



# Would fewer people drive to work in a city without excess commuting? Explorations in the Paris metropolitan area



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## ABSTRACT

Urban planners have explored many solutions for reducing the energy and environmental costs of daily mobility in cities and one of them is to encourage households to embrace more efficient commuting patterns. As research on “excess commuting” has shown, the spatial distribution of housing and jobs in many cities would theoretically allow much shorter commuting distances than are actually observed. The question this paper tackles is how a more efficient commuting pattern would affect the transport modes workers use to travel to work. If workers and jobs were rematched in such a way as to minimise average commute distance, how would such a change impact the way people travel to work? While one might easily imagine an increase in the share of trips covered by soft modes of transport, there are reasons to believe that in some cases there might also be unexpected outcomes such an increase in car use. So how would people travel to work in a city where there is no “excess commuting”? We looked for an answer to this question through empirical simulations in the case of the Paris Metropolitan Area.

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## 1. Introduction

The distances people living in cities travel on a daily basis, especially by car, has increased greatly since the 1970s (cf. [Lee et al. \(2009\)](#), [Nielsen et al. \(2005\)](#), [Frändberg and Vilhelmson \(2011\)](#), [Massot and Roy \(2004\)](#) for trends in different countries). This trend has led to greater energy consumption from urban mobility and rising greenhouse gas emissions. Urban planners can call on a portfolio of solutions to counter these trends: the development of efficient alternatives to the car and of cleaner and more energy-efficient vehicles; changes to road network design in order to reduce speed and capacity; tax measures affecting the cost of travel; planning efforts to locate employment and housing in places well served by public transport ([Banister, 2008](#)). An alternative solution is to encourage households to make residential location choices that bring the origins and destinations of their daily trips, particularly the home and workplace, closer to one another. In theory, this should be an effective strategy for shortening daily trips, especially trips-to-work. The research on “excess commuting” has produced a large number of empirical studies which have stimulated discussion about the practical effectiveness of this strategy. The aim of this research is to calculate the shortest average commute distance possible in a city, given the spatial configuration of housing and workplaces, by finding a different match between workers and jobs. The difference between the average actual commute and the theoretical minimum is defined as “excess” or “wasteful” commuting.

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Since the seminal studies by Hamilton (1982) and White (1988), the volume of research on excess commuting has grown year on year (Cropper and Gordon, 1991; Small and Song, 1992; Giuliano and Small, 1993; Kim, 1995; Merriman et al., 1995; Frost et al., 1998; Horner, 2002, 2010; Horner and Murray, 2002; Manning, 2003; O’Kelly and Lee, 2005; Niedzielski, 2006; Ma and Bannister, 2007; Charron, 2007; Yang, 2008; O’Kelly and Niedzielski, 2009; Murphy, 2009; Loo and Chow, 2011; Boussaou et al., 2011; Suzuki and Lee, 2012; Chowdhury et al., 2013). This research has shown that, in many urban contexts, the theoretical minimum commute is only a few kilometres, suggesting that current levels of excess commuting are substantial (40–50% of observed commute distances) (Horner, 2007).

Discussions on the excess commuting issue have focused mainly on the interpretation of the results and their implications for scientific knowledge and public policy. They have also taken the form of critical reflections about the robustness of the results (cf. Ma and Bannister (2006) for a critical meta-analysis). Conceptual and methodological improvements and sophistications were introduced on the basis of additional concepts and indicators such as the theoretical maximum average commute, commute range, capacity utilization, and average random commute, which enriched the reflection on the commute efficiency issue (Horner, 2002; Charron, 2007; Murphy and Killen, 2011). In alternative studies (O’Kelly and Niedzielski, 2009), the issue was addressed from a different perspective, centred on the measure of the effort needed to reduce average commute length and exploring the way this task appears to be more or less achievable according to the spatial structure of cities. Some authors (Merriman et al., 1995; Horner and Murray, 2002; Layman and Horner, 2010) have also explored the changes that need to be made to the urban fabric to help cities move closer to the *post-min* model.<sup>1</sup> Similarly, the approach by Horner (2008) is an attempt to reduce the gap between the excess commuting literature and the urban form literature by seeking the set of flows and simultaneously the increase in numbers of workers and employments in each zone that would minimize the total commuting distance. In all likelihood, our cities will never match this model in reality, as stated by O’Kelly and Niedzielski (2009), but public interventions on land-use, transport, mobility and the job market could potentially have an impact and bring actual commuting distances closer to the theoretical minimum. Job deconcentration, development of residential facilities closer to employment centres, investment in public transport facilities, tax measures on travel costs, more efficient matching of workers and jobs, are some of the potential incremental ways of achieving this target.

Up to now, little attention has been paid to the *post-min* city’s characteristics in terms of energy consumption, greenhouse gas emissions or commuting transport modes. The research by Scott et al. (1997) and Welch and Mishra (2014), who developed simulation models to estimate the level of congestion and greenhouse gas emissions in the *post-min* city, are major but rare contributions to such a project. Yet such analyses are surely useful if the *post-min* city is a model to which urban policy seeks to aspire. The aim of the research presented in this paper is to explore the *post-min* city’s characteristics in terms of travel mode choice on trips-to-work. How would workers travel to work in a city with no excess commuting? If jobs and workers were matched to maximum efficiency, which transport modes would be most frequently used, and which would lose market share?

This question is all the more interesting in that there may well be unexpected outcomes. For obvious reasons, one can imagine the *post-min* city to be perfectly suited to soft modes and public transport. As mentioned above, previous research on excess commuting showed that in many cities, the minimum average commute length is quite small, in some cases only a few kilometres. This suggests that a significant proportion of commutes in the *post-min* city would consist of short trips, which could potentially be covered by soft modes or public transport. However, as we will discuss, under particular conditions – depending on the relative performances of public transport and car travel on mid-range and long commutes, and on the way the minimisation of average commute length reshapes the distribution of commuting distances – the *post-min* city could, paradoxically, also lead to a rise in commuting by car.

The research is applied to the case of the Paris Metropolitan Area (PMA). Using data from the French Census and from the *Comprehensive Transport Survey* (CTS – *Enquête Globale sur les Transports*), we conducted simulations to estimate the modal split in trips-to-work in the *post-min* PMA, that is after commuting distances have been minimised through the rematching of workers and jobs. By comparing the *post-min* modal split with the existing distribution, we were able to evaluate how a shift towards the *post-min* city would impact modal choice on trips-to-work in the PMA.

Before going any further, we would like to underline here that the aim of our research is mainly to give some insights into what the *post-min* city model might look like. For obvious reasons, the results shown in the following pages cannot pretend to represent exactly the way things would go if commute length was minimised in the PMA. There is no doubt that when trends occur for real, the urban system reacts, the socioeconomic actors modify their behaviour in response, new policies are conceived and implemented, and these changes affect the trends themselves. The simulations we have produced aim to provide some basic markers to feed into thinking about the characteristics of the *post-min* city and are a way to identify some of the trends that might be observed, *ceteris paribus*, if workers commuted more efficiently.

The paper is organised into four sections. In the first section, we explore theoretically the potential impact of minimising commute length on the modal choice of workers in their trips-to-work. The second section sets out the methodology designed for the purpose of our analysis and the data used. In the third section, we present the main results and, in the final section we discuss the implications of our findings for urban policy.

<sup>1</sup> We use the term “*post-min*” to refer to a virtual city where the average commute length is minimised – *post-min* meaning after the minimisation of total commuting distance.

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