Productivity of Passenger Rail Transportation Services in the Northeast Corridor


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Motivation and Objectives

Evaluate the performance of the Northeast Corridor (NEC) passenger rail services from FY 2002-2012 via productivity analysis	Analyze the Tokaido-Shinkansen line in Japan from 1964-2010 and various European HSR experiences	Provide some insight into how the NEC might be developed over the next decades if international-quality HSR is introduced

Methodology

Productivity:
-Can explain long-term growth of an entity
- Improvements are caused by technological changes, investment, organizational reforms, and external factors

Definition: Ratio of outputs to inputs
- Single-Factor Productivity (SFP), a single input and a single output
- Multi-Factor Productivity (MFP): multiple inputs but a single output

Method: Non-parametric SFP and MFP Törnqvist trans-log index, with many metrics

$$\ln\left(\frac{SFP_1}{SFP_0}\right) = \ln\left(\frac{y_1}{y_0}\right) - \ln\left(\frac{x_1}{x_0}\right)$$

$y = output,\quad x = input,$
$1 = current\ year, 0 = last\ year$

Outputs:
-Ridership, (ticket) revenue, revenue passenger-miles (RPM) or revenue passenger-km (RPK), and available seat-miles (ASM)

Inputs:
- Operating costs
- (Capital, personnel, and non-personnel expenses in the case of Japan)

The Amtrak Northeast Corridor (NEC)

- Amtrak: Established in 1971
- NEC: A 457-mi rail corridor connecting Washington, DC, New York, NY, and Boston, MA, the most densely settled and richest region in the U.S. -- A multi-state, multi-operator, multi-use, and multi-owner corridor
- Acela Express (top speed 150 mph) and NE Regional (125 mph) are the most important passenger services

Performance 2002-2012

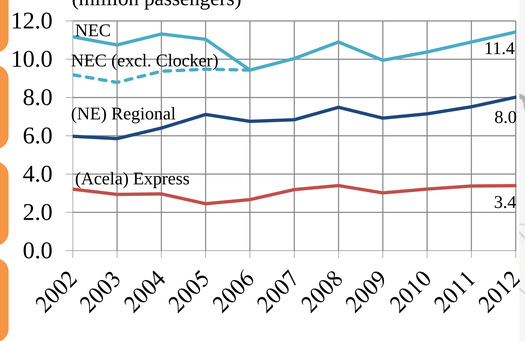
2002: Technical problems with braking system of the Acela

2005: Removal of Clocker. Problems with Acela's braking system

2008-09: Economic recession

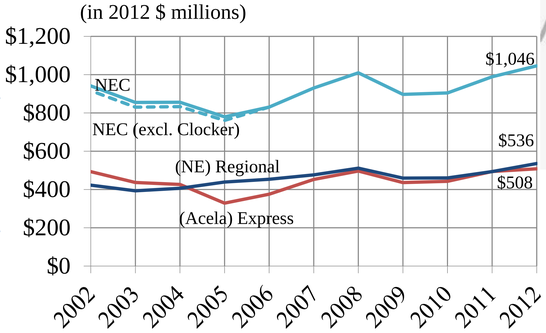
Since 2009: Federal funding for capital investments

Amtrak's NEC Ridership FY 2002-2012
(million passengers)



Substantial ridership and revenue growth despite a 2-3 year setback caused by economic recession

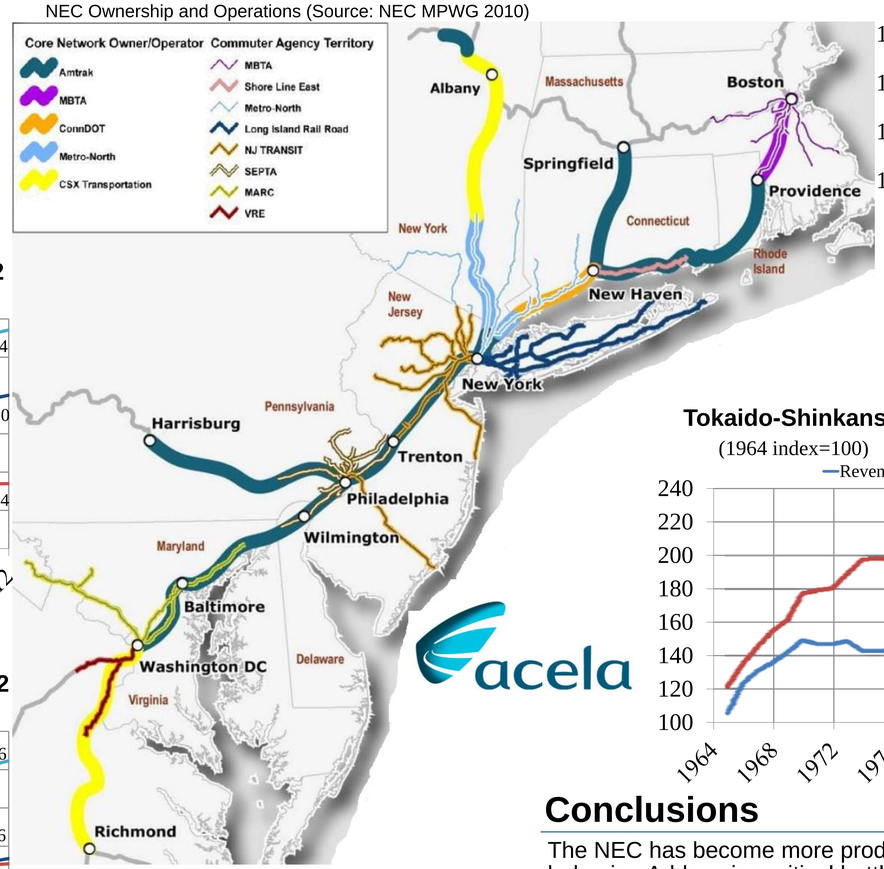
Amtrak's NEC Ticket Revenue FY 2002-2012
(in 2012 $ millions)



Improved market share relative to air. Upward trend. NEC is 52% of Amtrak's ticket revenue

Capacity-constrained shared corridor. Level of service has only marginally improved

NEC Ownership and Operations (Source: NEC MPWG 2010)



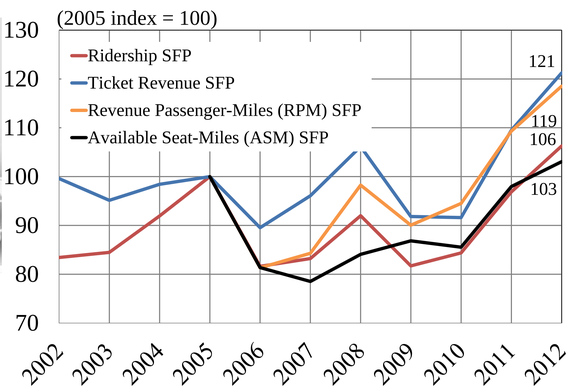
Express services were more sensitive than Regional services to externalities

Ridership is growing faster on Regional than on Express services

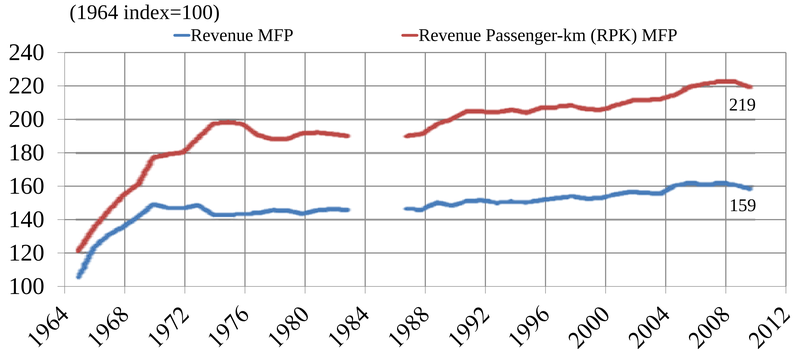
But Express services contributed in 2012 nearly as much revenue as Regional services

Productivity Analysis

NEC Cumulative SFP Growth FY 2002-2012



Tokaido-Shinkansen HSR Line Cumulative MFP Growth 1964-2010



NEC's Productivity

- Volatile but considerable productivity growth (~1-3% yearly), +-20% peak
- Increased ability to exploit available capacity, but not so much to create additional capacity

Drivers of Productivity

- Service changes in 2006
- Technical problems with train sets in 2005
- Targeted capital investments
- Economic recession and recovery since 2008

Express vs. Regional

- Sensitive to external events
- Large economies of scale
- Slow capacity adjustment via rolling stock and infrastructure improvements
- Acela Express more sensitive than Northeast Regional

Privatization of JNR '87

- Increased MFP for the Tokaido-Shinkansen line
- Brought a new surge in ridership and revenue

Vertical Separation in EU

- Positive results in Germany and Sweden (Friebel et al.)
- Reduced productivity in France (Friebel et al.)
- Expectation about developments in Italy

Conclusions

The NEC has become more productive, due mainly to external factors and market behavior. Addressing critical bottlenecks can continue to increase productivity

Increasing costs of running HSR rolling stock in the next years could be balanced by a more efficient use of infrastructure in the NEC, thus increasing productivity

Construction of HSR and introduction of vertical separation in infrastructure and operations increased productivity in some international settings

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Implications

Experience in Japan suggests that private sector involvement can lead to enhanced productivity	Vertical separation in the responsibility for operations and infrastructure may open the door for competition, and also lead to enhanced productivity	Efficacy of implementation depends on the particular set of circumstances. Potential private sector involvement and vertical separation should be consider in the planning process