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Urban transport transitions: Copenhagen, City of Cyclists

Stefan Gössling *

Dept. of Service Management, Box 882, 25108 Helsingborg, Sweden
School of Business and Economics, Linnaeus University, 391 82 Kalmar, Sweden

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ABSTRACT

Mobility growth poses considerable challenges to city planners around the world, as it entails problems of congestion, air pollution, and accidents. Many cities have thus sought to increase the share of sustainable transport, and specifically travel by bicycle. However, it appears that measures to foster cycling are often implemented on an ad hoc basis, lacking strategic focus and a more profound understanding of bicycle cultures. New insights can be gained from Copenhagen, Denmark, a selfdeclared City of Cyclists that has made considerable progress towards increasing the share of travel by bicycle, with the political goal to become the "world's best city for bicycling". In this article, the success, reproducibility and limitations of the Copenhagen bicycle strategy are discussed in an urban transport transitions framework, based on a content- and discourse analysis of the city's official documents to assess the respective role of market-based, command-and-control, and soft policy measures in encouraging bicycling. Results suggest that soft policies, integrated with command-and-control measures, and the consideration of bicyclist expectations and concerns with regard to perceptions of safety, speed and comfort have been key in achieving high bicycle trip shares. Integrating these in comprehensive planning frameworks appears to be an approach that is more likely to foster bicycle cultures that can result in urban transport transitions.

1. Introduction

Most urban agglomerations face problems of congestion and air pollution due to high or increasing levels of individual motorised transport, and in particular car use (Gilbert and Perl, 2008; Stanley et al., 2011). To restructure transport systems is thus high on the agenda of policy makers. In the European Union, the 2011 White Paper Transport (EC, 2011a) suggests that sustainable *urban* transport systems demand a phasing out of vehicles with internal combustion engines (ICEs), smaller road passenger vehicles, higher shares of collective transport, and urban mobility and infrastructure designs that facilitate walking and cycling (EC, 2011a). However, there is currently limited evidence of urban transport systems becoming more sustainable in significant ways (e.g. Stanley et al., 2011; for case study exceptions see Santos et al., 2010), raising the question as to how transport transitions on a larger scale can be initiated.

In this paper, three general mechanisms to achieve changes in transport behaviour are distinguished, including (i) market-based instruments, (ii) command-and-control approaches, and (iii) soft policy measures. Market-based instruments include taxes, subsidies or duties, which affect behaviour because of rising or declining costs for travel (e.g. OECD, 2009; OECD and UNEP, 2011). Control-and-command instruments, sometimes also referred to as hard policy (e.g. Friman et al., 2012), set standards for products and services as well as behaviour, affecting transport choices through urban design and land use planning, or investments in specific transport infrastructure. Soft policy measures have the objective to support decisions that are more socially desirable, generally relying on the distribution of information on more sustainable transport choices.

All of these measures have in common that their success in significantly changing urban transport behaviour has been limited, in the sense of achieving overall reductions in personalised ICE transport, even though individual measures may have been successful. For example, *market-based instruments* have included taxes for cars, which in the EU have significantly reduced growth rates in car use (Sterner, 2007). Cities like Stockholm and London have had considerable success with the introduction of congestion charges (e.g. Börjesson et al., 2012; Tuerk et al., 2012), and in France, a bonus/malus system for cars based on emission performance has initiated shifts in consumer preferences (D'Haultfœuille et al., 2011). While there are consequently various examples of successful market-based strategies to achieve changes towards urban transport systems as envisioned in the EU 2011 White Paper, there is little evidence that market-based instruments have been used systematically to stimulate significant change in transport behaviour (e.g. OECD and UNEP, 2011).

* Address: School of Business and Economics, Linnaeus University, 391 82 Kalmar, Sweden. Tel.: +46 70 4922634, 480 497194; fax: +46 42 356660.
E-mail address: stefan.gossling@lnu.se

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Command-and-control measures have included fuel efficiency standards, speed limits, High Occupancy Vehicles (HOV) and bicycle lanes/tracks, as well as infrastructure developments to support specific transport mode choices (e.g. Pucher et al., 2010). Corporate Average Fuel Economy (CAFE) standards have existed in the US since 1975 (Leiby and Rubin, 2004), and EU policy implemented in 2009 has sought to reduce per km CO_2 emissions from newly registered automobiles through efficiency standards (Frondel et al., 2011). Fuel standards are essentially considered a success, though energy-efficient car ownership has also been found to lead to fuel economy rebound effects (Greene et al., 1999), i.e. owners of new efficient cars tend to drive more. Such rebound-effects are substantial, and have recently achieved greater attention even in more general contexts (Santarius, 2012). In the context of this article, all infrastructure developments for cyclists, as well as urban designs and layouts that would seek to make cycling more attractive are considered command-and-control measures, even though it may be argued that land use planning can be aimed at incentivising changes in transport behaviour through seductive or suggestive means, and thus be considered soft policy (Allen, 2006; Jensen, 2011).

Soft-policy measures focus on facilitating more sustainable transport behaviour through education and information, and may include instruments as diverse as travel policies, personalised travel planning based on software or smartphone apps, information and marketing campaigns, campaigns for alternative transport modes, car sharing initiatives, car co-operatives, tele-/video-conferencing, or shopping from home (e.g. Cairns et al., 2008). Various soft policy campaigns appear to have had success in affecting transport behaviour, though available meta-studies (e.g. Bamberg et al., 2012; Friman et al., 2012) have raised concerns regarding the validity of evaluation results, and it remains unclear whether more fundamental, significant changes in transport behaviour have been achieved through such policies.

Though not representing a complete overview, examples as presented above indicate that most market-based, command-and-control, and soft policy measures have had some success in affecting transport behaviour. In absolute terms, however, individual motorised transport volumes continue to grow. For instance, in the EU27, growth in passenger growth (measured in passenger kilometres, pkm) has averaged 1.3% per year between 1995 and 2010, notably including a slight decline in transport volumes in 2009 and 2010 due to the financial crisis in 2008, affecting mostly air travel (EC, 2012). Further growth in transport volumes is however anticipated (e.g. Dubois et al., 2011; OECD and UNEP, 2011). As an example, the International Energy Agency (IEA, 2012) expects a doubling of the global number of passenger cars in the period 2011–2035, and ICAO expects growth in global aviation emissions in the order of 290–670% by 2050 (compared to 2006; EC, 2011b). These developments are in conflict with global greenhouse gas mitigation objectives, as well as sustainable urban transport futures as for instance outlined in the EU 2011 White Paper Transport, calling for more fundamental changes in transport behaviour (Anable et al., 2012; Dubois et al., 2011; Stanley et al., 2011). Specifically, bicycles are increasingly advocated as ideal mobility choices in urban contexts, as they require less area, cause less congestion, contribute to better health, are pollution free, and cause fewer accidents (Heinen et al., 2010; Horton et al., 2007; Pucher et al., 2010).

2. Bicycling in cities

The use of bicycles as a transport mode has constantly declined in industrialised countries since 1950, when bicycles were still the most important transport modes (e.g. Agervig Carstensen and Ebert, 2012). Since then, bicycling has fallen from more than 1400 km per person per year to less than 1000 km on global average (Gilbert and Perl, 2008). Car use, on the other hand, increased since the early 20th century, from virtually car-free environments before 1910 to a global average of 2000 km/person/year driven in the 1990s (Gilbert and Perl, 2008: 66), and an EU27 average of 9490 km/person/year in 2010 (EC, 2012). Table 1 shows the share of trips made by bike in a wide range of cities, indicating that there is huge variation from 1% (London, UK) to 40% (Groningen, The Netherlands). Notably, in virtually all cities listed in Table 1, considerable growth in bicycle use has been reported over the last decades, though in some cases from very low starting points. Shares of bicycle use <1% have been reported for cities including Hong Kong, Warsaw, Sao Paulo, Valencia, Stockholm, Lisboa, Geneva, Rome, and Dubai (in 2001; Gilbert and Perl, 2008). In comparison, car use shares range from 16% (Hong Kong) to 88% (Chicago). While Table 1 thus indicates a renaissance in bicycling in European cities, transitions in other parts of the world continue to favour the car, as shown by Wang (2012), who reports that, referring to the Beijing Transportation Research Centre, bicycle use in the Chinese capital had declined from 63% of all trips in the mid 1980s to 39% of all trips in 2000 and 17% in 2010.

Programs and policies to promote bicycling in urban environments have included a wide range of market-based, command-and-control and soft policy measures. Market-based measures mostly seek to reduce ICE-transport – through congestion charges or taxation –, creating better conditions for cyclists as a side effect. Vice versa, command-and-control measures have focused on safety, preferential treatment, and infrastructure development for bicyclists, and have thus been more successful in creating interest in this transport mode. A meta-review of 139 studies (Pucher et al., 2010) suggests that interventions such as on-road bicycle lanes, two-way travel on one-way streets, shared bus/bike lanes, off-street paths, signed bicycle routes, bicycle boulevards, cycletracks (separated by kerb from other traffic infrastructure), coloured lanes, shared lane markings, bike boxes (also called 'advanced stop lines'), bicycle phases/traffic signals, maintenance of infrastructure, wayfinding signage, techniques to shorten cyclists' routes, traffic controls/traffic calming, home zones, car-free zones, complete streets, bike parking, bicycle stations, parking at rail stations, parking at bus stops, bike racks on buses, bikes on rail cars, short-term rental bikes, and showers at workplaces all have had positive impacts on bicycling levels (for an alternative approach to a discussion of bicycle determinants see Heinen et al., 2010). Moreover, while Pucher et al. (2010) suggest that though any individual intervention is likely to increase bicycling levels, these are more effective when introduced in integrated packages, and possibly in combination with measures to restrict car use. Results consequently suggest that both pull and push measures are important,

Table 1
Share of trips made by bicycle and growth rates, various cities.

City	Trips made by bike (%)	Growth by period
London, UK	1.2% (2006)	2000–2008: +99%
Bogota, Columbia	3.2% (2003)	1995–2003: +300%
Berlin, Germany	10.0% (2007)	1975–2011: +275%
Paris, France	2.5% (2007)	2001–2007: +150%
Barcelona, Spain	1.8% (2007)	2005–2007: +100%
Amsterdam, Netherlands	37.0% (2005)	1970–2005: +48%
Portland, OR	6.0% (2008)	1990–2008: +445%
Copenhagen, Denmark	38.0% (2005)	1998–2005: +52%
Münster, Germany	35.0% (2001)	1982–2001: +21%
Freiburg, Germany	27.0% (2007)	1982–2007: +80%
Odense, Denmark	25.0% (2002)	1994–2002: +9%
Groningen, Netherlands	40.0% (since 1990s)	1990–2005: +0%

Source: Pucher et al. (2010).