DAILY TRAVEL AND CO_2 EMISSIONS FROM PASSENGER TRANSPORT: A COMPARISON OF GERMANY AND THE UNITED STATES

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Overview

- Why Germany and the USA?
- Trend in CO_2 Emissions from Passenger Transport in Germany and the USA
- Technology
- Travel Behavior and Policies
- Conclusion/Lessons

Similarities between Germany and the USA

- Federal systems of government, local self-government
- Strong economies, high standards of living
- Important automobile industry
- Highest levels of car ownership in the world
- Most adults have a driver's license
- Extensive road networks
- Much urban & suburban (re) development since WWII

New Jersey Turnpike, 2007

First "Autobahn" , 1931, (Source: BMVBS, 2007)

Trends and Levels CO_2 Equivalent Emissions from Ground Passenger Transport

	1990	1995	2000	2005	2009/2010	*% Change 1990-2000*	*%Change 1990-2005*	*% Change 1990-2010*
Total CO_2 Equivalent (Tg)								
Germany	117	119	115	107	100	-2	-8	-15
USA	1,039	1,116	1,216	1,259	1,165	17	21	12
Ratio USA/Germany	*8.9*	*9.4*	*10.6*	*11.7*	*11.7*			
CO_2 Equivalent per Capita (Kg)								
Germany	1,470	1,455	1,399	1,303	1,217	-5	-11	-17
USA	4,166	4,246	4,309	4,255	3,793	3	2	-9
Ratio USA/Germany	*2.8*	*2.9*	*3.1*	*3.3*	*3.1*			
CO_2 Equivalent per Passenger km (G)								
Germany	134	121	119	113	107	-11	-16	-20
USA	214	228	217	214	208	1	0	-3
Ratio USA/Germany	*1.6*	*1.9*	*1.8*	*1.9*	*1.9*			
CO_2 Equivalent per Constant $1,000 GDP (using PPP) (Kg)								
Germany	57.0	52.4	46.2	41.8	36.4	-19	-27	-36
USA	129.4	122.7	108.4	99.7	89.0	-16	-23	-31
Ratio USA/Germany	*2.3*	*2.3*	*2.3*	*2.4*	*2.4*			

Note: CO_2 equivalent emissions are based on national fuel consumption estimates. The data do not capture 'gray imports' due to refueling abroad.

Fuel-Efficiency and CO_2-Emission Standards

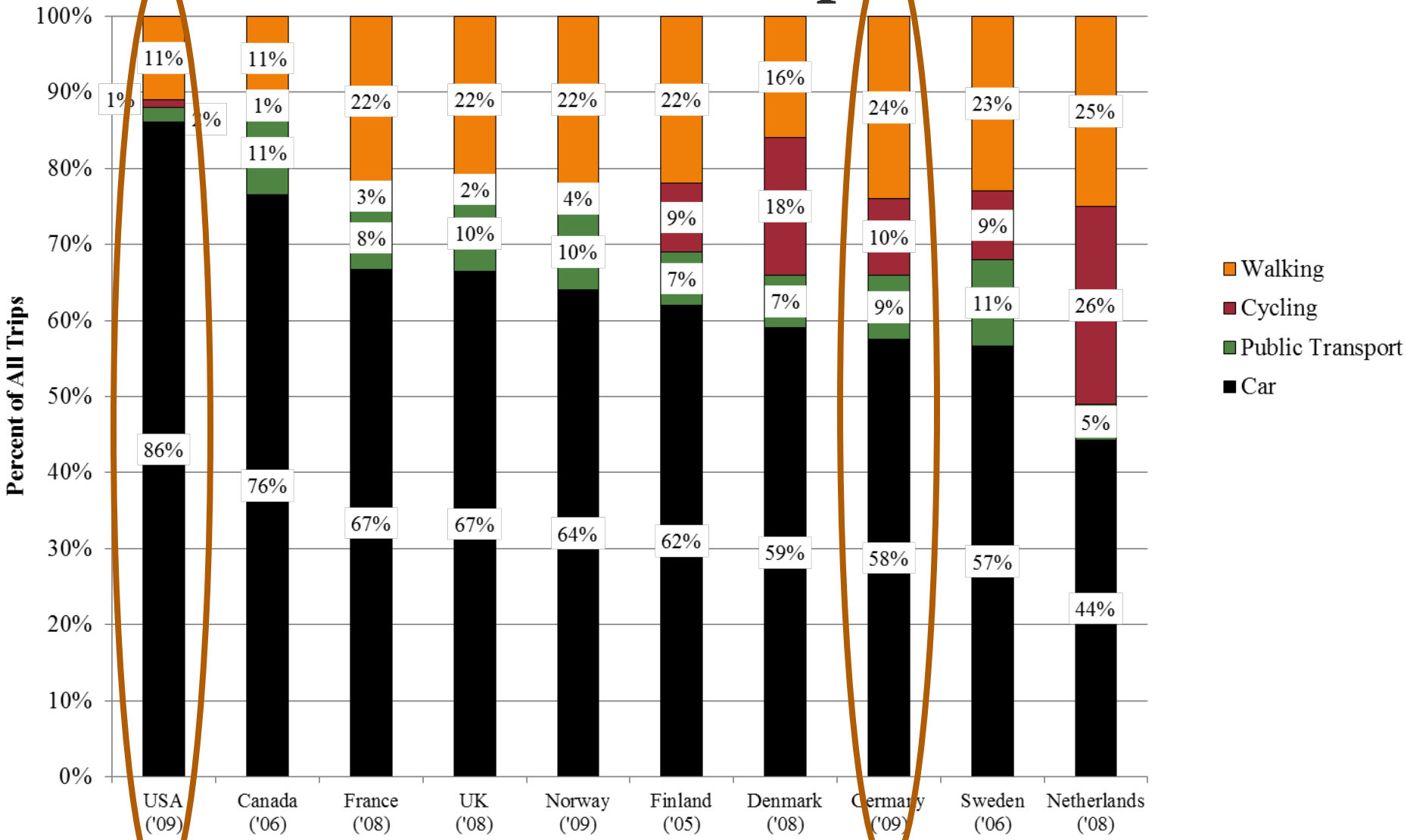
- U.S. CAFE standards
  - *Improved efficiency of fleet: 16-21mpg 1980 to 1991 and then 24mpg in 2009;*
  - *Problems: light trucks and (lack of) revisions over time;*
  - *New revised standards: 2015 and 2020 translate to 181 and 144 g CO_2/km for new light duty vehicles (and 107g by 2025).*
- No fuel efficiency standards in Germany
  - *Higher taxes on fuel;*
  - *Failed 1990s/early 2000 voluntary agreement of car industry (140g but 160/km 2006; gains in dieselization, but higher energy & carbon content)*
  - *EU standards:130 g CO_2/km by 2015 and 95g CO_2/km by 2020 → German government tries to change this.*
- Problem: how to design and update standards?
  - Track width (USA) vs weight (EU)
- German automobile & light truck vehicle fleet 55% more fuel efficient than US fleet in 2010 (35 vs. 23 mpg or 7.5 vs. 11.2 l per 100km of travel)

Note: Miles per gallon (mpg) values presented in this paper are based on the U.S. CAFE testing cycle. Liters per 100 kilometers (l/100km) values are based on the NEDC. CO_2 per km also based on NEDC.

Incentivizing Less Polluting Cars and Fuels

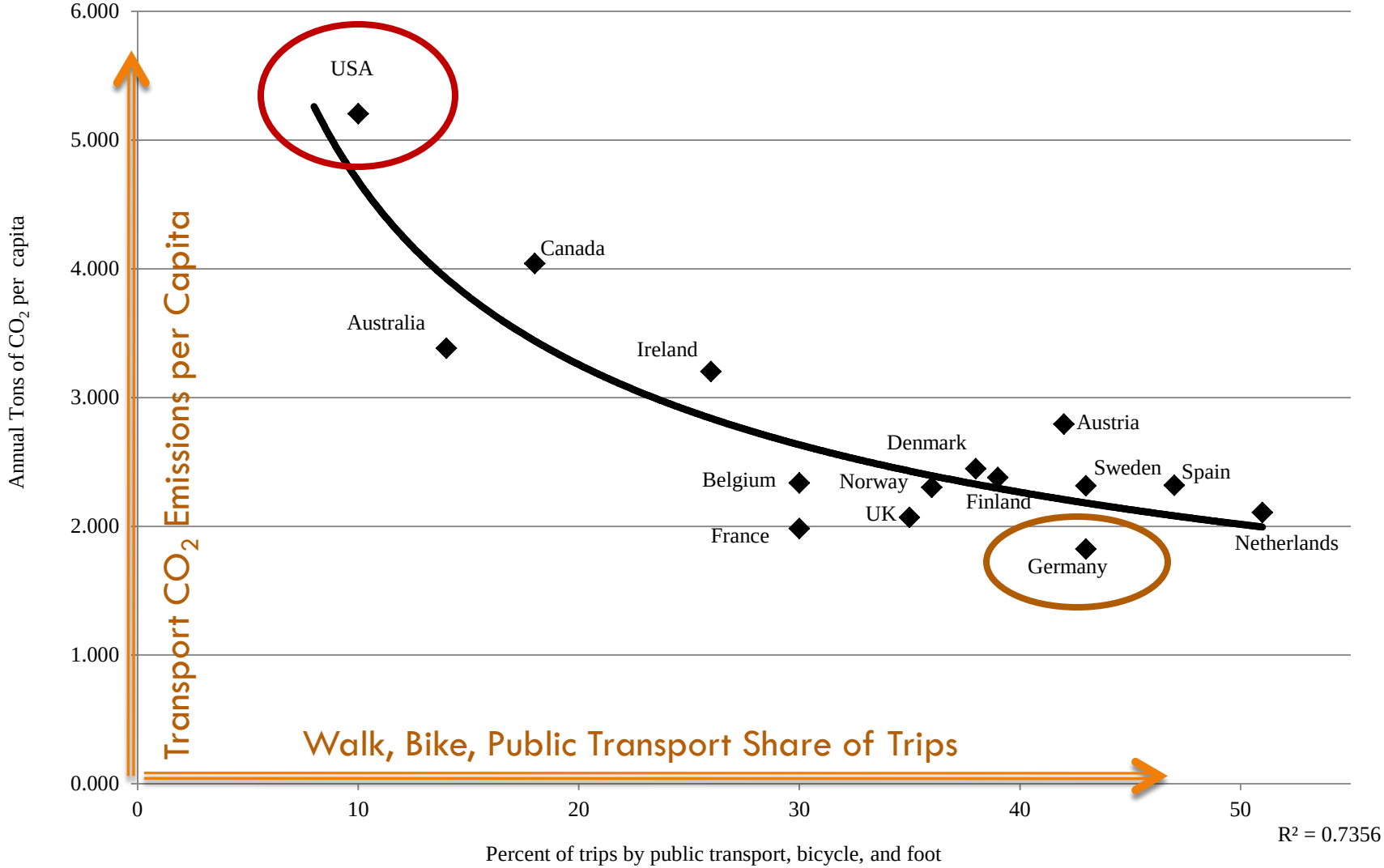
- German annual vehicle registration fees for new cars include a small share based on CO_2 emissions; electric exempt;
- Federal tax incentives (tax credits) and privileges for certain cars in the U.S. (hybrid, electric, etc.);
- 'Cash-for-Clunkers' programs *(€5 billion in Germany and $3 billion in USA)*
  - *U.S. program more environmentally friendly by design;*
  - *Pro: New vehicles purchased under these programs were more fuel efficient and had lower CO_2 emissions per km than the vehicles traded-in;*
  - *Con: Life-cycle analysis, higher levels of use in newer cars, volume)*
- Both countries support alternative fuels and alternative fuel vehicles
  - *Longer history in USA;*
  - *'Fear' of E-10 in Germany and E-15 in USA.*

Percent of Trips by Means of Transport in the USA and Western European Countries



Source: Buehler, R., Pucher, J. 2011. "Sustainable Transport in Freiburg: Lessons from Germany's Environmental Capital," International Journal of Sustainable Transportation, Vol. 5, pp. 43-70.

Travel Behavior and CO_2 Emissions Per Capita

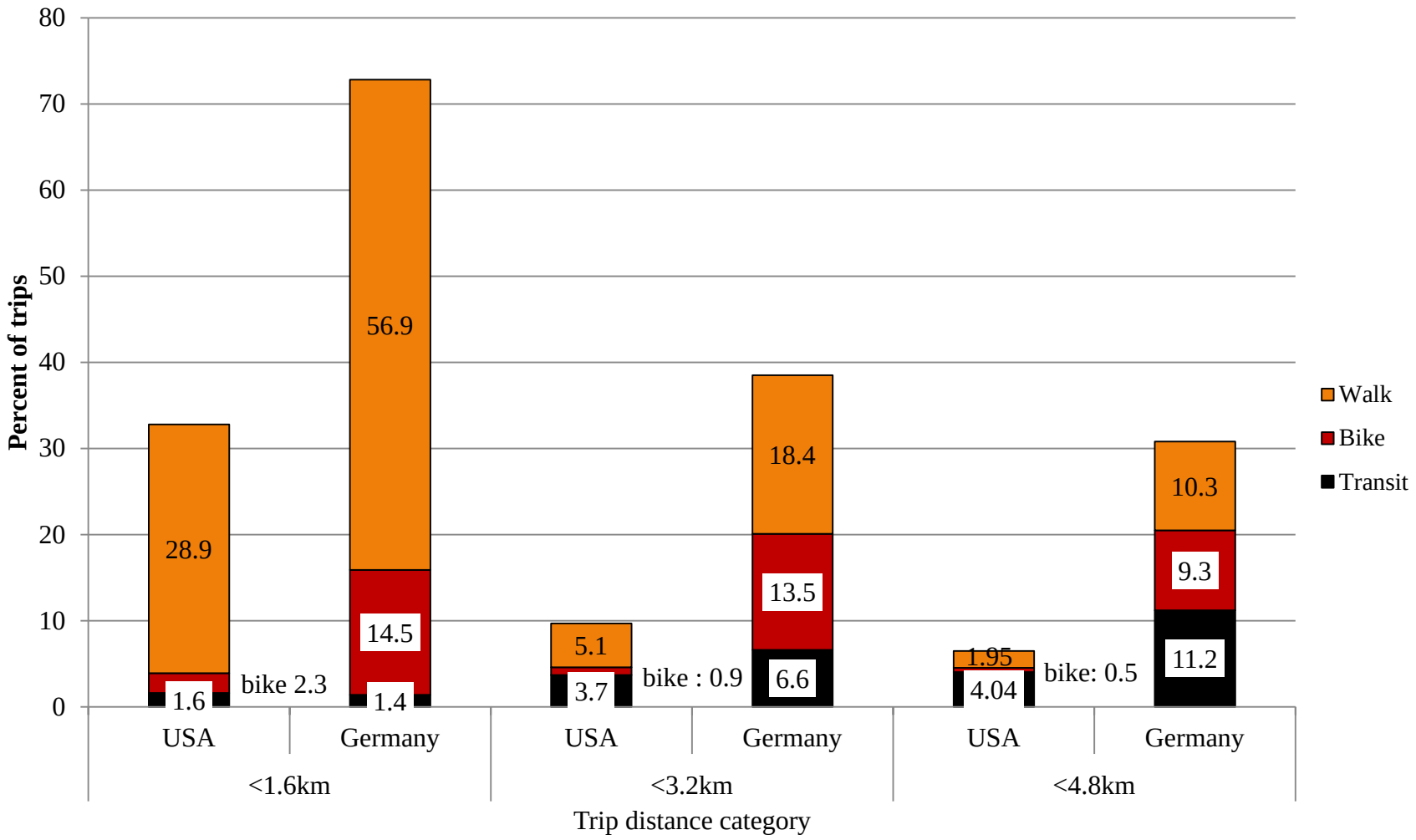


Source: Buehler, R., Pucher, J. 2011. "Sustainable Transport in Germany: Lessons from Germany's Environmental Capital," International Journal of Sustainable Transportation, Vol. 5, pp. 43-70.

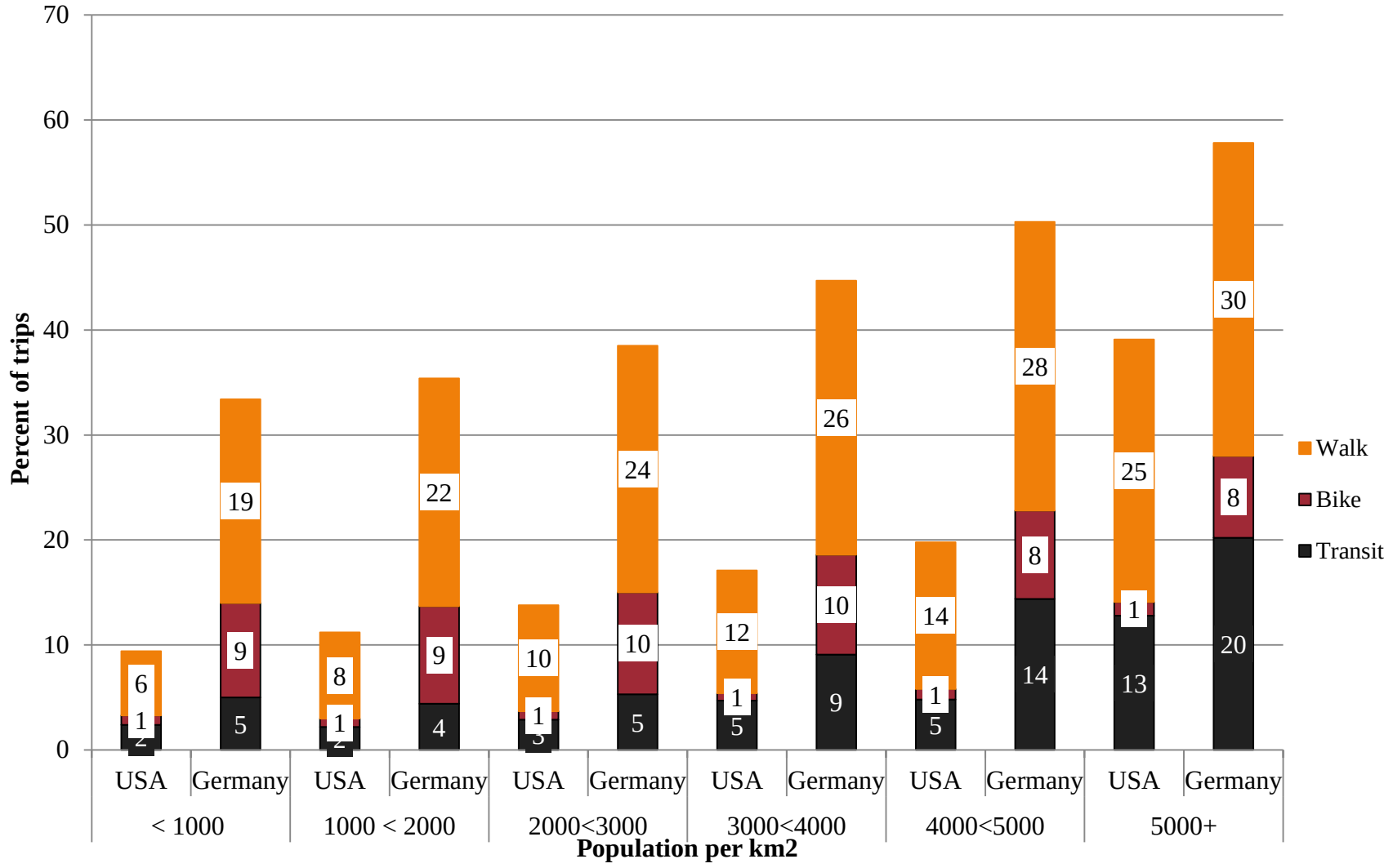
Travel Behavior

- Americans drive almost twice as many km per year: 21,700 vs. 11,000 passenger km.
- Longer average trip distances in the USA (15.7 vs. 11.2km) do not fully explain different driving rates:
  - *In both countries a similar share of all trips (32% in Germany and 27% in the USA) is shorter than 1 mile (1.6km).*
  - *However, Americans drive for 65% of these short trips compared to only 28% of Germans*
- Public policies at federal, state, and local levels of government help explain differences in car use and CO_2 emissions.

Americans Use the Car for the Majority of Short Trips



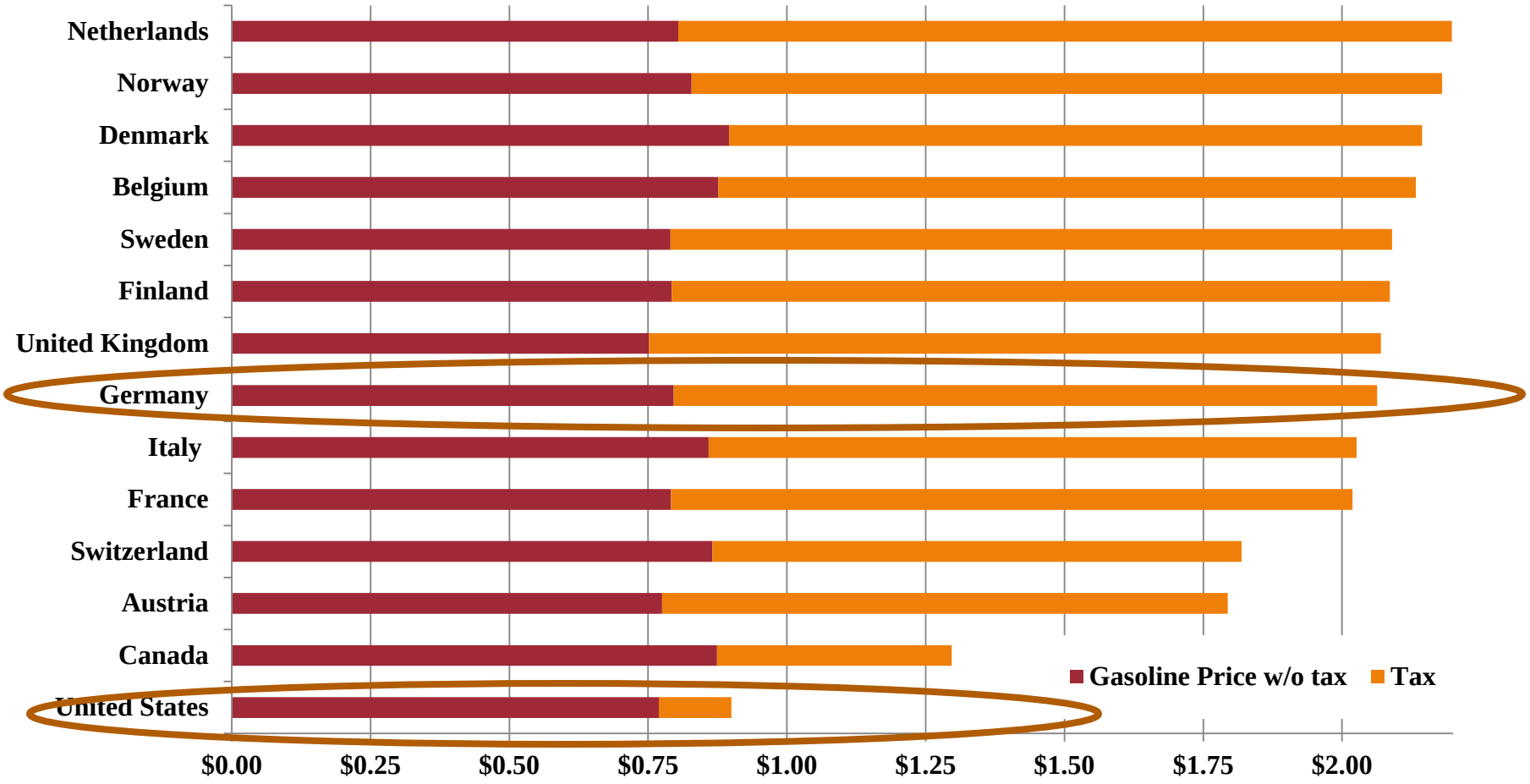
Americans Living at High Densities Make a Similar Share of Trips by Car as Germans at Lower Densities



Policies that Restrict Car Use and make it More Expensive

- Gasoline taxes
- Sales tax for new cars
- Road revenues & expenditures
- Traffic calming & speed limits in urban areas
- Roadway & parking supply in urban areas

Premium Unleaded Gasoline Prices and Share of Taxes in 2011 (Selected OECD Countries, U.S. $ per Liter)



Source: OECD: Energy Prices and Taxes 1st Quarter 2011.

Policies that Promote Public Transport, Cycling, and Walking as Viable Alternatives to Driving for Daily Travel

- Public transport
  - Quantity and quality of service
  - User information
  - Discounts
  - Region-wide integration
- Walking and Cycling
  - Car-free zones
  - Traffic calming
  - Pedestrian facilities
  - Bikeway networks
  - Traffic education

Discussion and Conclusion 1

- **CO_2 emissions from transport are higher in the USA** than in Germany, even when controlling for population, economic activity, and travel distance.
- Between 1990 and 2010, **Germany has reduced CO_2 emissions from ground passenger transport** (more than the US).
- **Efficiency standards can help boost fuel efficiency** of new vehicles, but it also highlights the **difficulty of adapting the standards to changing technology, politics, and societal preferences.**
- Government **incentives for the purchase of more fuel efficient cars** with lower CO_2 emissions, such as special tax credits or no/lower annual registration fees, **can help increase demand** for those vehicles, but the **overall volume** of the programs is often **too small or incentives are too little.**

Discussion and Conclusion 2

- **Germany achieved higher fuel economy** of its vehicle fleet and greater reductions in CO_2 emissions from transport than the USA **without fuel economy or CO_2 emission standards.**
- **Technological improvements alone are prone to the potential rebound effect** of heavier vehicles, larger engines, and greater car travel demand.
- Policies focusing on **technological improvements can only be part of a policy package** geared at reducing CO_2 emissions from transport.
- Germany's experience shows that **public policies can also help reduce car travel demand while making walking, cycling, and public transport more attractive modes of transport**.
- Recent trends in travel demand and **travel preferences among young adults may provide a window of opportunity for policies** that promote walking, cycling, and public transport.

Thank you!

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