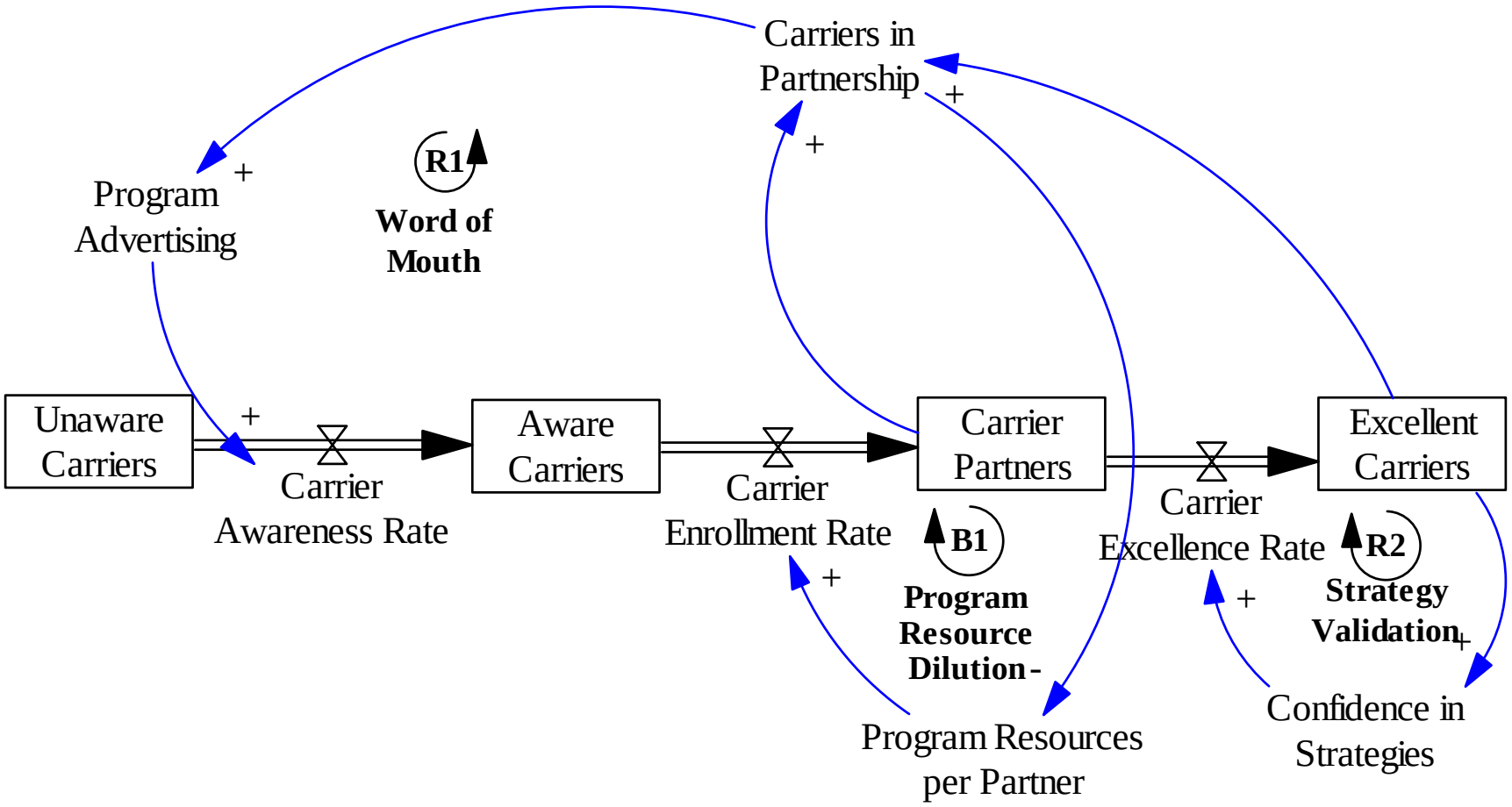
Reinforcing Loop 1: Word of Mouth



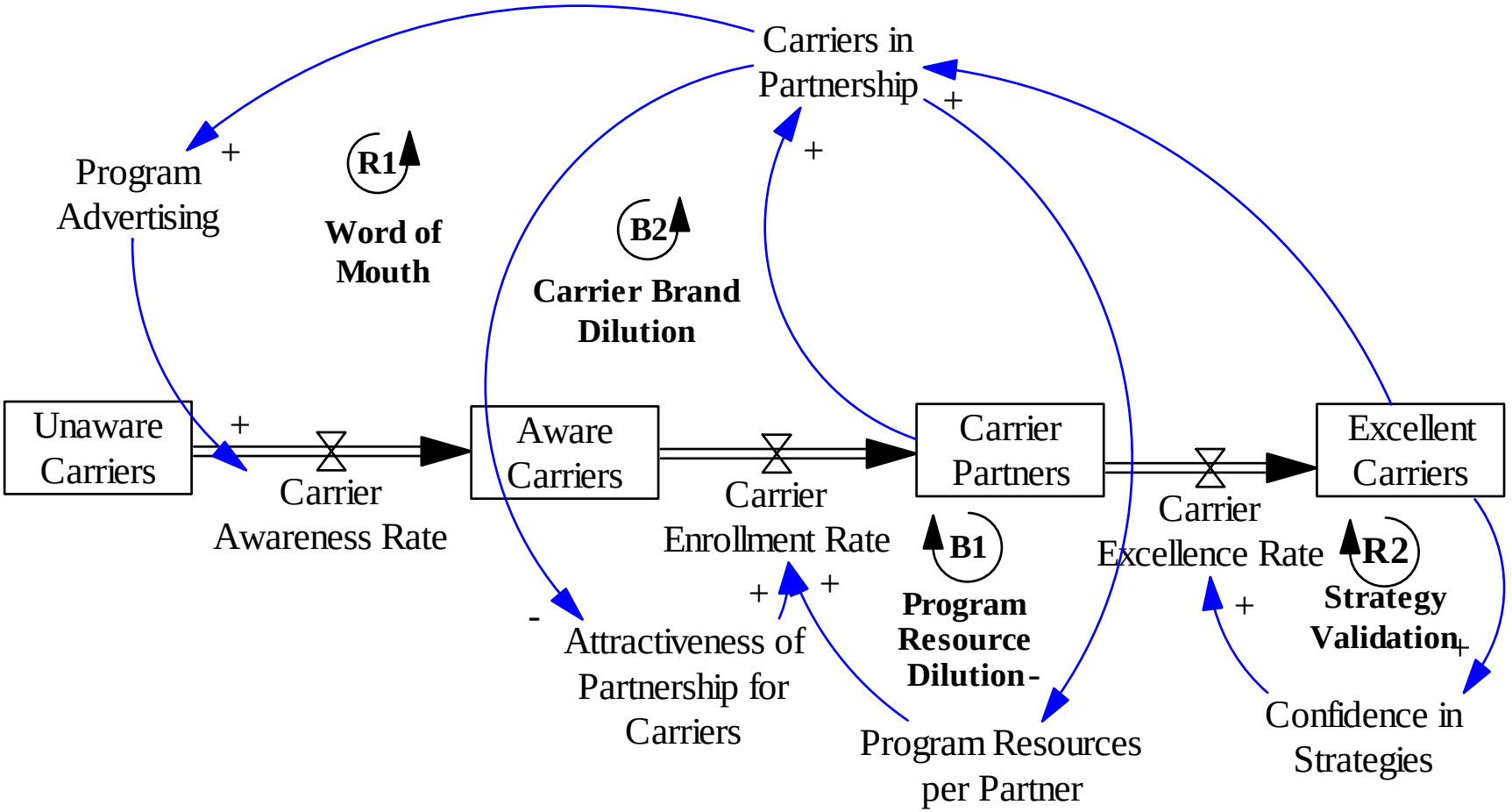
Reinforcing Loop 2: Strategy Validation



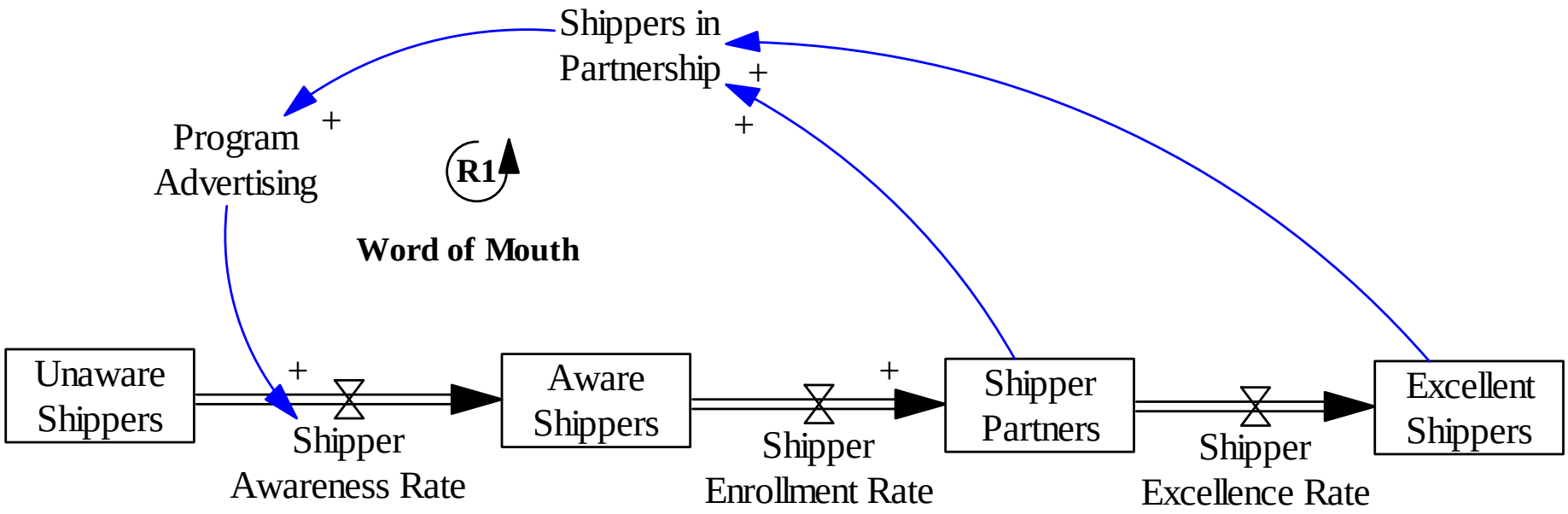
Balancing Loop 1: Resource Dilution



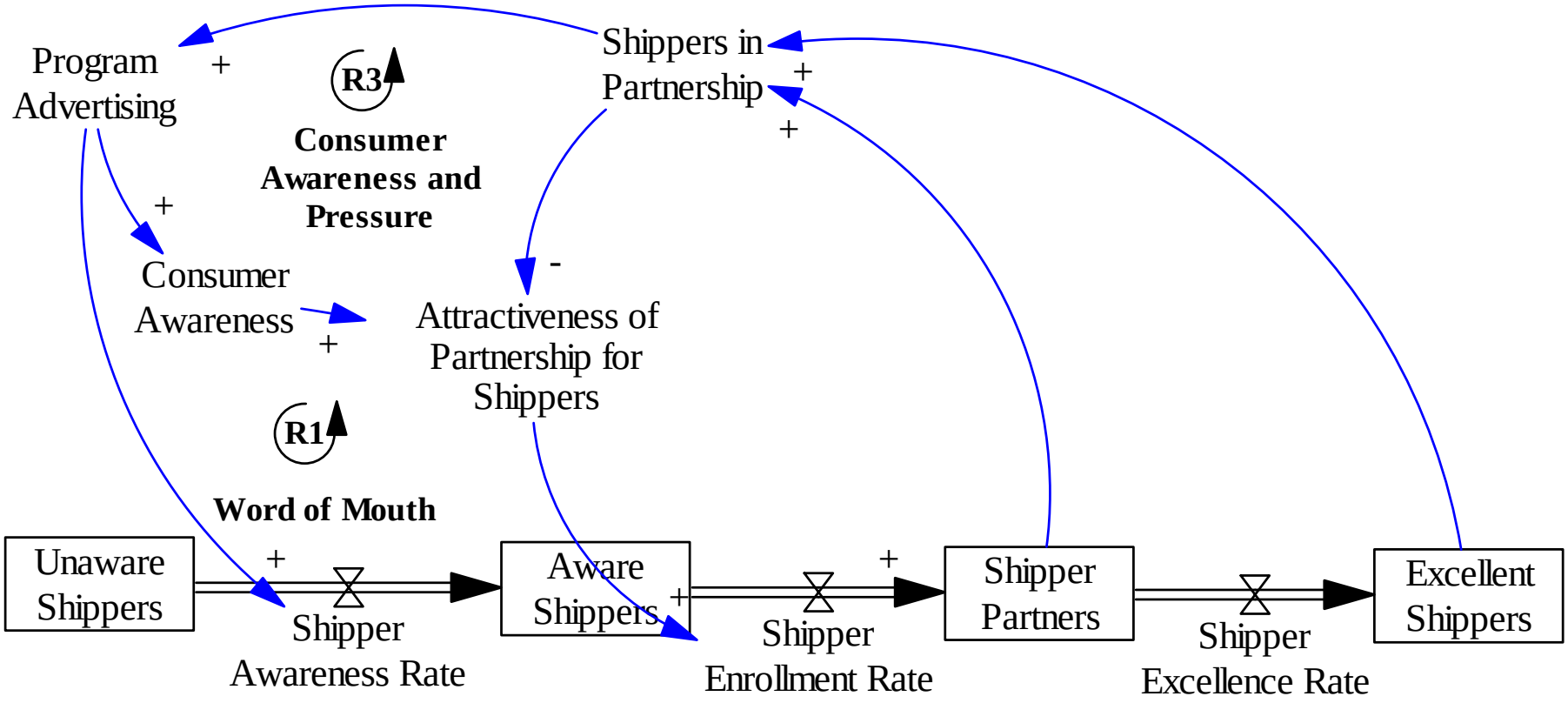
Balancing Loop 2: Brand Dilution



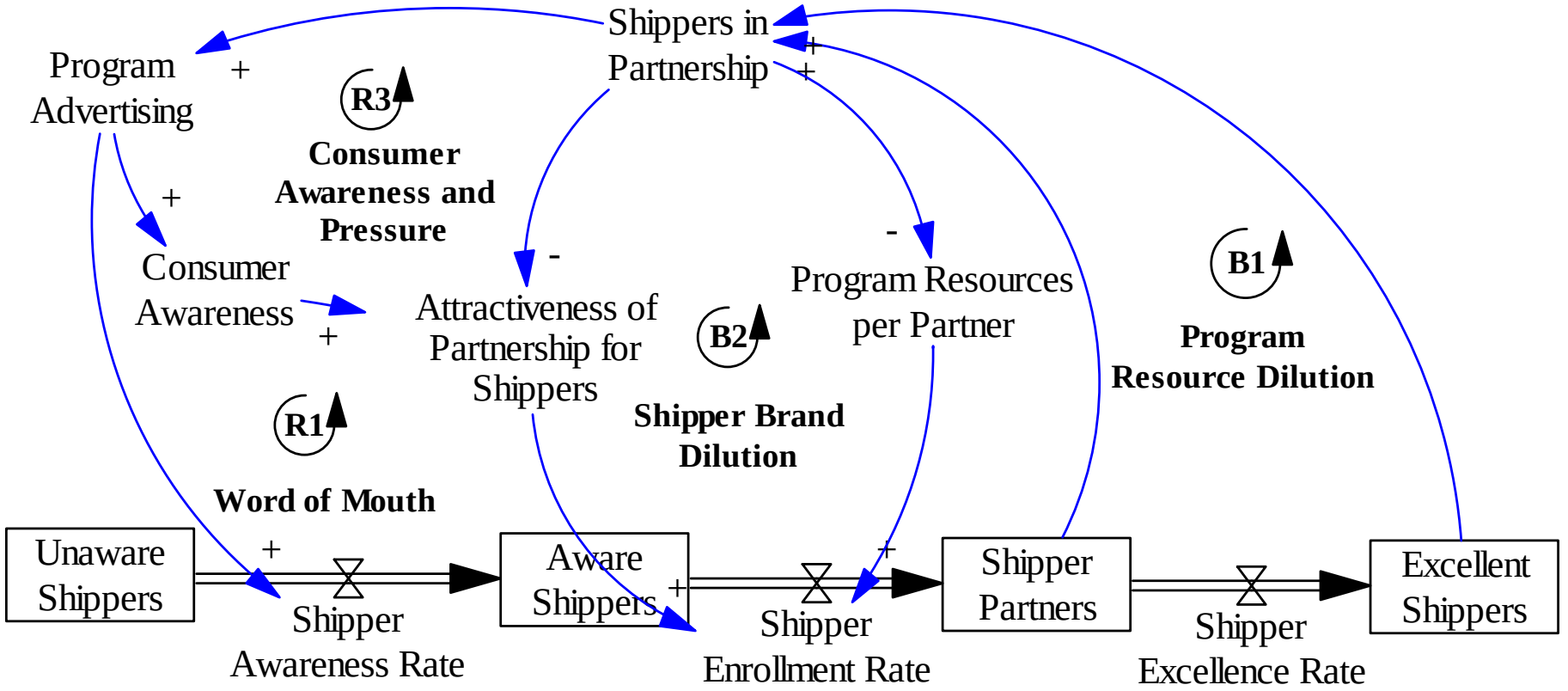
Shipper Stocks and Flows



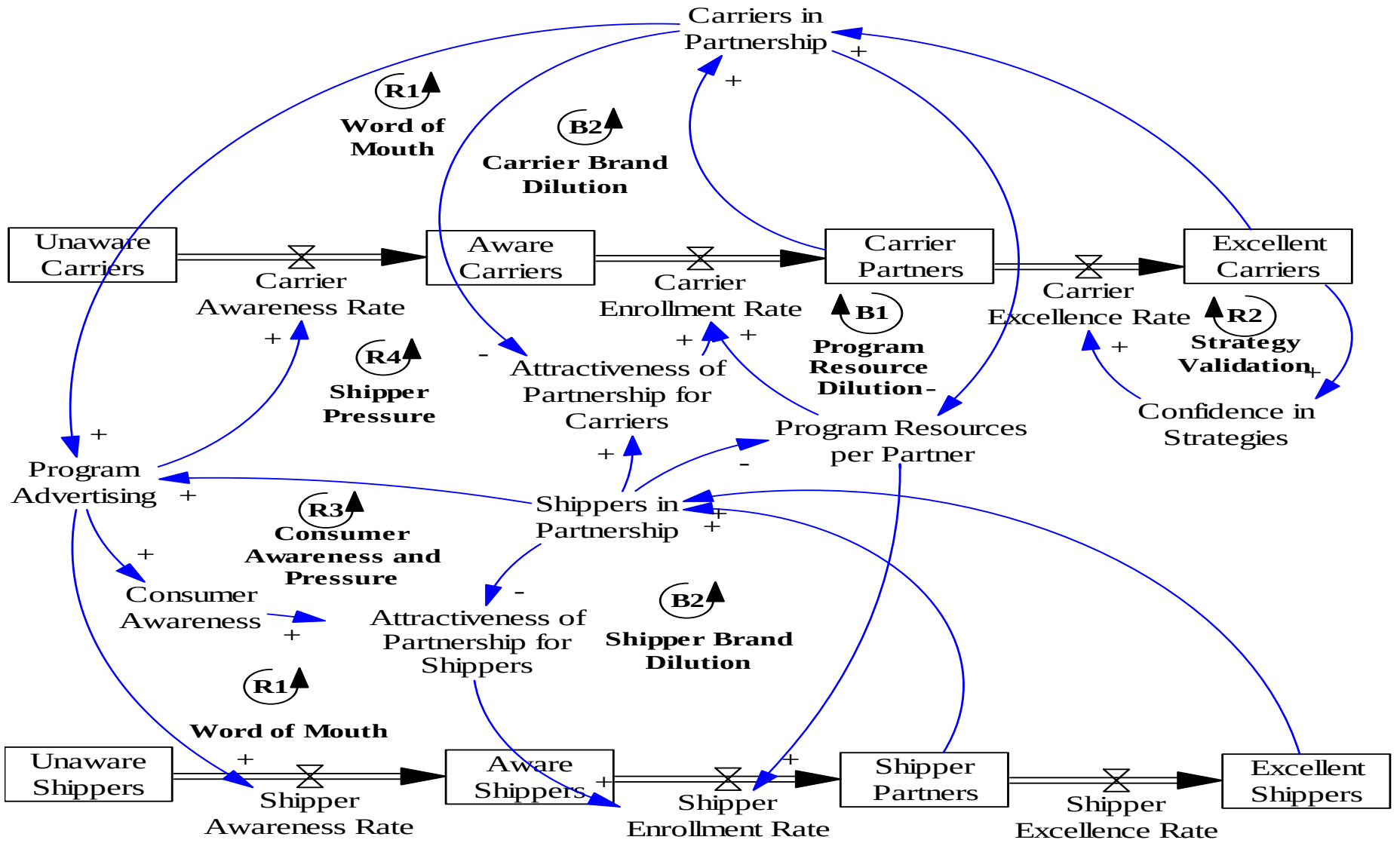
Reinforcing Loop 3: Consumers



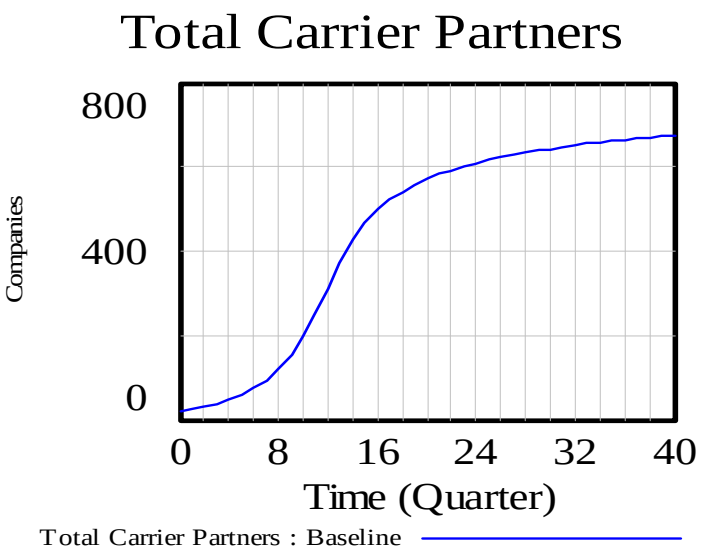
Shipper Balancing Loops

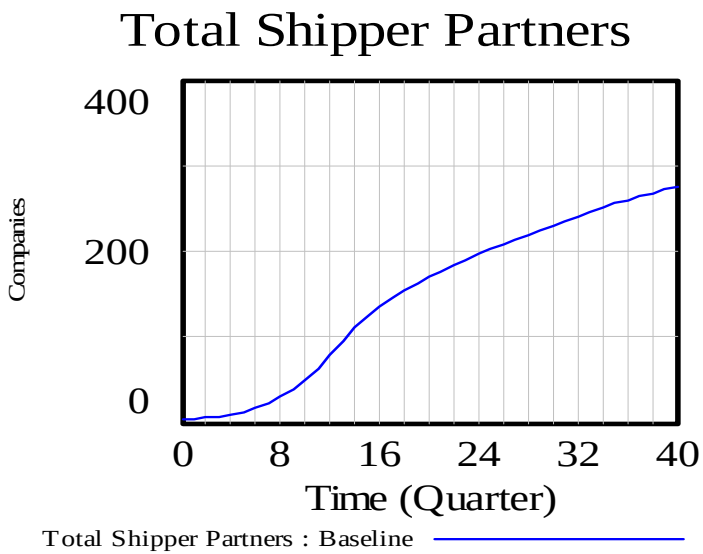


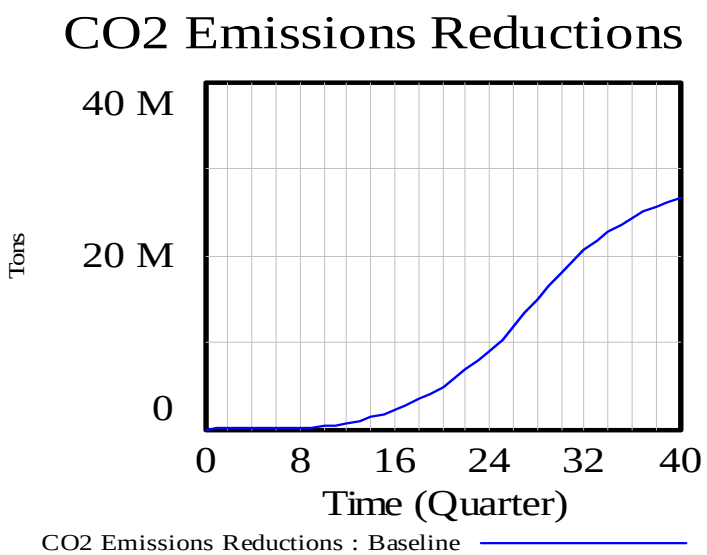
Stock and Flow Diagram



Baseline Simulation

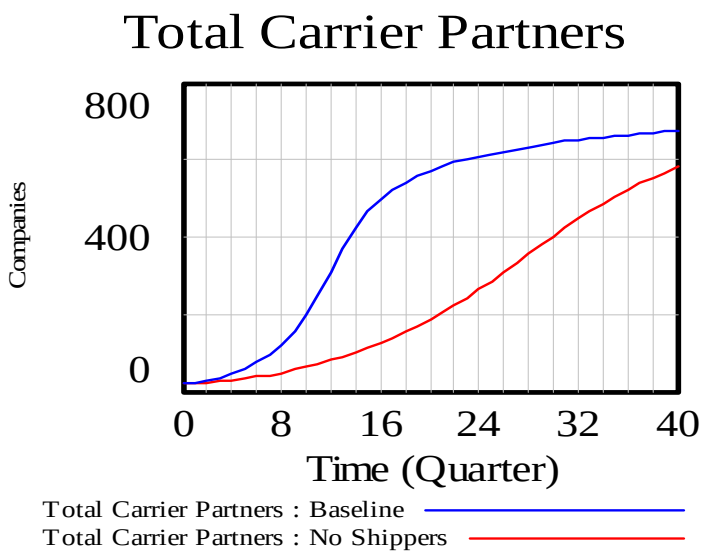


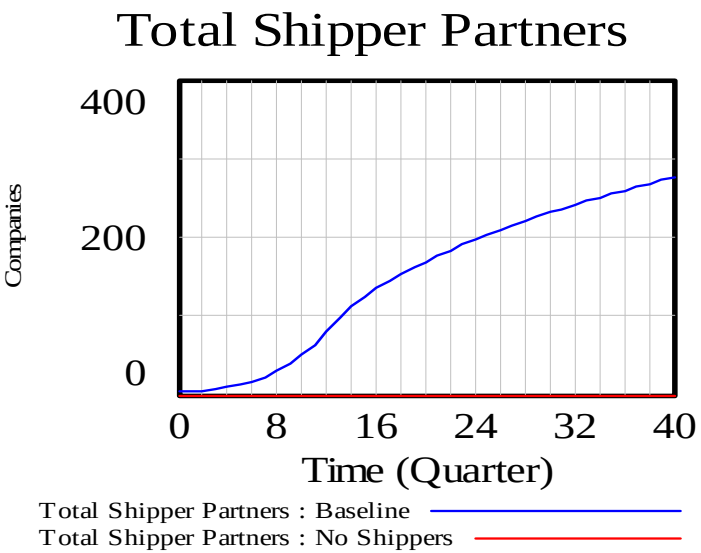


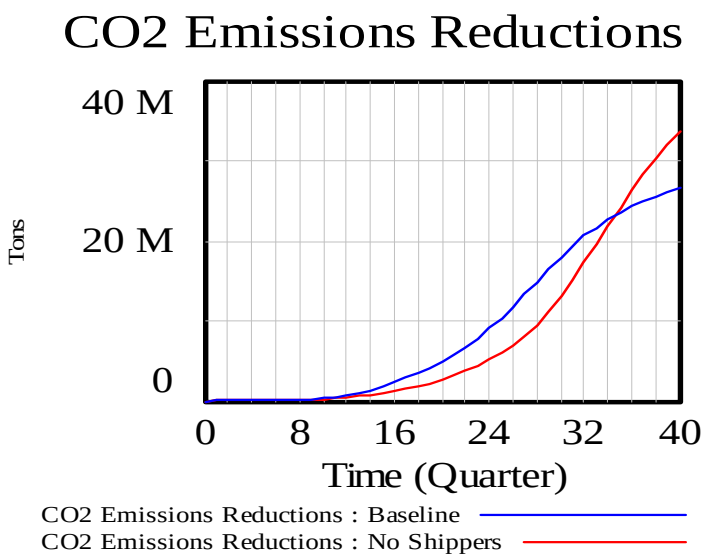


- Rapid initial growth
  - Word of mouth
  - Advertising
  - Recruitment
  - Shipper pressure
- Saturation
  - Limited program resources

No Shipper Scenario

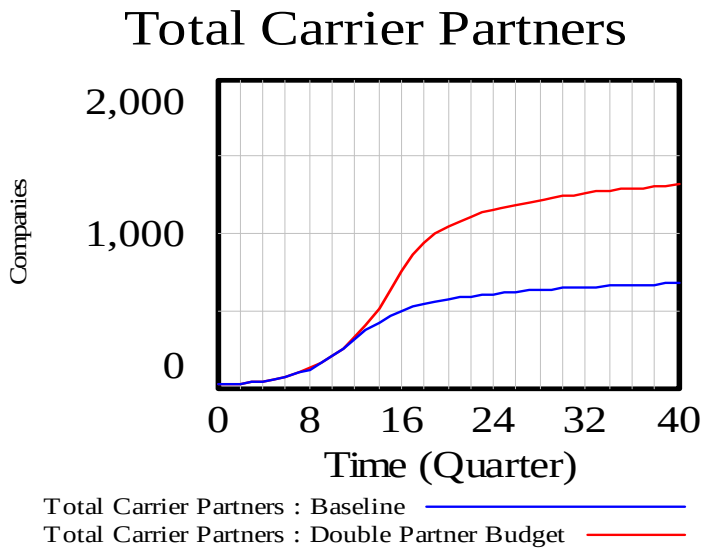


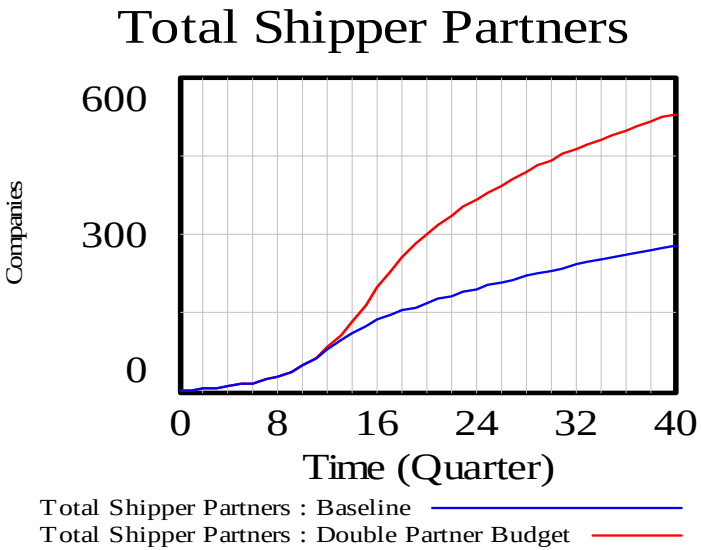


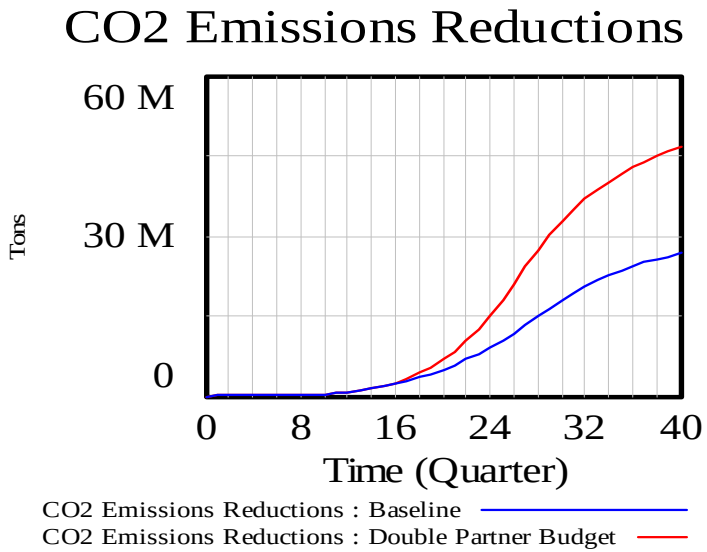


- Slow initial growth
  - Importance of shipper influence
- Larger long term CO_2 reductions
  - Focus on carrier emission potential
  - But assuming resource constraint

Double Partner Budget

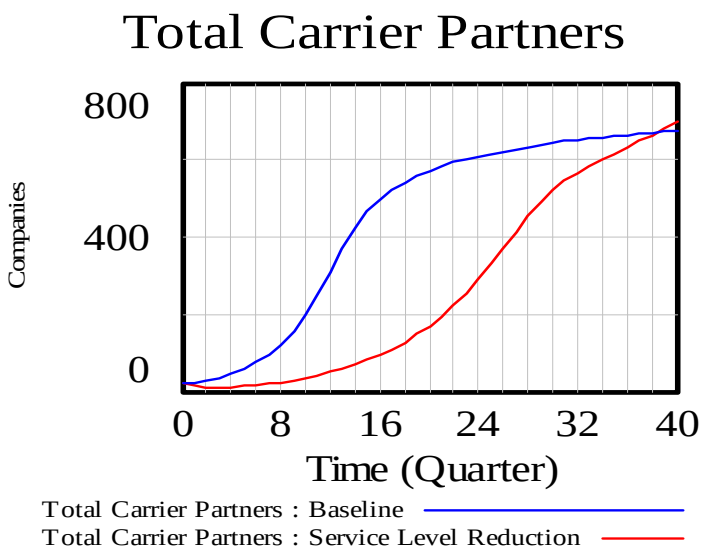


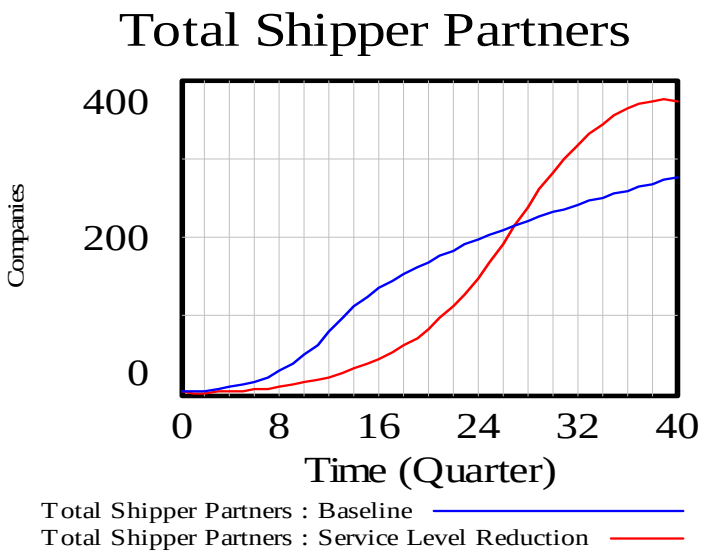


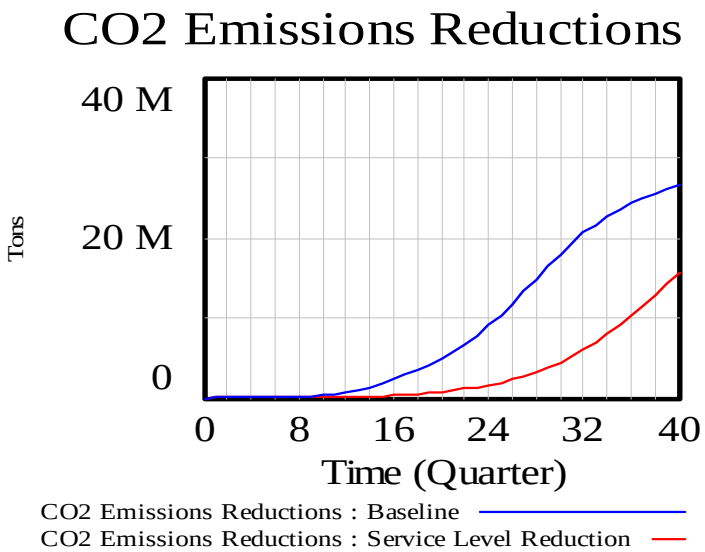


- Ability to handle more partners
  - But for a limited time
- Funding opportunities are limited

Reduction in Service Level

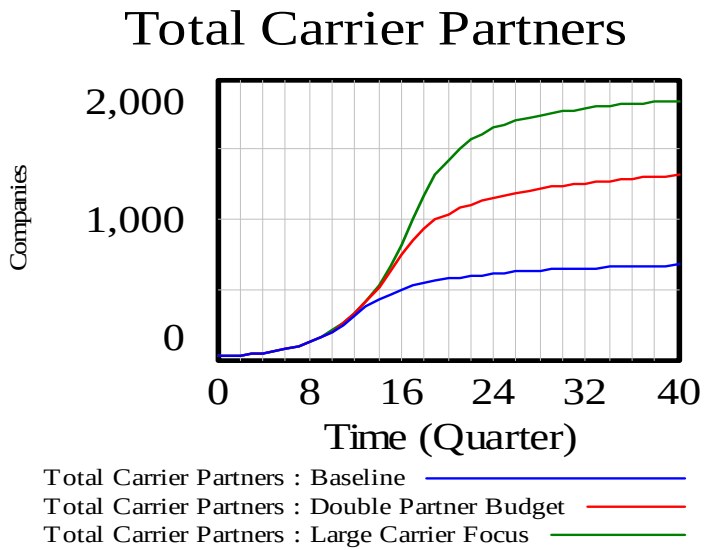


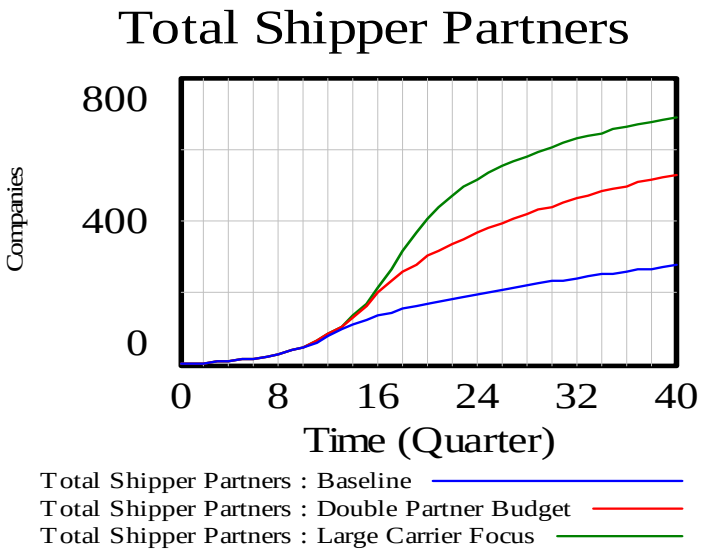


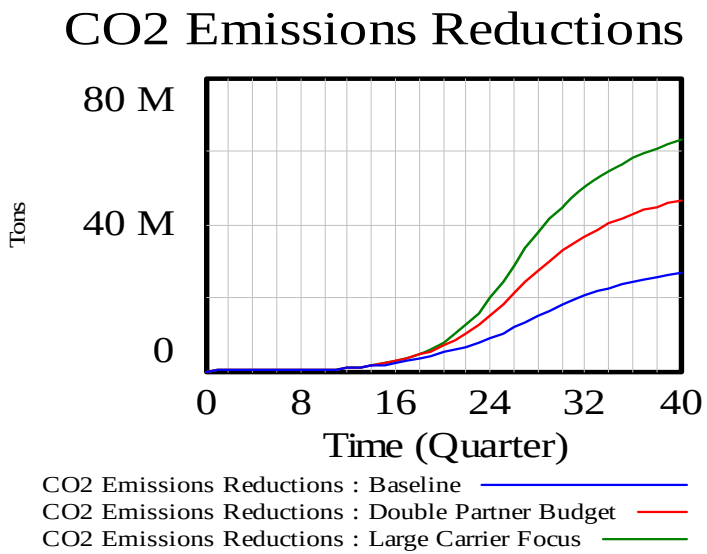


- Generic partner management
  - Less staff/resource intensive
- Reduced initial attractiveness

Large Carrier Focus







- Focus on larger carrier partners
  - Fleet size > 1000
  - Greater reduction potential
- Less direct involvement with smaller partners

Observations

- Importance of shipper participation in program
- Value of knowledge sharing in partnership for technology diffusion
- Provision of quality tools and services
- Dilution of brand not as significant
- Advantages of voluntary private public partnerships

Special Thanks

- SmartWay team for their generous help and assistance in the study
- Partners who participated in the interviews and contributed their valuable feedback

Questions?

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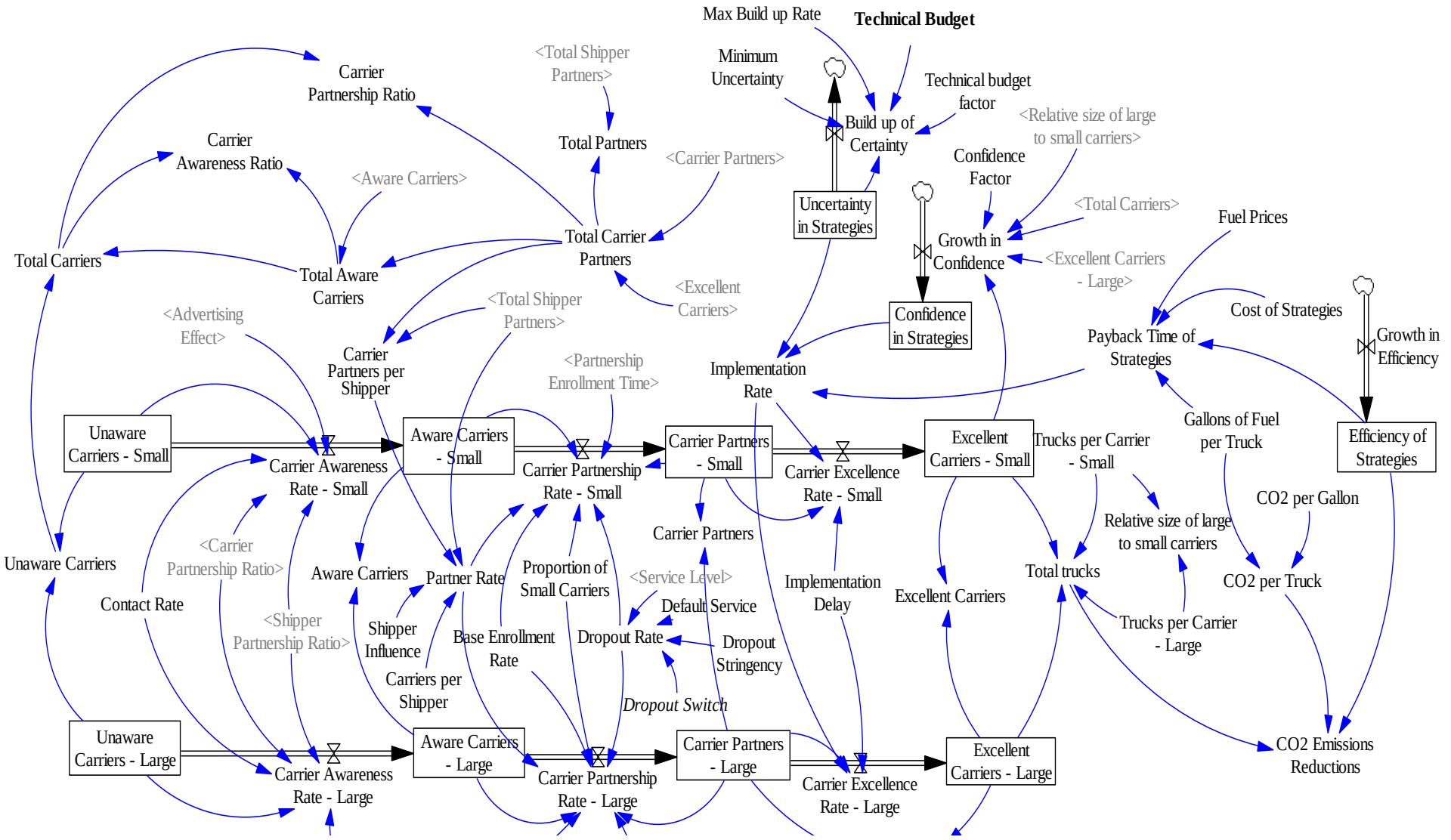
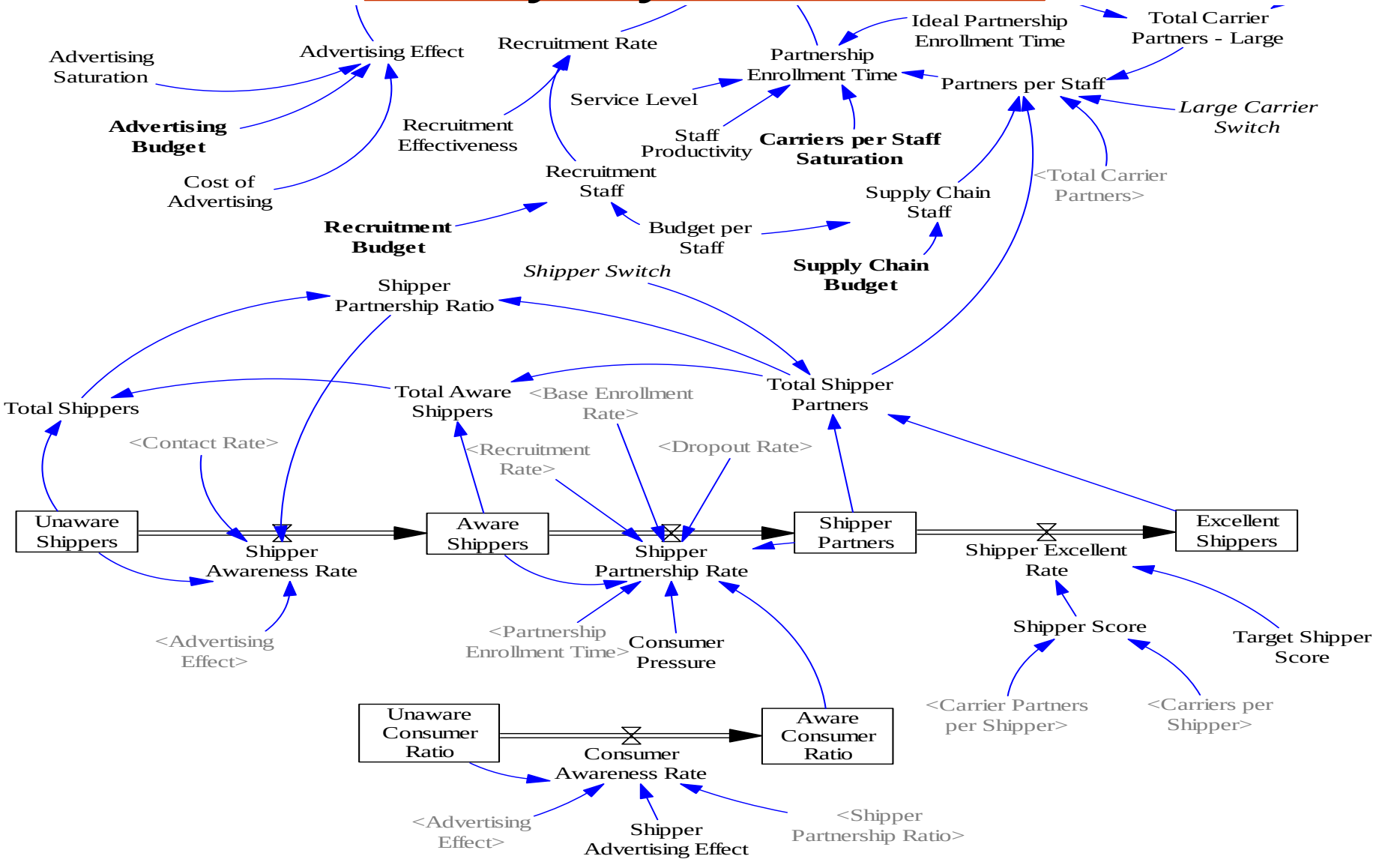
SmartWay System Model 1/2



SmartWay System Model 2/2



Causal Loop Diagram