# The distributional effect of commuting subsidies - Evidence from geo-referenced data and a large-scale policy reform☆

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## ARTICLE INFO

## ABSTRACT

We use the unexpected partial repeal of a tax break for commuters in Germany to examine the distribution of benefits from commuting subsidies between workers and firms. Drawing on a large set of geo-referenced employer-employee data, we use exact route distances between place of work and place of residence to calculate individual net wage benefits from commuting subsidies. In line with urban efficiency wage theories, we find robust evidence that employers compensate workers on average for about one third of the net wage loss caused by the reform if wages are individually negotiated. We find no comparable effect for workers covered by collective wage agreements. The subsequent existence of two common subsidy regimes within an otherwise stable institutional environment allows to draw inference on how each regime redistributes income between wage groups and between regions. We find that the introduction of a lower bound for commuting distances leads to a more equal distribution of net wage benefits between wage groups and regions compared to a regime without a lower bound.

## 1. Introduction

Tax laws in most OECD countries, as well as in many states in the US, foresee some kind of tax break for commuting. These regulations are usually inspired by both efficiency and equity considerations. On the one hand, commuting subsidies are intended to increase efficiency in the labor market by encouraging workers to increase their radius of job search and to commute further for a better match (Borck and Wrede, 2009).[1] On the other hand, equity considerations suggest that workers willing to accept longer commuting distances should not be disadvantaged financially (Borck and Wrede, 2005).

Compared to the efficiency aspect, little is known about the distributional consequences of commuting subsidies.[2] In particular, we lack an understanding of the extent to which workers would be compensated for commuting costs by their employers in the absence of commuting subsides and, hence, of the distribution of tax benefits between workers and firms. In addition, it has so far remained unclear whether commuting subsidies are progressive or regressive in nature and how net wage benefits are distributed between workers in urban and rural regions. Addressing either of these issues has so far been inhibited by a lack of exogenous variation in the extent to which workers can offset their commuting expenses against tax, as well as by a lack of precise and worker-specific information on commuting distances. This ignorance about the distributional effects of commuting

[1] Commuting subsidies are usually designed as deductions of commuting expenses from taxable income. As such, they offset negative effects from income tax on job search and commuting decisions (Richter et al., 2004). In a simple example, let $\Delta w$ be the wage premium for commuting and $c$ the commuting cost. In the absence of taxation commuting will take place if $\Delta w - c > 0$. Sufficiently high income taxes $t$ will inhibit commuting since $\Delta w (1 - t) - c < 0$. If, however, commuting is tax deductible, every efficient job match will be achieved even under taxation since $(\Delta w - c)(1 - t) > 0$ holds as long as $\Delta w - c > 0$.

[2] A substantial body of theoretical literature examines how commuting subsidies should be designed in order to reach an efficient level of job search and commuting (see, e.g., Wrede, 2003 and Richter, 2006). Weiss (2009) and Boehm (2013) provide empirical evidence that workers commute longer distances if they can offset commuting expenses against income tax.

subsidies stands in stark contrast not only to the equity concern by which they are inspired, but also to the fiscal burden they put on public budgets. In Germany, the sum of foregone tax revenues from tax breaks on commuting amounts to 4.5 billion Euro annually (Bundesministerium der Finanzen, 2010), which corresponds to 0.4 percent of overall public expenditures.

In this paper, we provide new and consistent evidence on the distributional effects of commuting subsidies by drawing on a unique tax reform in Germany, which in 2007 repealed commuting subsidies for commuting distances below 20 kilometers. With 2.5 billion Euro of additional tax revenues annually (Donges et al., 2008), this abrupt change in the tax regime was not only substantial in size but also led to a large shift of a major kink in the tax scheme. Exploiting the resulting exogenous variation in individual tax savings by means of an instrumental variable approach, we examine in a first step whether workers are compensated by their employer for the net wage losses they incur from the partial repeal of commuting subsidies. Empirically, the existence and the size of compensation payments are ex-ante unclear as they depend on the mobility of workers and firms and the market structure on the demand and supply side (Manning, 2003), the level of information that firms possess (Zenou, 2006; Ross and Zenou, 2008), the propensity of workers to shirk (van Ommeren and Gutiérrez-i-Puigarnau, 2011), the relative bargaining power of workers (Rupert et al., 2009) as well as the extent to which wages are flexible enough to adjust to worker-specific circumstances (Baldry, 1998). Examining the distribution of net wage benefits between workers and firms becomes possible through the availability of a large and novel data set which contains geo-referenced information on the exact place of work and place of residence of each worker. Drawing on this data and using GIS-software, we construct an accurate worker-specific measure of real commuting distances, which has not been available so far. Combining this measure with information on gross wages of about 1.7 million workers for the years 2004 to 2008 allows for determining the size of individual losses in tax savings as a result of the partial repeal of commuting subsidies that came into effect on January 1st 2007.

If workers are not (fully) compensated for commuting costs by their employers, commuting subsidies effectively reduce the financial burden of commuters. The obvious question from an equity perspective is then how the benefits from commuting subsidies are distributed between different groups of workers. While it is mostly assumed that high-wage workers benefit more than proportionally due to higher marginal income tax rates and longer commuting distances (Bach et al., 2007), little is known about the distribution of benefits from commuting subsidies across wage groups.[3] In addition, we lack an understanding of the spatial component of commuting subsides. While workers employed in cities may profit most from these subsidies due to higher urban wages and correspondingly higher marginal tax rates, these effects may be offset by smaller commuting distances. In addition, it is ex ante unclear whether the overall dispersion of net wage benefits is driven by differences within or between local labor markets. In the second part of the paper, we therefore shed light on the distribution of benefits from commuting subsidies between wage groups and regions and examine how this has been altered by the partial repeal of tax breaks on commuting costs.

We contribute to the literature in three major respects. First, we shed light on the distributional effects of commuting subsidies. In particular, we examine whether workers or firms effectively benefit from tax breaks on commuting costs and analyze how these benefits are distributed between worker groups and between regions. Second, we provide an estimate of the extent to which firms compensate workers

for their commuting expenses.[4] In this regard, the results provide a test of the urban efficiency wage model proposed by Ross and Zenou (2008), which suggests that firms pay higher wages to workers with longer commutes to prevent them from shirking. In our analysis, we disentangle whether efficiency wages operate on either worker or firm level and examine if they vary with the intensity of supervision. Third, understanding the distributional effects of the reform allows to infer on the equity effects of the two major regimes of commuting subsidies prevailing in different countries. In countries like, e.g., Finland and Norway, commuting costs can be deducted without a lower bound on commuting distances while Sweden, Denmark, and Austria among others foresee tax deductions only for distances above a certain threshold (see Potter et al. (2006) and Borck and Wrede (2009) for an overview). The German case is unique inasmuch as both regimes were consecutively implemented within one country. We exploit this rare opportunity to examine the distributional effect of a paradigm shift in the design of commuting subsidies within one consistent institutional framework.

The results show that workers are partly compensated by their employer for the net wage losses they incur from the partial repeal of commuting subsidies. For workers with a low propensity of being covered by a collective wage agreement, compensations amount to about 36 percent of the net wage losses, suggesting that about two thirds of commuting costs are borne by workers. Notably, the bulk of these compensation are paid on firm rather than on worker level, supporting the argument raised by Ross and Zenou (2008) and van Ommeren and Gutiérrez-i-Puigarnau (2011) that firms may only imperfectly observe individual commuting costs and therefore resort to a firm-wide approximation. With respect to the distribution of benefits between worker groups, we find that commuting subsidies strongly favor high-earning workers employed in urban areas. Consistently, these workers have carried the burden of the reform. This result is instructive because it shows that granting tax breaks only above a certain threshold of commuting distances, as it is practiced in a number of countries, lessens the regressive effect of commuting subsidies and yields a more equal distribution of benefits from commuting subsidies between regions.

The paper is structured as follows. In Section 2, we outline the design of commuting subsidies in Germany before and after the reform in greater detail. Section 3 provides a summary of the data as well as descriptive statistics. In Section 4, we outline the instrumental variable approach used to identify the size of wage compensations paid to workers and provide the results. In Section 5, we shed light on the distribution of benefits across wage groups and regions and discuss the distributional consequences of the two major paradigms of commuting subsidies prevailing in OECD countries. Section 6 concludes.

## 2. The reform of commuting subsidies in Germany, 2006/07

The reform of commuting subsidies we draw on in this paper was implemented between 2006 and 2007. Before 2007, commuting costs were legally considered as income-related expenses, i.e., as necessary costs incurred by workers for taking up and sustaining a specific employment. Analogous to the taxation of self-employed, where costs reduce taxable revenues, workers could offset a lump-sum of 920 Euro per annum for income-related expenses against tax. If expenses exceeded a total of 920 Euro, workers could alternatively deduct 0.30 Euro per kilometer of a one-way commute per working day from their taxable income. In their check of individual tax returns, tax authorities automatically applied the option most advantageous for a worker.

Facing the urgent need to consolidate an increasing deficit in public budgets (Deutscher Bundestag, 2006), the German Parliament passed a

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[3] In 2010, the German Green Party expressed their concern that commuting subsidies favor higher income groups in an official inquiry to the Federal Government (Bundesministerium der Finanzen, 2010). In its response, the government stated that information on the correlation between personal income and individual tax breaks for commuting costs is not available.

[4] In this regard, the paper is similar to Mulalic et al. (2013), who use firm relocation as a source of exogenous variation in commuting costs, and to Dauth and Haller (2016).