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## New findings in the Netherlands about induced demand and the benefits of new road infrastructure

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### Abstract

The increase in traffic volume that arises after opening of new road infrastructure, is often attributed to ‘induced demand’. The objective of this study is to provide empirically derived insights in this phenomenon, in the amount of induced demand and in the benefits that adding road infrastructure has for users. Based on multivariate analyses of detailed data in The Netherlands from 2000-2012, it is concluded that the amount of induced demand in total is relatively low and that the relatively large increase in traffic volume during peak hours on roads that were congested before adding lanes mainly has been caused by shifts in route and departure time. The benefits of the new infrastructure for users have been calculated in terms of savings of travel time and travel time reliability. Implications for cost-benefit analyses of road investments have been reviewed.

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### 1. Introduction

Increase of road capacity by adding one or more lanes to existing roads, or the opening of new road(link)s, may improve the traffic flow and thereby reduce congestion. However, new road infrastructure may also attract extra new traffic (‘induced demand’) and thereby reduce the initial effect on congestion.

This paper addresses the following questions related to the phenomenon of induced demand. How much is the

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increase of observable car use on the road network after the opening of new road infrastructure? How much of this new car use on the network has been evoked by adding road capacity? What are the benefits of adding road capacity for the user?

## 2. Definitions of induced demand

Induced demand can be defined in different ways. The definition may include all possible behavioural reactions of travellers (Hills, 1966), may be limited to the extra traffic on formerly congested links during peak hours (McKinsey, 1986) and – broader - be defined as the net amount of vehicle kilometres on the total road network.

Research literature from the US and UK routinely refers to induced demand as the ‘total’ or ‘net’ increase impact of added infrastructure on traffic volume in terms of vehicle miles. The trigger for this research was to find answers to commonplace clichés, such as “you can’t pave your way out of congestion” (Cervero, 2003a). In the popular press, the term can be used to suggest that any increase in highway capacity is quickly negated by additional traffic and hence does not reduce congestion. The phenomenon of induced demand also garnered attention because of the possibly negative impact that traffic increases may have on spatial development and the environment (Noland & Lem, 2002).

The concept ‘latent demand’ is derived from the economic theory of supply and demand (Noland & Lem, 2002). Latent demand arises if the expected benefits of the journey for the traveller do not outweigh the expected costs. As a result, this traveller’s demand doesn’t manifest itself and remains latent. Improving supply by adding road capacity may produce travel time benefits and thereby transform part of the latent demand in manifest demand. If roads are congested, adding lanes may lead to shorter travel times. And because journeys from origin to destination become shorter, new roads may produce shorter travel times. Other benefits of expanding infrastructure may arise because the reliability of travel times may improve, and because travellers may choose their preferred time for travelling.

Several alternate concepts are used to refer to the phenomenon of induced demand: induced travel, induced traffic, and latent demand. Induced traffic has been defined as “all the traffic which would be present if an expansion of road capacity occurred, which would not be there without the expansion” (Goodwin & Noland, 2003), or “the realized demand that is generated because of improvements to the transportation system” (Mohktarian, 2010). These definitions indicate the net effect that expansion of infrastructure has on the total road network. Cervero (2003b; Cervero & Hansen 2002) makes a distinction between *induced travel* (“the more inclusive term, reflecting all changes in trip-making that are unleashed by a road improvement: (1) newly generated trips (that is, latent demand); (2) longer journeys; (3) changes in modal splits; (4) route diversions; and (5) time-of-day shifts”) and *induced demand* (“the more restrictive, encompassing only the first of these components, thereby representing only newly added vehicle miles travelled within a region”).

The US federal government defines induced travel as “the observed increase in traffic volume that occurs soon after a new highway is opened or a previously congested highway is widened” (FHWA, 2013), and further explains that “much of the observed increase in traffic comes from trips that were already being made before the increase in highway capacity, or reflect predictable traveller behaviour that is accounted for in travel demand forecasts”, that “the increase in traffic on the new facility...is largely offset by reductions in traffic along parallel routes and other times of the day”, and that the “net effect on region-wide daily vehicle miles of travel (VMT)...is minimal”.

The SACTRA report (1994, 1999), which was based on theoretical and empirical research conducted for the UK, found that “induced traffic” (extra traffic likely to be induced by road improvements) exists (“probably quite extensive”), and that the amount varies depending on the circumstances. The report offers suggestions about how to measure the phenomenon.

Table 1 presents an overview based on Hills (1996) of all possible behavioural reactions of travellers in terms of journeys that are possible following road expansion. After opening a road expansion, some travellers undertake the same journeys as previously, while other travellers change their behaviour in various ways. Combinations may occur as well. The marked (✓) behavioural reactions may lead to an increase in traffic volume (but not necessarily). In practice, some behavioural reactions occur frequently, and others infrequently.

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