Transport Policy 18 (2011) 126–138

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

Making public transport financially sustainable

Ralph Buehler [a,*], John Pucher [b,1]

[a] Virginia Tech, Urban Affairs and Planning, 1021 Prince Street, Room 228, Alexandria, VA 22301, USA
[b] Rutgers University, Bloustein School of Planning and Public Policy, 33 Livingston Avenue, Room 363, New Brunswick, NJ 08901, USA

ARTICLE INFO

Available online 31 July 2010

Keywords:
Public transport
Germany
Sustainability
Efficiency
Productivity
Finance

ABSTRACT

Over the past two decades, Germany has improved the quality of its public transport services and attracted more passengers while increasing productivity, reducing costs, and cutting subsidies. Public transport systems reduced their costs through organizational restructuring and outsourcing to newly founded subsidiaries; cutting employee benefits and freezing salaries; increasing work hours, using part-time employees, expanding job tasks, and encouraging retirement of older employees; cooperation with other agencies to share employees, vehicles, and facilities; cutting underutilized routes and services; and buying new vehicles with lower maintenance costs and greater passenger capacity per driver. Revenues were increased through fare hikes for single tickets while maintaining deep discounts for monthly, semester, and annual tickets; and raising passenger volumes by improved quality of service, and full regional coordination of timetables, fares, and services. Those efforts by public transport agencies were enhanced by the increasing costs and restrictions on car use in German cities. Although the financial performance of German public transport has greatly improved, there are concerns of inequitable burdens on labor, since many of the cost reduction measures involved reducing wages or benefits of workers.

1. Introduction

Most definitions of sustainability include three dimensions: environmental, social, and economic (Banister, 2005; TRB, 2005; World Bank, 1996). In practice, however, the emphasis has been on environmental sustainability. The neglect of financial sustainability has been an important omission. For example, many public transport systems around the world suffer from low productivity, high costs, and the need for large government subsidies (TRB, 2001). While public transport offers significant social and environmental benefits, it is crucial to increase productivity and reduce costs. Indeed, improving the financial sustainability of public transport would help realize the potential environmental and social benefits of public transport, since it would make expanded public transport service more affordable, both for the governments who provide it and for the passengers who use it.

Germany and the USA offer interesting contrasts in the financial sustainability of public transport. Over the past two decades, Germany has improved its public transport services, increased productivity, reduced costs, cut subsidy requirements, and attracted more passengers. American public transport systems have improved and expanded services, but at a far higher cost, requiring much larger government subsidies, and attracting fewer additional riders.

Since the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) subsidies for public transport in the USA have increased considerably: from $14 billion in 1991 to $32 billion in 2007 (APTA, 2009). Even adjusted for inflation, this constitutes a 50% rise in annual funding for public transport. At first glance, it appears that increased funding was successful. Over the same period, vehicle kilometers of public transport supply rose by almost 20% and passenger trips increased by 16% (APTA, 2009). However, controlling for population growth, public transport passenger kilometers and trips per capita have hardly increased at all. Moreover, the share of operating expenses covered by farebox revenue fell from 37% in 1992 to less than 33% in 2007 (APTA, 2009). Public transport agencies in the USA need to develop policies to improve public transport's competitiveness relative to other modes, attract more passengers, and increase productivity and financial efficiency. A better utilized and more efficient public transport system could improve mobility options, reduce energy use, and decrease greenhouse gas emissions.

Public transport in Germany captures five times as high a market share as in the USA (8.0% vs. 1.6% of all trips) (BMVBS, 2004; ORNL, 2005). Moreover, public transport use per capita increased in Germany by 22% between 1992 and 2007 (VDV,

* Corresponding author. Tel.: +1 703 706 8104; fax: +1 703 518 8009.
E-mail addresses: ralphbu@vt.edu (R. Buehler), pucher@rutgers.edu (J. Pucher).
URL: http://www.policy.rutgers.edu/faculty/pucher (J. Pucher).
[1] Tel.: +1 732 932 3822x722; fax: +1 732 932 2253.

0967-070X/$ - see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.tranpol.2010.07.002

2001–2008). Productivity and financial efficiency have also improved significantly in Germany: the share of operating expenses covered by passenger fares increased from 59% in 1991 to 77% in 2007, and inflation-adjusted subsidies per passenger declined by almost 40% (VDV, 2001–2008).

There are many similarities between Germany and the USA that enable a meaningful comparison of transport systems and policies in the two countries. Germany and the USA are democracies with federal systems of government, in which the interaction of national, state, and local levels shapes transport policy (Wentzel and Wentzel, 2000). Both countries have market economies with significant government involvement in the public transport sector (Wentzel and Wentzel, 2000). Both are among the wealthiest countries in the world, although the USA has a higher per-capita income than Germany: $46,400 vs. $40,900 in 2008 (IMF, 2010). Thanks to their affluence, both countries have high rates of car ownership: 560 cars per 1000 population in Germany versus 780 cars per 1000 inhabitants in the USA (BMVBS, 1991–2010; USDOT, 1990–2008). Both countries have extensive roadway systems with limited access highway networks (IRF, 2007; OECD, 2008). Car manufacturing and related sectors are important to both national economies—but twice as important in Germany as in the USA (20% vs. 10% of GDP) (USDOT, 1990–2008; VDA, 2007). In both countries the automobile is an important symbol of freedom and mobility (Schmucki, 2001; Wachs et al., 1992; Wolf, 1986).

Similar to trends in the USA, German cities have also been decentralizing. Much stricter land-use controls and planning regulations have ensured a more compact pattern of suburban development in Germany, but the trend toward decentralization of German cities is strong (Karsten and Usbek, 2005; Schmidt and Buehler, 2007; Schulz and Dosch, 2005). Much of the development in and around German cities is as new as that around American cities, since many German cities were almost completely destroyed in World War II.

This paper first compares trends in public transport demand, supply, productivity, and financial sustainability in Germany and the USA over the last two decades. We then present our in-depth case study analysis of how and why German public transport increased its productivity and financial efficiency. We provide a holistic description and critical analysis of the complex interaction of various government policies and public transport agency measures that contributed to this trend. We conclude with lessons the USA and other by countries can learn from the German experience.

2. Data and methods

Our case study analysis of public transport relies on a wide range of data sources and research methods to document and explain trends in efficiency, productivity, and ridership. We derived most of our statistical data for public transport demand and supply in the USA from the National Household Travel Survey (NHTS) and various other datasets of the U.S. Departments of Transportation (USDOT) and Commerce (USDOC), and the American Public Transportation Association (APTA). Corresponding data for Germany were derived from the German national household travel survey, "Mobilität in Deutschland 2002" (MiD) as well as databases from the German Federal Ministry of Transport and Urban Development (BMVBS) and the German Public Transport Association (VDV).

Our analysis of how and why public transport systems in Germany increased their financial efficiency and ridership relied on qualitative and quantitative information gathered from VDV, the German League of Cities (Deutsche Städtetag), city and regional public transport authorities, public transport agencies, federal, state, and city governments, and labor unions.

A case study approach is most appropriate for a holistic description and critical analysis of the complex interaction of government policies, public transport agency measures, and city, regional, and state differences that all shaped the trend towards more financial efficiency in Germany (Yin, 2009). We gathered information for our case study analysis through in-person and telephone interviews, archival research, and analysis of published reports and documents from the German League of Cities, federal, state, and city governments, city and regional public transport authorities, public transport agencies, labor unions, and the German Public Transport Association. Synthesizing the information from these diverse sources provides a multifaceted perspective on policies that increased ridership, improved productivity, and reduced costs in Germany's public transport system.

3. Trends in public transport demand, supply, and financial sustainability

3.1. Public transport demand in Germany and the USA

According to the National Household Travel Survey (NHTS) and its German equivalent the Mobility in Germany (MiD) survey from 2001/2002, public transport accounted for 8.0% of all trips in Germany compared to 1.6% in the USA. MiD might underestimate Germany's transit mode share, since other credible German sources find an 11% share of trips by public transport (BMVBS, 1991–2010; Brög, 2004). No matter which statistic is more accurate, in 2001/2002 Germans were at least five times more likely to ride public transport than Americans.

Germans used transit more than Americans even after controlling for income, car ownership, population density, metropolitan area size, and trip purpose. For example, Germans in the highest income quartile rode transit for a higher share of trips than Americans in the lowest income quartile (6% vs. 5% of all trips). Indeed transit ridership is more evenly spread across all income groups in Germany than the USA. Differences in income and transit use are particularly striking for bus travel: average household incomes of German bus passengers were 4% below the German average in 2001/2002. In contrast, average household incomes of bus passengers in America were 50% below the U.S. national average in 2001/2002. Moreover, Germans in rural areas make 5% of their trips by public transport—a share of trips only surpassed by the largest and most transit oriented metropolitan areas in the USA. In both countries the majority of transit trips are made for the commute, but Germans also use transit for 5% of social and recreational trips (BMVBS, 2004; Buehler, 2009; ORNL, 2005).

Public transport ridership data provided by the German and American public transport associations, VDV and APTA, show that public transport use has been increasing in both countries from 1990 to 2007—both in terms of annual number of trips and kilometers of travel (see Table 1). Adjusting for population growth, however, passenger trips per capita increased strongly in Germany and declined slightly in the USA. Passenger kilometers of transit use per capita increased three times faster in Germany than the USA. In 2007, Germans made an average of six times more trips and traveled four times more kilometers by public transport than Americans.

Aggregate statistics mask variability in trends across modes of public transport. For example, between 1992 and 2007, growth in transit ridership in Germany was stronger for metro and commuter rail than for light rail and buses (+50% vs. +7%)

(VDV, 2001–2008). Similarly, in the USA, commuter and metro rail ridership increased more strongly than combined bus, light rail, and trolley patronage (+22% vs. +15%)(APTA, 2009).

Public transport usage also varies among regions within each country. In Germany, for example, increases in public transport usage were concentrated in the western part of the country, while formerly socialist eastern Germany saw a drop in public transport patronage of almost 20% between 1992 and 1998 (BMVBS, 1991–2010; Brög and Erl, 2003; Städtepegel, 2003). The sharp drop in ridership in eastern Germany immediately after reunification in 1990 is likely related to the change from a socialist to a market based economy—including sharp increases in private car ownership, steep reductions in transit subsidies, and increasing suburban sprawl.

There is also great variability in public transport use within the USA—where most public transport use is concentrated in a few large metropolitan areas. In 2007, New York City, Chicago, Los Angeles, Washington, DC, Boston, Philadelphia, and San Francisco accounted for more than 50% of all unlinked transit trips in the USA (APTA, 2009). Public transport is more evenly distributed across German cities. Fig. 1 shows that both small and large German cities have transit mode shares of over 10% of all trips—a threshold only surpassed by the most transit oriented cities in the USA.

3.2. Trends in public transport supply and financial sustainability

From 1992 to 2007, trends in public transport supply and financial sustainability were diverging between the countries (see Table 2). The USA witnessed expansion of public transport supply and declining financial efficiency. German public transport did not expand its overall supply, but improved its financial productivity and efficiency. In the USA, public transport vehicle kilometers of service increased by 20% between 1992 and 2007. Similar to trends in demand described above, vehicle kilometers of combined bus, light rail, and trolley service increased at a slower rate than metro and commuter rail service (APTA, 2009).

In contrast to the USA, vehicle kilometers of bus and light rail service in Germany declined slightly between 1992 and 2007. The comparability of this trend data for Germany is limited due to changes in data collection methods and the reorganization of the regional rail sector starting in 1996 (VDV, 2001–2008). More reliable short-term trend data for the years 1998 through 2007 confirm a small decline of public transport vehicle kilometers for road and rail public transport combined. The aggregate masks diverging trends. Rail vehicle kilometers increased while bus and light rail vehicle kilometers of service fell—mainly due to service cutbacks in rural areas (VDV, 2001–2008).

Over the last 20 years German public transport companies have covered an increasing share of their operating budgets with farebox revenue. In contrast, public transport fares in the USA have accounted for a decreasing share of operating expenses: a decline from 37% in 1992 to 33% in 2007 in the USA compared to an increase from 59% to 77% in Germany (APTA, 2009; VDV, 2001–2008). Fig. 2 shows that public transport systems in both eastern and western parts of Germany raised the share of farebox

Table 1
Trends in public transport demand in Germany and the USA, 1990–2007.
Sources: (APTA, 2009; BMVBS, 1991–2010).

	1990	1995	2000	2005	2007	Change 1990–2007
Total linked transit trips per year in USA (million)	5,499	4,852	5,852	6,134	6,404	16%
Linked transit trips per inhabitant per year (USA)	**22**	**18**	**21**	**21**	**21**	**-4%**
Total transit trips per year in Germany (million)	9,156	9,265	9,638	11,069	11,203	22%
Linked transit trips per inhabitant per year (Germany)	**114**	**113**	**117**	**134**	**136**	**20%**
Total transit passenger kilometer in the USA (million)	65,829	63,693	76,266	79,485	85,365	30%
Transit passenger kilometers per inhabitant (USA)	**265**	**239**	**271**	**269**	**283**	**7%**
Total transit passenger kilometers in Germany (million)	77,300	86,700	90,900	97,300	100,300	30%
Transit passenger kilometers per inhabitant (Germany)	**963**	**1,060**	**1,104**	**1,179**	**1,220**	**27%**
Public transport mode share of all trips (Germany I)	10.0	10.5	11.0	11.4	n.a.	n.a.
Public transport mode share of all trips (Germany II)	10.0	n.a.	8.0	n.a.	n.a.	n.a.
Public transport mode share of all trips (USA)	2.0	1.8	1.6	n.a.	n.a.	n.a.

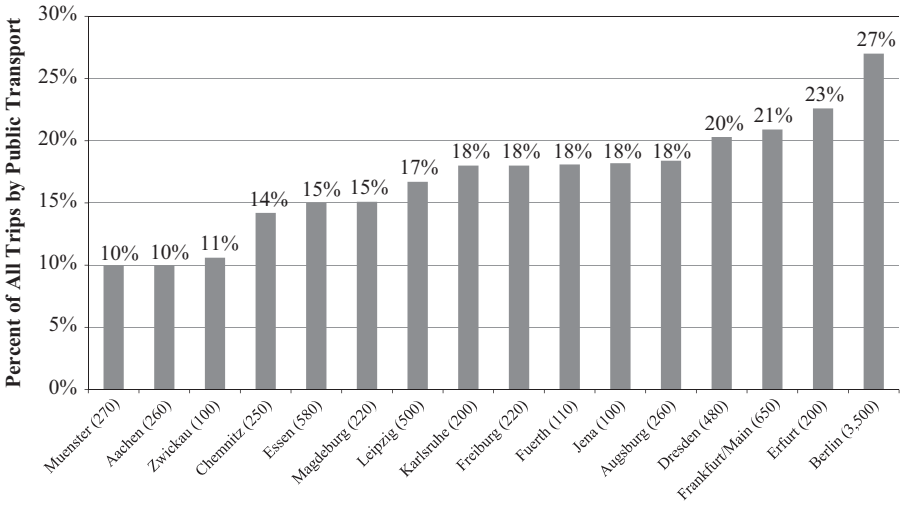

Fig. 1. Share of all trips by public transport in selected German cities, 2003–2007 (city population size in 1000 inhabitants in parenthesis) (Städtepegel, 2003; Städtetag, 2006; Socialdata, 2009).

Table 2
Trends in vehicle kilometers of public transport supply in Germany and the USA, 1992–2007.
Sources: (APTA, 2009; USDOC, 2009; VDV, 2001–2008).

	USA		Germany	
	Percent change 1992–2007 (%)	Percent change 1998–2007 (%)	Percent change 1992–2007 (%)	Percent Change 1998–2007 (%)
Vehicle kilometers of transit service per year (all modes)[a]	20	14	n.a.	−2
Vehicle kilometers of bus/light rail/trolley supply per year	15	7	−4	−7
Vehicle kilometers of commuter/metro rail supply per year	32	19	n.a.	4

[a] Excludes paratransit.

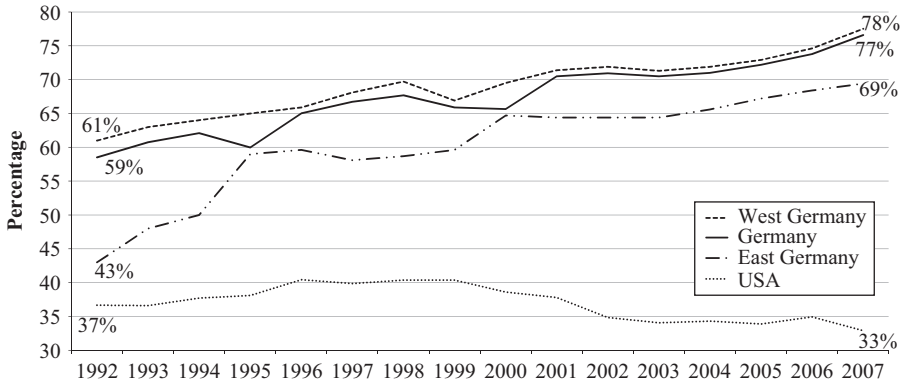

Fig. 2. Trend in farebox revenue as share of transit operating expenditure in Germany and the USA, 1992–2007 (VDV, 2001–2008; APTA, 2009).

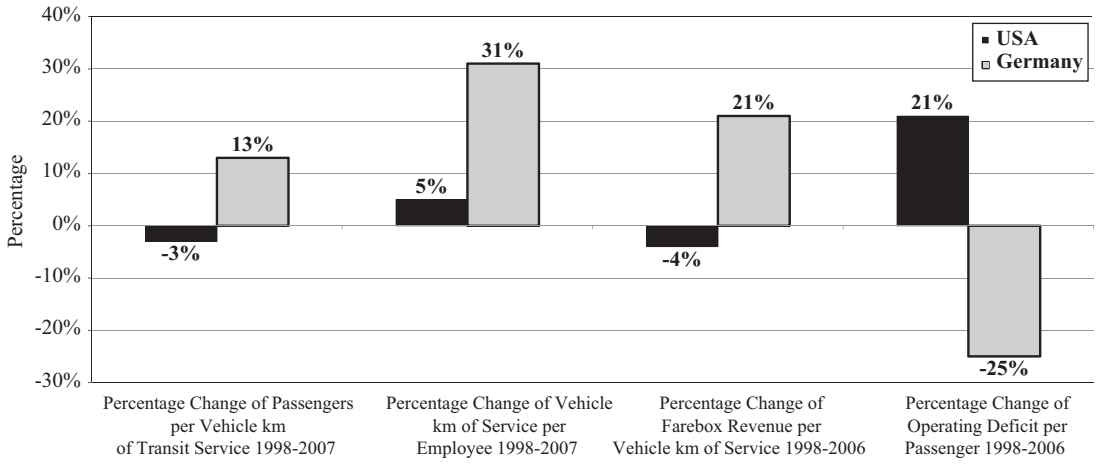

Fig. 3. Percentage changes of public transport productivity and financial efficiency indicators in Germany and the USA, 1998–2006/2007 (relative to 1998) (APTA, 2009; VDV, 2008; VDV, 2001–2008).

revenue covering operating costs. In spite of improvements, eastern Germany still trails the western part of the country (69 vs. 78%) (VDV, 2001–2008). The share of government subsidies in public transport operating budgets in the USA was almost three times the share in Germany in 2007 (62% vs. 23%).

German public transport also increased its productivity and financial efficiency significantly—compared to more modest increases and even decreases for some productivity and efficiency indicators in the USA (see Fig. 3). From 1998 to 2007, American public transport agencies expanded their transit services at a faster rate than ridership increased. Thus, the number of passengers per vehicle kilometer of transit service declined in the USA. Over the same time period, German transit demand increased faster than transit supply. Moreover, farebox revenue per vehicle kilometer of transit service declined in the USA, but increased sharply in Germany—likely related to more passengers per vehicle kilometer and increased transit fares.

Labor productivity in the transit industry has been improving in both countries. However, vehicle kilometers of transit service per employee increased six times faster in Germany than in the USA—indicating more significant gains in labor productivity in Germany. Large increases in labor productivity, and more riders

and additional farebox revenue per vehicle kilometers in Germany helped decrease transit's operating deficit per passenger by 25% between 1998 and 2006. More limited increases in labor productivity, fewer passengers, and less farebox revenue per vehicle kilometer contributed to a 21% increase in transit's operating deficit per passenger in the USA.

The preceding discussion has been limited to comparisons of operating expenses, revenues, and subsidies. Capital costs and subsidies must obviously be considered as well. That is more difficult due to the uneven timing of capital investments over time and differences among countries in their accounting for capital expenditures. In both Germany and the USA, federal, state, and local governments all contribute to capital funding to some degree. While the USA has a unified system of reporting for both operating and capital expenses, Germany's accounting is so confusing and unclear that it has sometimes been described as "spaghetti financing" (BMVBS, 2009; Scholz, 2006; USDOT, 2008; Wissenschatlicher Beirat, 2008). The multitude of different government programs, inconsistent reporting requirements, and complicated intergovernmental transfer arrangements make it difficult to determine exactly how much is spent on capital investments each year. Nevertheless, official statistics from several different sources indicate that Germany has averaged less than $5 billion a year in government subsidies for transit capital investments from 1997 to 2006 (Bundesregierung, 1999; Scholz, 2006; UBA, 2003). Per passenger kilometer, the average capital subsidy is considerably lower in Germany than in the USA ($0.05 vs. $0.17) (APTA, 2009; Wissenschatlicher Beirat, 2008). German transit also requires significantly less operating assistance ($0.13 vs. $0.19 per passenger kilometer). Thus, the total operating and capital subsidy per passenger kilometer, from all government levels combined is only about half as large as in the USA ($0.18 vs. $0.36). The rest of this paper investigates reasons why financial efficiency and productivity in public transport in Germany improved during the last decade.

4. Reasons for efficiency gains in Germany

There are two main reasons for improved financial performance of public transport in Germany: reduced costs and increased revenues. In the following discussion, we first consider the range of measures implemented to reduce costs, followed by an analysis of measures taken to increase ridership and revenue (for an overview of measures see Table 3).

4.1. Reducing costs

Reduced costs and increased financial efficiency in transit were triggered by new European transport financing legislation that has been enacted since the early 1990s. These regulations were never fully adapted into German law, but theoretically they distinguished between transit services that receive subsidies and those that do not (Brandt, 2006; Ewers and Ilgmann, 2000; Mietzsch, 2002; VDV, 2008). According to those regulations, subsidized transit services could be subject to a competitive call for tender process. Governments could be forced to award transit operating licenses to lowest cost providers. Transit services that do not require subsidies would not have to go through this call for tender process. Most local public transit services in Germany are subsidized. Thus, transit agencies perceived the pending EU regulation as an existential threat, since their agency might be outbid by an outside competitor in the bidding process—leaving the transit agency without a market to serve (Brandt, 2006; Girnau, 2003).

Table 3
Summary of measures taken by German public transport to reduce costs and raise revenues.

Cost reduction measures:
Organizational restructuring
Outsourcing to newly founded subsidiaries
Cutting of employee benefits
Increased work hours
Salary freezes
Early retirement programs
Cooperation agreements with other agencies to share employees, rolling stock, and facilities
Cutting underutilized routes and shifting resources to the most profitable services
Evaluating long term operating and maintenance cost resulting from any planned investments
Revenue enhancement measures:
Fare increases
Regional coordination of timetables, fares, and policies in metropolitan areas
Region-wide monthly or annual tickets that provide discounts compared to single trip fares
Full integration of public transport with walking and cycling
Cost increases for automobile use
Clustering of new development around transit stops

Successful lobbying from the German transit industry, long lasting court battles, disagreements about the legal definition of subsidies, and a slow acting German legislature have up to now delayed the implementation of these EU regulations in German national law (Girnau, 2003; Van de Velde, 2003; VDV, 2008). However, virtually all German transit operators assume that their agency will eventually have to compete with outside companies for the right to provide transit service. Moreover, it has been customary for many municipally owned transit agencies to cover their losses through cross-subsidies from other profitable municipal utilities. This revenue stream will likely run dry due to increased competition in liberalized electricity markets and shrinking profits for municipal electric utilities.

With the prospect of potential future competition, shrinking revenues of municipal utilities, and legal uncertainty due to pending court cases, most German public transport agencies have started to get ready for competitive tendering since the mid-1990s. Measures taken by transit agencies varied widely across Germany and depend on local circumstances. In spite of great variability, there are some communalities in cost cutting measures across all transit agencies (Girnau, 2003). Since the mid-1990s, most transit agencies have reduced their workforce, decreased salaries for employees, restructured their organization, and focused on overall cost effective provision of transit service. Transit agencies, local governments, and labor unions have worked together in implementing these changes. In many cases, public transport agencies and local governments guaranteed employment for union members during the restructuring process (for example in Munich, Berlin, and Leipzig). Unions in turn agreed to renegotiate labor contracts for current and future employees (Girnau, 2003).

Most transit agencies cut employee benefits that had been provided voluntarily and were not required by German law. Many agencies, for example in Bochum, Dresden, and Hamburg, eliminated or significantly reduced (1) pay for breaks and extended leave periods; (2) extra pay for overtime or certain odd-hour shifts; and (3) continued pay for workdays missed. Some public transport agencies increased the number of weekly hours worked without raising salaries. For example, public transport agencies in Hamburg and Dresden increased weekly work hours from 38 to 40 for all workers. BT, a subsidiary of Berlin's BVG, introduced a 42 hour workweek for new

employees—a weekly workload almost unheard of in Germany (Girnau, 2003).

Many agencies negotiated a freeze of salaries for current employees while the organization was undergoing restructuring—often for five years or longer. Public transport agencies in turn guaranteed not to lay-off any current employees during the time of restructuring. The job guarantee assured union buy-in to this policy.

Special programs encouraged older employees to retire earlier than originally planned. Replacement hires were often forgone or made at significantly lower salaries—either as part-time employees or full time in newly founded subsidiaries. Between 1998 and 2007, the number of workers employed by German public transport agencies directly shrank by 25% and payroll's share of overall transit agency expenditures decreased from 48% in 1998 to 38% in 2007 (Topp, 2006; VDV, 2001–2008). Berlin offers a drastic example: in 2008 only 11,000 of the 28,000 public transport workers employed in 1991 remained (Reinhold and Kearny, 2008). In 2007, German public transport had 130,000 full-time equivalent employees, compared to 382,000 full-time equivalent transit employees in the USA (VDV, 2008; APTA, 2009). Controlling for differences in overall passenger levels, there were four times as many employees per million linked passenger trips in the USA as in Germany (60 vs. 14).

The German workforce number stated above probably slightly underestimates total public transport employees, since many transit agencies have founded subsidiaries for hiring new employees. It is unclear if these new hires were fully captured in the reported data (Weiss, 2009). New subsidiaries are not necessarily part of the transit agency and are generally not subject to the same union contracts as the mother company. Thus, new hires in subsidiaries can receive lower salaries, fewer benefits, and work longer hours than older workers employed by the transit agency directly.

Between 1995 and 2003 salaries for new public transport employees in Germany fell by an estimated 30% (Ickert et al., 2005; Topp, 2006). Older and more expensive employees as well as a large part of overhead costs remain with the mother company. Thus, the new subsidiaries are very cost efficient, with low salaries and little overhead. Transit agencies are planning to use these new subsidiaries to win bids in future calls for tender in other cities and regions—thus potentially increasing the company's market share and geographic reach (for example: BT in Berlin or moBiel' in Bielefeld) (Girnau, 2003).

Overall, German transit agencies seem to emphasize long term operating and maintenance cost when making decisions on new infrastructure investments and changes in service provision. German cities like Berlin and Hamburg, for example, provide new rapid bus services on arterial roads with headways as short as four minutes (Reinhold and Kearny, 2008; Topp, 2006). The main focus is on reliability, convenience, and travel speed to compete with the automobile. One of Hamburg's new articulated MetroBus lines carries up to 50,000 passengers per day. In past decades comparable levels of service and passengers, would have likely been considered sufficient to justify more expensive subway service (Topp, 2006).

Similarly, German public transport operators have focused their transit services on profitable and attractive routes, while cutting less profitable, unattractive services. For example, BVG in Berlin conducted a corridor by corridor analysis of traffic patterns in the city to identify strengths and weaknesses of the public transport system compared to other modes of transport (Reinhold and Kearny, 2008). This analysis identified (1) less profitable routes with low ridership (mainly bus lines) at the fringe of the transit network and (2) ridership potential for increased service and more passengers on arterials in the city itself. Slashing of bus services at the fringe and increased service on arterials – the so-called MetroBuses – enabled the BVG to save €9.5 million annually and to increase transit ridership in the city by 24 million linked trips per year (Reinhold and Kearny, 2008).

Some public transport agencies entered into cooperation agreements with other agencies to reduce overall costs or to enter new markets. For example, neighboring transit agencies reduced costs by sharing garages (yard and shop) and part of their vehicle fleet. Transit agencies also share their IT and administrative personnel. In some municipalities employees are shared with other utilities, such as local water or energy utilities. Bremen's public transport agency went one step further and offers the services of its planning and IT staff as consultants to other transit agencies (Girnau, 2003).

Transit agencies also cut costs by jointly purchasing higher quantities of supplies at lower marginal prices—this can even include purchases of transit vehicles. In Freiburg, two light rail and bus providers (VAG and SWEG) jointly entered the commuter rail market and are operating the "Breisgau S-Bahn" (BSB). This is an endeavor which the two companies, with little or no experience in commuter rail operation, would likely not have undertaken individually. Moreover, BSB could only enter the commuter rail market, because of deregulation of regional rail in Germany, which started in 1996.

Indeed, most actual competitive tendering to date has occurred in Germany's regional rail markets in response to the restructuring of government-run German Railways (*DB*) (Brenck and Peter, 2007; Höhnscheid, 2005). In 1996, the federal government devolved the responsibility for the provision of regional rail service to its 16 member states. New public transport legislation in each state and new state-wide public transport planning agencies now set the framework for regional rail service in Germany.

Each year, states receive a share of the federal gas tax revenue to fund regional rail services—amounting to an average of €7 billion for all states together annually between the years 2002 and 2008 (Brenck and Peter, 2007; Höhnscheid, 2005). States are free to contract with *DB* or to issue calls for tender. Some states, such as Thuringia in 2002, contracted with *DB* for 10 years without any tendering. Other states did not contract their whole network to one company, but issued calls for tender for certain lines and routes. Between 1993 and 2005 the number of regional rail providers in Germany more than tripled from 25 to 93 (Brenck and Peter, 2007; Höhnscheid, 2005). The share of train kilometers of transit service of *DB* competitors increased from only 3% in 1993 to over 13% in 2005. Studies report cost savings of up to 18% per kilometer of train service when comparing costs of new and old contracts (Brenck and Peter, 2007; Höhnscheid, 2005).

Moreover, since the mid-1990s the quality and quantity of regional rail service has increased considerably, partially driven by new operators and a renewed customer orientation of *DB*. Moreover, German states used federal and own funds to buy new rolling stock, update train stations, improve the coordination and frequency of regional rail service, and integrate rail and other public transport services statewide (Brenck and Peter, 2007; Höhnscheid, 2005). For example, in the southwestern state of Baden-Württemberg, train kilometers of regional rail service increased from 54 to 81 million between 1994 and 2006 (Glaser, 2007; Pätzold, 2008; Schmidt-Hornig, 2008). During the same time period, statewide annual rail transit ridership increased by almost 50%; in some areas ridership more than doubled. The state used federal and own funds to upgrade and increase the frequency of its rail service and to coordinate regional rail schedules with the timetables of other transit services provided through Baden-Württemberg's 20 regional public transport authorities (Glaser, 2007; Pätzold, 2008; Schmidt-Hornig, 2008).

More national trends in demand side policies are described in the next section.

4.2. Increasing ridership and revenue

Public transport agencies and local governments have encouraged transit ridership through a variety of programs that increase transit's attractiveness compared to other modes. Public transport agencies have increased collaboration with regional partners in regional transit agencies and promoted regional monthly and annual transit passes for all groups of society. Transit agencies also increased the quality of their vehicles, stations, and other services with a focus on customer convenience. But they also increased fares significantly. Local governments have limited car travel speeds, clustered new development around transit, and coordinated their transport and land-use plans.

Public transport fares almost doubled in Germany between 1991 and 2007—almost three times faster than average consumer prices increased (+37%) (see Fig. 4). Fare increases were criticized by consumer advocacy organizations (Brandt, 2006). However, the increase in average transit fare was slightly less than the increase in gasoline prices (+95% vs. +100%). The sharp rise in gasoline prices was due to two significant gasoline tax increases in 1991 and 1994 and a series of gasoline tax hikes between 1999 and 2003. Moreover, world petroleum prices increased sharply between 2005 and 2007. Average automobile ownership and operating costs increased faster than consumer prices, but significantly slower than gasoline and transit ticket prices (Fig. 4). Once individuals have chosen to own an automobile, it is mainly the operating cost that determines daily travel choices. Thus, in the eyes of most Germans, transit and automobile costs have increased at roughly the same rate over the last 16 years. Rising transit fares increased revenue per passenger for transit agencies. Moreover, transit agencies' total revenues increased because the number of transit passenger trips rose in spite of the fare increases.

One reason for the success of German public transport is the tight coordination of transit services, fares, and schedules within metropolitan areas (Bundesregierung, 1999; Pucher, 1998; Pucher and Kurth, 1996). Starting with Hamburg in the 1960s, one German city after another created regional transit organizations (Verkehrsverbunds) which fully coordinated all aspects of public transport operations and ticketing (Pucher and Kurth, 1996). By 1990, virtually every metropolitan area in Germany had such a transit organization, which have expanded and upgraded services, vastly improved fare structures, and attracted large increases in passengers (BMVBS, 1991–2010; Buehler et al., 2009). As a result, transfers between bus and rail are closely coordinated, both in terms of timing as well as distance walked. Similarly, bus and rail lines are well coordinated with each other.

Special state government programs incentivize regional cooperation of transit providers. For example, in Baden-Würtemberg, the state government distributes €50 million annually to its 20 regional transit authorities to cover costs of regional coordination of transit service and ticketing (Land Baden-Württemberg, 2005). Verkehrsverbunds receive a higher share of funds if they are more successful in attracting passengers, increase the share of passengers with monthly and annual tickets, cooperate with neighboring transit authorities, and are more financially efficient (Land Baden-Württemberg, 2005).

Figs. 5 and 6 show trends in transit ridership and farebox revenue per passenger in German Verkehrsverbunds. Growth in ridership and revenue per passenger was stronger in Verkehrsverbunds than the German average. For example, the Verkehrsverbund in Freiburg saw an increase in ridership of over 50% between 1991 and 2007. Other regional transit agencies, such as Stuttgart, Rhein-Sieg, Hamburg, and Berlin also witnessed ridership increases of over 20%. While ridership expanded, regional transit authorities also increased their farebox revenue per passenger by at least 15%—indicating increasing overall revenue.

More recently, German states are emerging as a new level of integration and coordination of public transport services. Since 1996, all states introduced new coordinated timetables (Taktfahrplan) for rail public transport with the goal to integrate all rail public transport operations with local public transport services and long-distance rail—thus making transit more attractive (Bundesregierung, 1999; Scholz, 2006). Recent evidence from the USA suggests that metropolitan areas with integrated bus and rail networks have higher ridership levels and are more cost effective compared to other metropolitan areas (Brown and Thompson, 2008).

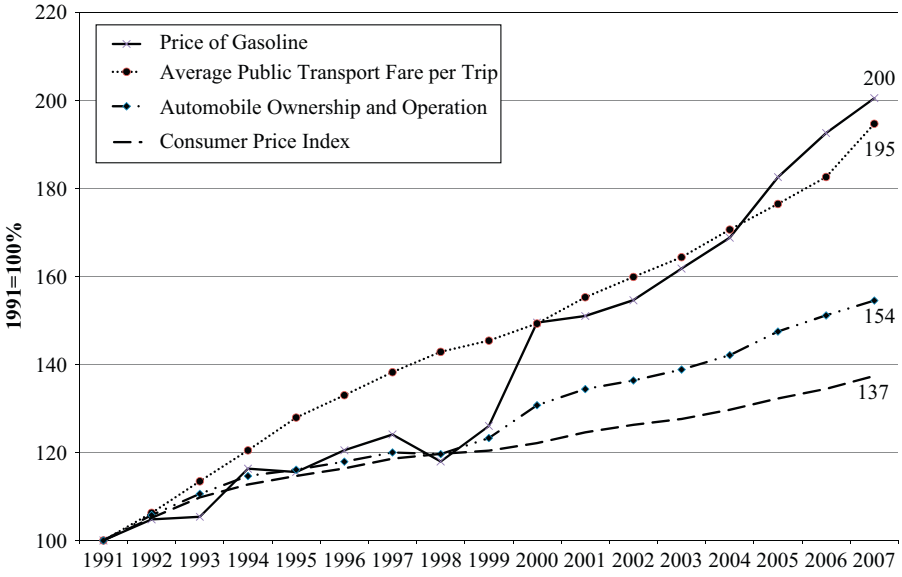

Fig. 4. Trend in average transit fares, automobile ownership and operation costs, and consumer price index in Germany, 1991–2007 (percent relative to 1991) (DESTATIS, 2009).

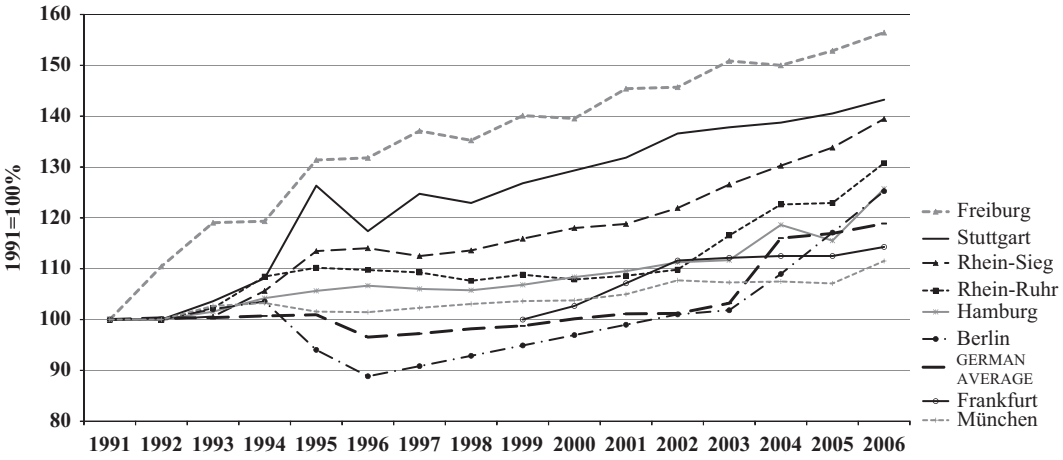

Fig. 5. Trend in annual transit trips in selected "Verkehrsverbunds" in Germany, 1991–2006 (percent relative to 1991) (*BMVBS, 1991–2008*).

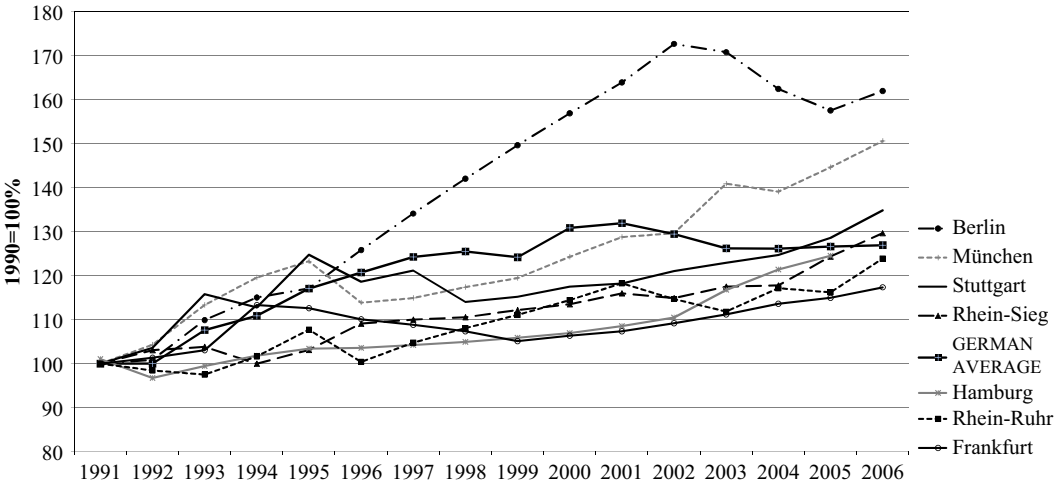

Fig. 6. Trend in transit revenue per passenger in "Verkehrsverbunds" in Germany from 1990 to 2006 (percent relative to 1990) (*BMVBS, 1991–2008*).

Most regional transit authorities offer integrated daily, monthly, and annual tickets, which allow passengers to use one ticket for the entire trip, regardless of how many transfers are necessary and how many different transit modes are used. Moreover, virtually all German states now offer state-wide public transportation tickets for groups of up to five travelers. These tickets cost €30 per day and grant access to all regional and local public transport systems in the state.

Weekly, monthly, and annual transit tickets offer a 60% discount per trip compared to single trip fares. This makes it economical and convenient to use public transit on a daily basis and as an alternative to driving during the commute (VDV, 2001–2008, 2006). In fact, German public transport has successfully expanded the share of passengers using weekly, monthly, or annual tickets from 60% in 1992 to 76% in 2007 (VDV, 2001–2008). In some cities over 90% of passengers rely on monthly and annual tickets. For example, in the southwestern city of Freiburg, the share of riders with monthly and annual tickets increased sharply from 64% in 1983 to 92% in 2007 (see Fig. 7). Freiburg was the first German city to successfully experiment with transferable monthly and annual tickets starting in 1984.

Nationwide 45% of regular passengers had monthly tickets and 33% had annual tickets in 2007. In addition, German public transport agencies actively expanded their programs of deeply discounted student and senior tickets (e.g. the Rhein-Ruhr Verkehrsverbund's *Schokoticket* or the Rhein-Neckar Verkehrsverbund's *Maxx Ticket*). Some Verkehrsverbunds offer monthly and annual tickets that also include other transport services. For example, in 2004, the city of Hanover introduced a new integrated mobility ticket, which offers free access to all transit services in the greater Hanover region—including reduced rates for taxis, car-sharing services, and rental cars. In addition, users receive 25% discounts for long-distance rail travel throughout Germany and other services such as bicycle maintenance, luggage delivery, and travel information services (Nobis, 2007).

Public transport agencies have also improved their customer service and increased the convenience of many other services to make transit an attractive alternative to the car. These measures include:

- Electronic real time information at most commuter and light rail stops and on almost all train cars and busses effectively communicates arrival and departure times of trains.
- Signal priority at intersections gives transit vehicles an automatic green light when approaching intersections. This makes transit service faster and more reliable.

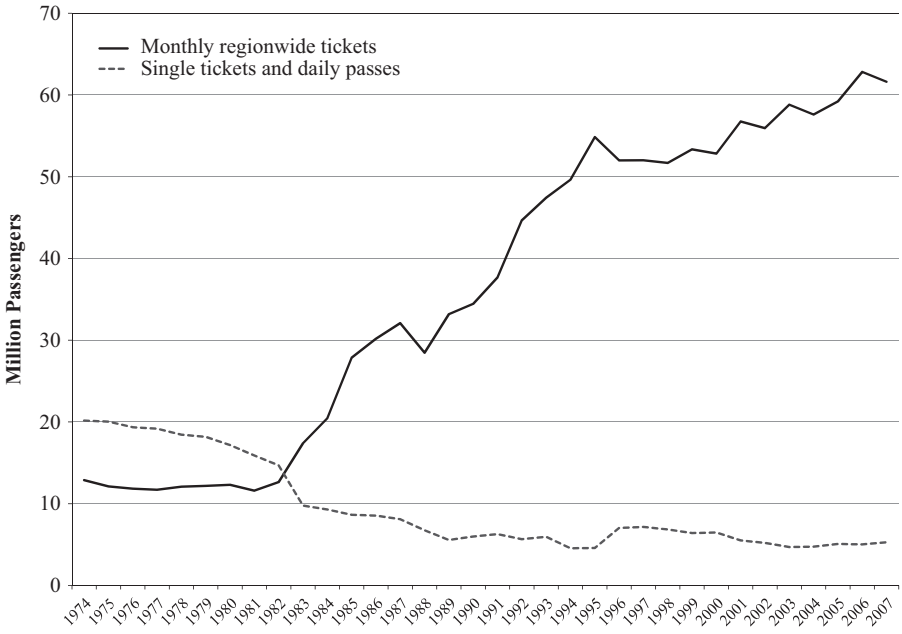

Fig. 7. Trend toward monthly region-wide tickets in Freiburg, 1974–2007 (City of Freiburg, 2008b).

- Integration of public transport with bicycling. For example, the German national rail provider *DB* provides its "Call-A-Bike" program in several large German cities. Bikes are located at transit stops and throughout cities. Everyone who finds a parked *DB* bike can call a number displayed on the bike, give their credit card information and obtain a passcode for the bike lock. Once the bike lock is opened, *DB* charges €0.08 per minute. Owners of transit season tickets pay only €0.06 per minute. The bikes can be used for as long as necessary and can be left at any intersection in the city. German Railways ceases charging as soon as the lock of the bike is closed (German Railways, 2007).
- Tickets for large events, such as professional soccer games and music concerts, generally also serve as transit tickets to access and leave the venue—at no extra charge. This was put to a test when Germany hosted the soccer world cup in 2006. Transit agencies in all German world cup host cities participated and allowed fans to access the soccer stadium by honoring the entrance ticket on local transit services.
- Electronic tickets can be purchased via mobile phone and do not require passengers to wait in line at ticket booths or ticket vending machines. If passengers choose to purchase their ticket electronically, passengers simply flash the screen of their mobile phone as proof of purchase.
- Improved searchable internet websites with timetables that are fully integrated across operators, public transport modes, regions, and even statewide. Moreover, some Verkehrsverbunds allow passengers to create an electronic login and to customize their website. The *Stuttgart VSS Verkehrsverbund* employs this tool to send emails and text messages informing customers about upcoming delays, construction site, and other events (VDV, 2008).

4.3. Complementary government policies

Transport, taxation, and land-use policies at all levels of government have helped to make German public transport more attractive compared to the automobile. For example, area-wide traffic calming, car-free pedestrian zones, increased fees for car parking, and reduced parking supply slow down car travel, raise its cost, and make it less convenient. Similarly, federal taxation policies have helped make car use more expensive. For example, from 1999 to 2003 the federal government increased the gas tax by €0.03 per liter each year to a total of €0.15 over five years (BMF, 2005). In 2007, the share of taxes in the price of gasoline was four times higher in Germany than the USA (IEA, 2008). Sales taxes on new vehicle purchases were three times higher in Germany than the USA (BMF, 2008; USDOT, 2001).

Since the 1970s, most German cities have improved conditions for cycling and walking by traffic-calming nearly all neighborhood streets to 30 km/h or less, pedestrianizing downtowns, and expanding networks of separate bike paths and lanes (Pucher and Buehler, 2008). The vast majority of German passengers access public transport by bicycle or foot (BMVBS, 2004). Thus, safe and convenient facilities for walking and cycling help increase transit's appeal.

City planners deliberately connect sidewalks, crosswalks, and bike paths and lanes with transit stops. Moreover, all municipalities provide bike parking at transit stops. Generally all of these measures are applied at the same time. For example, the city of Berlin (3.5 million inhabitants) has 3800 kilometers traffic calmed streets (72% of its road network), a bike network of 1100 km of separate lanes and paths, and over 23,000 bike parking spots at transit stops (City of Berlin, 2006). Improving pedestrian and cycling infrastructure and connecting it to public transport is far cheaper and requires much less space than providing car parking lots or garages for park and ride facilities—and may help cities and transit agencies save money in the long run.

German land-use laws and regulations encourage dense and mixed-use settlements, which facilitate transit use (Hirt, 2007; Schmidt and Buehler, 2007; Wiegandt, 2004). Higher population density and mixed land-use assure short trip distances between transit stops and trip origins and destinations. For example, since 1984 the city of Freiburg has clustered its new development around its expanding light rail network. In 2007, 65% of all Freiburgers and 70% of all jobs were within 300 m of a transit stop. This might help explain, among others, why the mode share

of public transport there increased from 11% in 1983 to 18% in 2007 (City of Freiburg, 2008a).

Policies to limit car use and promote more sustainable modes of transport often face barriers such as public acceptability, splintered institutional responsibility, financial constraints, or legislative restrictions (European Commission, 2005; May, 2008). Innovative approaches implemented in Germany can help overcome some of these barriers.

When the Green Party became a coalition partner in the federal government in 1998, it proposed a gasoline tax increase of €0.15 per liter with the intention to curb energy use. The proposed tax increase was very unpopular and met intense public opposition. The governing coalition secured public support by earmarking gasoline tax revenue to finance a reduction in payroll taxes—thus returning the newly generated gasoline tax revenue to taxpayers and making the tax increase revenue neutral for the government. Moreover, the tax was introduced in €0.03 increments over five years, softening the impact a one-time €0.15 increase would have had on public opinion. The successive tax increases expired in 2003 as planned and there was no political support to continue with further tax increases. However, the five-year implementation of the environmental tax helped boost gas taxes and prices permanently.

Similarly, in many German cities local business leaders initially resisted the establishment of pedestrian zones in the city center—fearing a loss of customers and revenue. Local business opposition often only subsided when citizens and city governments agreed to build parking garages at the edge of the proposed pedestrian zones, thus ensuring access for customers.

Regional coordination with neighboring jurisdictions on land-use and transport planning has not always been easy. For example, many transit providers in the Freiburg region only agreed to join the unified regional transit ticket after receiving an initial contract guaranteeing minimum annual revenue. That protected the transit providers against financial risks of joining the regional transit authority.

Similarly, in 1984, Freiburg's transit provider (VAG) opposed the introduction of a flat fare monthly public transport ticket—fearing declining revenues and financial disaster. To overcome that resistance, the state government provided financial guarantees during the initial implementation phase. Freiburg's city council then forced VAG to implement the ticket, which turned out to be a huge success. Today VAG covers 90% of its operating budget with fare revenues—making Freiburg's transit system among the most financially sustainable in Germany.

4.4. Possible conflicts with social sustainability

Public transport and government agencies must balance the sometimes competing objectives of economic and social sustainability. In general, more frequent, higher quality, and financially efficient public transport also helps achieve social sustainability. However, in some circumstances financial efficiency and social equity might not be fully compatible (BBR, 2002; Topp, 2006; Werner, 2006). For example, focusing transit service on profitable arterials might result in more limited accessibility for poorer, carless households in peripheral and rural locations. Because of geographic equity and accessibility considerations governments and transit agencies subsidize certain unprofitable transit services with the goal of assuring accessibility for all citizens.

Furthermore, a considerable share of cost savings were achieved at the expense of public transport workers, either by reducing the size of the workforce, lowering wages, increasing the share of part-time positions, extending work hours, or reducing benefits (Brandt, 2006). Some scholars estimate that salaries for new hires are too low to maintain an average standard of living in some metropolitan areas (Topp, 2006). Lower wages and more precarious labor contracts might also be related to higher employee turnover rates, more absences, and lower worker moral.

After a period of cooperation, the future may hold increased confrontation between public transport providers and German labor unions. The last 20 years saw some strikes and labor disputes, but also witnessed close cooperation between public transport providers, municipalities, and labor unions (Brandt, 2006; Girnau, 2003). German labor unions are generally supportive of public transport as an equitable means of commuting (DGB, 2006a). For example, labor unions joined public transport's fight against proposed reductions of federal subsidies (Allianz Pro Schiene, 2006). However, labor unions seem to be taking an increasingly aggressive stance in pursuing the interests of their constituents (DGB, 2006b). For example, the head of Germany's largest union organization (DGB) declared the last ten years a "lost decade for labor". An increasing number of strikes in small and large public transport agencies in recent years may serve as a bellwether for worsening labor relations in the coming years.

Moreover, cutting costs through workforce reductions and limiting wages can be problematic. For example, in the summer of 2009, an inspection by the German rail regulatory office (EBA) detected a potential malfunctioning in the wheels of certain Berlin S-Bahn cars (Eisenbahnbundesamt, 2009). Nobody was hurt, but EBA ordered one quarter of all S-Bahn trains off the tracks and required an inspection of all cars. Over the past decade, the Berlin S-Bahn has closed many of its garages and laid-off many maintenance workers. The remaining garages and employees did not have enough capacity to inspect rail cars quickly enough to avoid service cutbacks. Thus, the S-Bahn had to reduce service frequency and even shut down entire stretches of its network for weeks. Inspecting a fourth of all trains at once is a challenge for any transit agency, but this case points to a potential conflict between a lean organization and preparedness for unexpected disruptions.

The potential problems highlighted above are reminiscent of experiences with private provision of public transport in the USA during the last 30 years (Black, 1995; Kim and Wachs, 2006; Richmond, 2001; Sclar and Leone, 2001; Frick et al., 2008; Vuchic, 2005). Most authors' acknowledge potential cost savings and – at least short term – efficiency gains of privatization of public transport in the USA. However, most studies recognize that private sector cost savings, compared to service provision by public agencies, have often come at the expense of lower quality of public transport services, lower wages, and less benefits for employees. Lower levels of worker compensation have often been associated with higher employee turnover and lower worker morale. Moreover, some observers suggest that private provision of public transport in the USA has only resulted in short-term efficiency gains, which might be off-set in the long run. Financial efficiency of transit in Germany has been increasing continuously for over 15 years now, suggesting it might not be a short-term occurrence. However, reorganization of the public transport sector in German public transport is still unfolding, and it is too early for a final judgment.

5. Lessons from Germany

Improved financial performance of German public transport provides useful lessons for government and transit agencies in the USA and other countries:

Encourage regulated competition and private sector involvement: New proposed European Union regulations possibly requiring

public tendering of subsidized transit routes have forced German transit agencies to cut their costs and increase their revenues. Similarly, partial liberalization of the regional rail market, initiated by the German federal government, increased competition, attracted new rail companies, and resulted in an increase in the level and quality of German regional rail service. Reorganization of public transport agencies, competitive tendering, and contracting-out occurred within a framework of government oversight and planning. In Germany, state, regional, and local governments retain control over public transport planning, coordination across operators, integration with land-use planning, and regional and state-wide integration of public transport service. Most public transport services in Germany are still provided by public transport agencies, but in a regulated and competition oriented environment (Brandt, 2006).

Collaborate with local governments and labor unions: Collaboration with labor unions and local governments made it possible to negotiate new more flexible labor contracts with less generous benefits, increased work hours, and lower starting salaries for new employees. One solution was the formation of subsidiaries that were governed by new rules. The existing labor force in the mother company was generally protected from changes. Another way of reducing labor costs were early retirement programs targeted at older workers who voluntarily left the transit agencies and thus helped to reduce the number of employees. Transit agencies reduced costs by not replacing departing workers or hiring new employees at significantly lower salaries in the newly founded subsidiaries.

Collaboration with labor unions can also assure that wage levels for public transport employees are not so low that they depress morale, increase turnover, and diminish the quality of public transport service. In Germany, some public transport systems may have reduced wages too much—resulting in strikes and other conflicts with unions.

Focus on profitable services without abandoning equity criteria: German transit agencies analyzed transit markets and focused system expansions in areas with greatest ridership potential. At the same time unprofitable services at the fringes of transit networks were cut. While expanding services, transit agencies kept future operating and maintenance costs in mind. In contrast to costly subway and light rail system expansions in the 1980s, some of these new profitable services include buses on dedicated routes with headways as short as four minutes.

Concentrating on profitable services should not come at the expense of equity and accessibility considerations, however. Governments will still have to subsidize less profitable public transport services in rural areas or along less popular routes to provide accessibility without a car for all groups of society.

Collaborate with other agencies: Transit agencies collaborated with regional partners to share employees, facilities, and make joint supply purchases at lower marginal costs. These collaborations, of course, also include regional or even state-wide integration of timetables and services that make transit more attractive to customers. Regional transit authorities (Verkehrsverbunds) emerged in Hamburg in the 1960s and have spread to virtually all German cities. More recently, German states encouraged statewide collaboration and integration of services.

Facilitating regional collaboration between public transport providers and establishing state-wide coordination of public transport service takes time and requires government involvement. In Germany, state governments were required by federal law to create transit authorities that coordinate public transport state-wide in the 1990s. Regional coordination of transit providers has been facilitated by annual state government subsidies that help cover the additional costs of regional coordination of transit service provision and ticketing.

Improve the quality of service with the customer in mind: Transit agencies also improved the attractiveness of their services to attract more passengers. Transit services were integrated region-wide across operators and modes—both in terms of timetables and ticketing. Attractively priced monthly and annual tickets provide an unlimited number of transit rides throughout metropolitan areas at 60% discounts compared to single trip fares. Transit agencies have also significantly increased their fares since 1990. In face of increasing transit fares, more and more passengers opted for monthly and annual tickets, which now account for 76% of ticket sales. Transit agencies have also integrated their services with walking and cycling—for example through bike parking at transit stops or bike sharing programs. Online services, such as searchable timetables, electronic tickets, or regular text messages and emails increase transit's convenience and meet the needs of younger tech-savvy transit riders.

Implement policies that increase public transport's competitiveness: All levels of German government have implemented policies that make public transport more attractive and automobile travel less convenient and more costly. For example, the federal government has more than doubled gasoline taxes between 1990 and 2007 and dedicated a share of gas tax revenue as matching funds for public transport investments. Local policies also increased the cost and decreased the convenience of car use. For example, traffic calming, car-free pedestrian zones, limited car parking and high parking fees increased the time and out of pocket cost of car use in cities.

At the same time, local governments have integrated land-use and transport planning to cluster new development around transit stops. Local integration of public transport with walking and cycling make these three modes together a viable alternative to the car. State and local governments also coordinate transit and regional rail timetables and fares. Changes in transport policies, land-use plans, and the built environment take time. Many municipalities in Germany started their journey towards more sustainable transport several decades ago. Germany's most sustainable city, Freiburg, started its transformation towards more sustainability over four decades ago.

Integrate and coordinate measures to enhance outcomes: Public transport agencies, cities, regions, and states in the USA already pursue some of the policies implemented in Germany. For example, some transit systems have introduced regional and monthly tickets, improved service, and upgraded their vehicles. Some cities have built bicycle paths and lanes, pedestrian zones, and new light rail and bus rapid transit systems. However, no American city has consistently implemented the entire gamut of measures found in Germany. Most German cities have relied on both incentives for public transport, bicycling, and walking and disincentives for car use. Only a few cities in the USA have even attempted to make car ownership and use more costly, slower, and less convenient. While incentives for public transport can work alone to some extent, the combination with disincentives for automobile use has the potential to amplify the outcome. That combined approach has been crucial to generating public and political support for public transport in Germany. Perhaps most important, car restrictive measures are not viewed as punitive, since car users are offered safe, convenient, and affordable public transport options.

6. Conclusions

Shifting trips from automobiles to public transport can help mitigate environmental and social problems, by reducing energy consumption and CO_2 emissions, curbing traffic congestion and fatalities, and providing mobility to disadvantaged groups

without access to cars. Increasing public transport's financial sustainability provides a unique opportunity to use public funds more efficiently while promoting environmental and social sustainability. From 1991 to 2007, public transport use per capita increased by 22% in Germany, while financial productivity improved significantly. From 1991 to 2007, the share of operating expenses covered by passenger fares increased from 59% to 77%. Between 1998 and 2006, vehicle kilometers of transit service per employee increased by 31%, and passenger revenue per vehicle kilometer grew by 21%. Rising revenues and declining costs reduced the inflation-adjusted deficit per passenger from 57 to 39 Euro cents (VDV, 2001–2008, 2008). Increasing financial sustainability is crucial to realizing the social and environmental benefits public transport can provide.

Acknowledgements

The authors are indebted to Tobias Bernecker (State of Baden-Württemberg), Wulf Daseking (City of Freiburg), Wilhelm Dückers (State of Brandenburg), Ursula Dziambor (VDV), Dagmar Glaser (State of Baden-Württemberg), Bernhard Gutzmer (City of Freiburg), Andreas Hildebrandt (VAG Freiburg), Uwe Kunert (DIW Berlin), Gabriele Linke (City of Berlin), Oliver Mietzsch (Deutscher Städtetag), Uwe Schade (City of Freiburg and Regio Verbund Freiburg), Wolfgang Schwenk (VDV), and Marga Weiss (VDV). We also thank Elizabeth Deakin and two anonymous referees for their suggestions for improving earlier versions of this article.

References

Allianz Pro Schiene, 2006. Vier Große Verbände Gegen Kürzungen Bei Den Regionalisierungsmitteln: Erfolg Belohnen—Nahverkehr Sichern. Deutscher Gewerkschaftsbund und Allianz Pro Schiene, Berlin.

APTA, 2009. Public Transportation Fact Book Appendix A: Historical Tables. American Public Transportation Association, Washington, DC.

Banister, D., 2005. Unsustainable Transport: City Transport in the New Century-Routledge, London, New York.

BBR (Ed.), 2002. Bahn in Der Fläche—Top Oder Flop?. Bonn, Bundesinstitut für Bau-, Stadt-, und Raumforschung.

Black, A., 1995. Urban Mass Transportation Planning. McGraw-Hill, New York City.

BMF, 2005. Die Mineralölsteuer—Petroleum Taxes. Bundesministerien der Finanzen—German Federal Ministry of Finance, Berlin.

BMF, 2008. Mehrwertsteuer—Value Added Tax. Bundesministerium der Finanzen—German Federal Ministry of Finance, Berlin.

BMVBS, 1991–2010. Verkehr in Zahlen. German Transport in Figures. German Federal Ministry of Transportation and Urban Development, Berlin.

BMVBS, 2004. Mobilität in Deutschland—Mobility in Germany Survey. German Federal Ministry of Transportation and Urban Development, Bonn.

BMVBS, 2009. Forschungsinformationssystem: Mobilität, Verkehr, Und Stadtentwicklung. BMVBS/FIS, Berlin.

Brandt, T., 2006. Liberalisation, Privatisation and Regulation in the German Local Public Transport Sector. Wirtschafts- und Sozialwissenschaftliches Institut der Hans Böckler Stiftung, Düsseldorf, Germany.

Brenck, A., Peter, B., 2007. Experience with Competetive Tendering in Germany. OECD, Paris.

Brög, W., Erl, E., 2003. Verkehrsmittelwahl in Deutschland: Neue Und Alte Bundesländer—Transportation Mode Choice in East and West Germany. Socialdata, Munich.

Brög, W., 2004. Neue Studie: Mobilität in Deutschland 2002: Oder Vorhang Zu Alle Fragen Offen. Mobilogisch, 25.

Brown, J., Thompson, G.L., 2008. Service orientation, bus–rail service integration, and transit performance: an examination of 45 U.S. metropolitan areas. Transportation Research Record: Journal of the Transportation Research Board of the National Academies of Science 2042, 82–89.

Buehler, R., 2009. Promoting public transportation: a comparison of passengers and policies in Germany and the US. Transportation Research Record: Journal of the Transportation Research Board of the National Academies of Science 2110, 60–68.

Buehler, R., Pucher, J., Kunert, U., 2009. Making Transportation Sustainable: Insights from Germany. The Brookings Institution, Washington, DC.

Bundesregierung, 1999. Bericht Der Bundesregierung üeber den Öeffentlichen Nahverkehr in Deutschland Nach Vollendung Der Deutschen Einheit. German Federal Government, Berlin.

City of Berlin, 2006. Radfahren in Berlin. Senatsverwaltung fuer Stadtentwicklung, Berlin.

City of Freiburg, 2008a. Verkehrsentwicklungsplan Endbericht 2008, Transportation Planning. City of Freiburg, Freiburg.

City of Freiburg, 2008b. Fritz Daten Online. City of Freiburg.

DESTATIS, 2009. Consumer Price Index Germany. Bundesamt fuer Statistik, Wiesbaden.

DGB, 2006a. A Kürzungen Im Nahverkehr. Deutscher Gewerkschaftsbund, Berlin.

DGB, 2006b. DGB Fordert Europaweite Mindesstandards Im Verkehrssektor. Deutscher Gewerkschaftsbund, Berlin.

Eisenbahnbundesamt, 2009. Eba Ordnet Vorübergehende Außerbetriebnahme Weiterer S-Bahn-Fahrzeuge An. Available at 〈http://www.eba.bund.de/cln_016/nn_201964/SharedDocs/Aktuelles/DE/Presse_26Fachmitteilungen/Pressemitteilungen/Archiv/2009/06__S__Bahn__Berlin__2.html?__nnn=true〉. Accessed 08 August.

European Commission, 2005. Plume. Planning and Urban Mobility in Europe. Final Report, Brussels.

Ewers, H.J., Ilgmann, G., 2000. Wettbewerb Im Öeffentlichen Nahverkehr: Gefordert, Gefürchtet, Verteufelt. Internationales Verkehrswesen 52, 17–20.

Frick, K.T., Taylor, B., Wachs, M., 2008. Contracting for public transit services in the US: evaluating the tradeoffs, OECD/ITF: Privatisation and Regulation of Urban Transit Systems—Round Table 141. Organisation for Economic Co-operation and Development, International Transport Forum, Paris.

German Railways, 2007. Call a Bike. Available at 〈http://www.bahn.de/p/view/mobilitaet/fahrrad/call_a_bike.shtml〉. Accessed 24 February 2008.

Girnau, G., 2003. Restrukturierungs-Modelle Deutscher Nahverkehrsunternehmen: Voraussetzungen, Massnahmen, Ergebnisse. Verband Deutscher Verkehrsunternehmen, Cologne.

Glaser, D., 2007. Der Öffentliche Personennahverkehr in Baden-Württemberg. Land Baden-Württemberg, Stuttgart.

Hirt, S., 2007. The Devil Is in the Definitions. Contrasting American and German Approaches to Zoning. Journal of the American Planning Association 73, 436–450.

Höhnscheid, H., 2005. Schienenpersonennahverkehr im Jahr Zehn Der Regionalisierung—Eine Bestandsaufnahme. VDV, Cologne.

Ickert, L., Greinus, A., Grotrian, J., Rommerskirchen, S., Weyand, E., Winkler, C., 2005. Bedeutung Des Öpnv-damit Deutschland Mobil Bleibt. ProgTrans/HSW, Luzern.

IEA, 2008. Energy Prices and Taxes. International Energy Agency, New York.

IMF, 2010. World Economic Outlook DatabaseInternational Monetary Fund.

IRF, 2007. World Road Statistics. International Road Federation, Brussels.

Karsten, M., Usbek, H., 2005. Gewerbesuburbanisierung—Tertiärisierung der Suburbanen Standorte. In: Brake, K., Dangshat, J.S., Herfert, G. (Eds.), Suburbanisierung in Deutschland. Leske und Bunderich, Oldenburg.

Kim, S., Wachs, M., 2006. Transit and contracts: what's best for drivers? Access 28, 26–31.

Land Baden-Württemberg, 2005. Verbundförderung. Land Baden-Württemberg, Stuttgart.

May, T., 2008. Changing Behavior in Passenger Transport—Strategies and Barriers. International Transport Forum, Paris.

Mietzsch, O., 2002. Auf Strasse Und Schiene: Stadtverkehr im Umbruch. Der Staedtetag 12.

Nobis, C., 2007. Multimodality—facets and causes of sustainable mobility behavior. Transportation Research Record 2010, 35–44.

OECD, 2008. Oecd Factbook. Organization for Economic Cooperation and Development, Paris, France.

ORNL, 2005. National Household Travel Survey 2001. Version 2004. U.S. Department of Energy, Oak Ridge National Laboratories.

Pätzold, J., 2008. Vdv Landesgruppen Erfahrungsaustausch Baden-Württemberg. VDV, Stuttgart.

Pucher, J., Kurth, C., 1996. Verkehrsverbund: the success of regional public transport in Germany, Austria and Switzerland. Transport Policy 2, 279–291.

Pucher, J., 1998. Urban transport in Germany: providing feasible alternatives to the car. Transport Reviews 18, 285–310.

Pucher, J., Buehler, R., 2008. Making cycling irresistible: lessons from the Netherlands, Denmark, and Germany. Transport Reviews 28, 495–528.

Reinhold, T., Kearny, A.T., 2008. More passengers and reduced costs—optimization of the Berlin Public Transport Network. Journal of Public Transportation 11, 57–76.

Richmond, J., 2001. The Private Provision of Public Transport, Cambridge, MA, Taubman Center for State and Local Government: Kennedy School of Government, Harvard University.

Schmidt-Hornig, G., 2008. Öpnv in Baden-Württemberg. Inenministerium Baden-Württemberg, Stuttgart.

Schmidt, S., Buehler, R., 2007. The planning process in the US and Germany: a comparative analysis. International Planning Studies 12, 55–75.

Schmucki, B., 2001. Der Traum vom Verkehrsfluss: Städtische Verkehrsplanung seit 1945 im deutsch-deutschen Vergleich. Campus Verlag, Munich.

Scholz, R., 2006. Woher Kommt das Geld fuer den öepnv. Internationales Verkehrswesen 58, 222.

Schulz, B., Dosch, F., 2005. Trends der Siedlungsflächenentwicklung und ihre Steuerung in der Schweiz und Deutschland DISP 160 (41), 5–22.

Sclar, E.D., Leone, R.C., 2001. You Don't Always Get What You Pay For: The Economics of Privatization. Cornell University Press, Ithaca, NY.

Socialdata, 2009. Mobility Indicators of German Cities. Socialdata, Munich.

Städtepegel, 2003. System Repräsentativer Verkehrsbefragungen. Mobilität in Städten 2003. SRV.
Städtetag, D., 2006. Der Städtetag Infoseite. Available at 〈http://www.staedtetag.de/10/staedte/nach_namen/index.html〉. Accessed 08/16/2008.
Topp, H., 2006. Zur Finanzierung Des Öffentlichen Personennahverkehrs. Verkehr und Technik 59, 157–159.
TRB, 2001. Making Transit Work: Insight from Western Europe, Canada and the United States. Transportation Research Board, National Research Council, National Academy Press, Washington, DC.
TRB, 2005. Integrating Sustainability into the Transportation Planning Process. Transportation Research Board, National Academies, Committee for the Conference on Introducing Sustainability into Surface Transportation Planning, Washington, DC.
UBA, 2003. Konzeption Zur Finanzierung Eines Umweltvertraeglichen Öffentlichen Personennahverkehrs. Umweltbundesamt, Dessau.
USDOC, 2009. American Community Survey. U.S. Department of Commerce, U.S. Census Bureau, Washington, DC.
USDOT, 1990–2008. Highway Statistics. U.S. Department of Transportation, Federal Highway Administration.
USDOT, 2001. Summary of State Motor Vehicle Registration Fee Schedules. U.S. Department of Transportation, Federal Highway Administration, Washington, DC.
USDOT, 2008. National Transit Database. U.S. Department of Transportation, Federal Transit Administration.
Van de Velde, D.M., 2003. Regulation and competition in the European Land Passenger Industry: some recent evolutions. In: Eighth Conference on Competition and Ownership in Land Passenger Transport, Rio de Janeiro, Brazil.
VDA, 2007. Automobilproduktion in Deutschland. Available at Accessed 02/25/2008.
VDV, 2001–2008. Vdv Statistik. VDV, Cologne.
VDV, 2006. Jahresbericht 2006. Available at 〈www.vdv.de〉. Accessed 10/12/2006.
VDV, 2008. VDV Jahresbericht 2007/2008. Available at 〈http://www.vdv.de/publikationen/periodika.html〉. Accessed 01/15/2009.
Vuchic, V., 2005. Urban Transit: Operations, Planning, and Economics. Wiley & Sons, Hoboken, NJ.
Wachs, M., Crawford, M., Wirka, S., Rikala, T., 1992. The Car and the City: The Automobile, the Built Environment, and Daily Urban Life. University of Michigan Press, Ann Arbor.
Weiss, M., 2009. Employment and Outsourcing in the German Public Transport Industry. VDV, Cologne.
Wentzel, B., Wentzel, D. (Eds.), 2000. Wirtschaftlicher Systemvergleich Deutschland/USA, Stuttgart, Lucius & Lucius Verlagsgesellschaft.
Werner, J., 2006. Reform Zur Marktöffnung Im Nahverkehr-Bewältigung Der Daseinsaufgabe Im Wettbewerb, Institut für Mobilitätsforschung: Öffentlicher Personenverkehr—Herausfoderungen Und Chancen. Springer, Berlin.
Wiegandt, C., 2004. Mixed land use in Germany: chances, benefits and constraints. Conference Paper: International Planning Symposium on Incentives, Regulations and Plans—The Role of States and Nation-States in Smart Growth. College Park, Planning National Center for Smart Growth Research and Education, University of Maryland.
Wissenschatlicher Beirat, 2008. Die Zukunft Des Öpnv—Reformbedarf Bei Finanzierung und Leistungserstellung. Zeitschrift für Verkehrswissenschaft 79, 75–101.
Wolf, W., 1986. Eisenbahn und Autowahn: Personen- und Guetertransport auf Schiene und Strasse. Rasch und Roehrig, Hamburg.
World Bank, 1996. Sustainable Transport: Priorities for Policy Reform. The World Bank, Washington, DC.
Yin, R., 2009. Case Study Research: Design and Methods. Sage, Washington, DC.