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Is there a double gap?
Urban-rural differences in the gender gap in commuting

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Motivation

It has been established as a stylized fact that women commute shorter distances to work than men (Madden 1998; Hanson and Johnston 1985; Gordon et al. 1989; Turner and Niemeier 1997; Hjorthol 2001; McQuaid and Chen 2012; Dargay and Clark 2012; Bohman et al. 2019: Gimenez-Nadal et al. 2020). Several determinants have been brought forward to explain this gender gap in commuting. Among individual and sociodemographic factors, differences in age, education or household responsibilities play a large role (Benito and Oswald 2000). Women's commuting patterns are constrained by household and family involvements as women still take on most of the responsibility in the household (Gimenez-Nadal and Sevilla 2012). Thus, they choose shorter commuting ways than men (Gimenez-Nadal and Molina 2016; Turner and Niemeier 1997; Clark et al., 2016). Furthermore, job-related factors such as working part-time, working in sectors located close to home or working in low-wage jobs make commuting long distances less attractive for women (van Ommeren and Dargay 2006; Sandow and Westin 2010; McQuaid and Chen 2012).

In spatial respect, urban structure and geographic characteristics also constitute important determinants of commuting. Foremost, the location of the residence in urban or rural areas decisively influences commuting behaviour (Östh and Urban 2012). In particular, Rouwendal and Nijkamp (2004) find a negative relationship between commuting and population density. Due to rising rents in the cities, individuals are moving to rural areas where population density is lower. As a result, commuting increases assuming jobs are located in the city (Rouwendal and Nijkamp 2004). However, men and women might be affected differently by these processes: due to their lower spatial mobility, women cannot benefit from better job and career opportunities or higher wages in other regions to the same degree as men. This is especially the case in rural regions, where individuals have to commute longer distances to their workplace than in urban regions. In that sense, Hanson and Johnston (1985) show that women have shorter commutes, because the share of women is greater in the city where population and job density is higher and thus commuting ways are shorter. A further regional determinant is the local economic structure. Women are more likely to work in the public sector, which is geographically more evenly distributed than male-dominated manufacturing (Halfacree 1995;

Hanson and Pratt 1995; Hanson and Johnston 1985). Therefore, they have better possibilities to find a job closer to their home, which fosters short commuting distances.

Although much is known on the gender-specific determinants of commuting, the lack of comprehensive data in spatial and temporal respect represents a major limitation. Consequently, only few studies address the role of space in the context of commuting differences between men and women (Halfacree 1995; Hanson and Pratt 1995; Hanson and Johnston 1985). What is more, most studies either focus only on a specific region (Hanson and Johnston 1985) or a specific year (McQuaid and Chen 2012). Thus, they cannot analyze the long-run evolution and determinants of the gender gap in commuting on a small-scale spatial level in a comprehensive way. This may be particularly important given that over the past decade, for example, better childcare has made it easier for women to work and increase their labour market supply, which might lead to a decrease of the commuting gap.

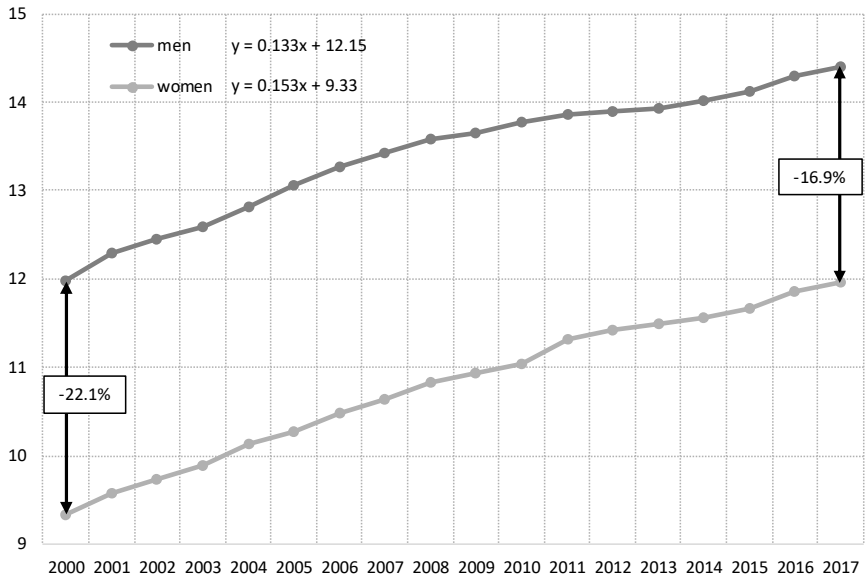
Data

Our study tackles these limitations by investigating the gender gap in commuting for the years from 2000 to 2017. Hereby, we shed a closer insight on the role of location and specifically the interrelation between urban and rural regions by using rich geocoded information. Our empirical analysis rests on the Establishment History Panel (BHP) and the Integrated Employment Biographies (IEB) that are provided by the Institute for Employment Research (IAB). The BHP contains detailed information on all establishments in Germany with at least one employee subject so social security contribution on the reference date June 30. The IEB provides detailed information on each employee liable to social insurance contributions, e.g., gender, education, wage, experience, age, and place of work and residence. A unique feature of our data is the additional information on the place of residence and the place of work in form of geocodes for the years 2000 to 2017. With these geocodes we calculate the distance between residence and workplace location using the algorithm by Huber and Rust (2016). This program calculates the commuting distance using Open Source Routing Machine (OSRM), which is a high-performance routing open-source software for shortest routes on road networks. OSRM can determine the commuting distance between two places and finds the most suitable roads and the fastest way for cars. For this calculation the Routing Machine uses the maps from OpenStreetMap of 01.01.2015. In addition, the software can calculate commuting times taking average values for highways, primary and residential roads. We use the commuting time, because this makes commuting more comparable, especially for employees who commute within and between regions.

First empirical evidence

Descriptive evidence supports the findings for other countries in that women drive shorter times to work than men. In 2017, up to a commuting time of about 12 minutes the share of women is higher than the share of men traveling these commutes. After this threshold the proportion of men exceeds. However, the commuting gap decreased between 2000 and 2017 (see Figure 1). While in the year 2000 women had an average drive time of 9.3 minutes and men 12.0 minutes, it increased to 12.0 and 14.4 minutes in 2017. This implies that the drive time for women increased more than for men until 2017, and women drove as long in 2017 as men did in 2000.

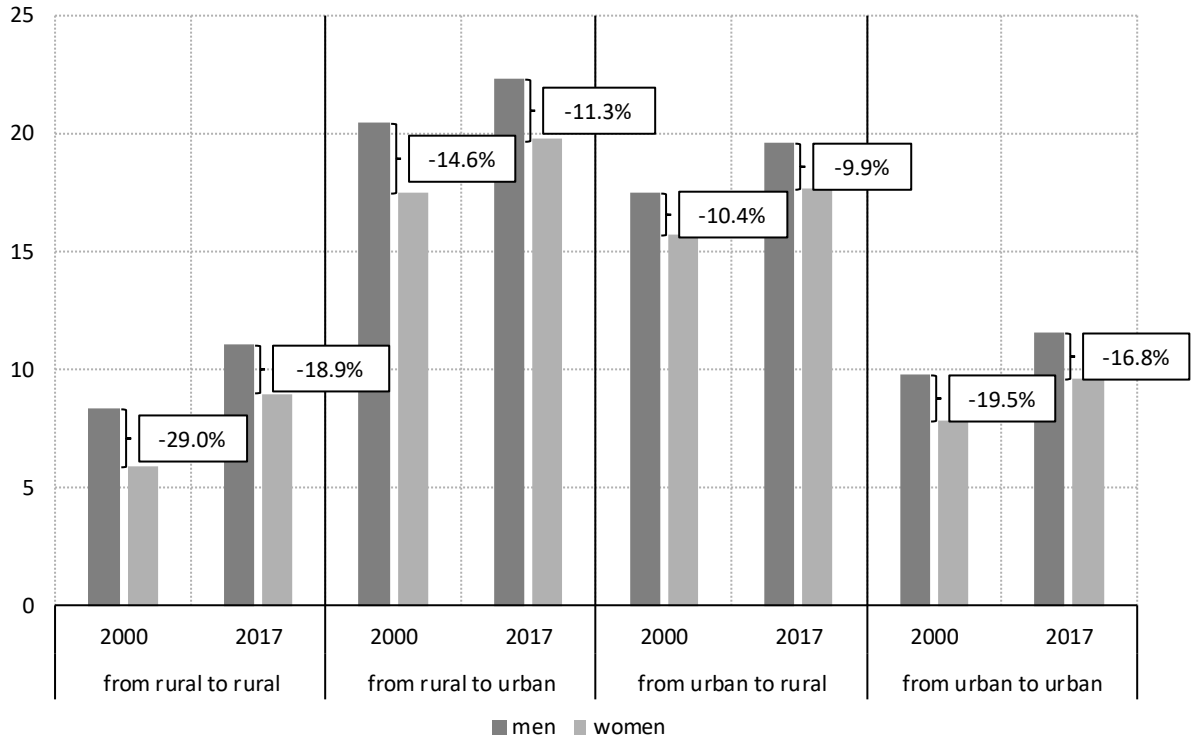
Figure 1: Commuting time and commuting gap between female and male employees (median, in minutes



Source: IEB; own calculations.

Figure 2 shows the commuting gap between women and men who commute within their region as defined by their place of residence – rural and urban – and between both region types for the years 2000 to 2017. It becomes apparent that the commuting times are especially high for women and men who commute between urban and rural areas. For individuals who work and live within the same region type, however, the commuting times are smaller, especially when living and working in rural areas: commuting times within rural regions are shorter than in urban regions. Previous literature argued that the larger a city becomes, the higher are the distances to the central city district (CBD) and thus commuting time increases (with the assumption that employment is located in the CBD). In addition, Figure 2 demonstrates that the commuting gap has decreased especially for women and men living in rural areas. For workers living in urban areas, in contrast, the commuting gap has hardly changed over the 18 years of observation.

Figure 2: Driving time and driving time gap between women and men for different combinations of resident place and work place (median, in minutes)



Source: IEB; own calculations.

Econometric analysis

In order to investigate the factors that are important in explaining the commuting gap between men and women we conduct Oaxaca-Blinder (OB-) decompositions for each year of observation (Oaxaca 1973; Blinder 1973). The OB-decomposition divides the commuting differential into an explained part consisting of observed gender differences in endowments and into an unexplained part consisting of unobserved differences in coefficients. Formally, it consists of two estimation steps.

First, estimations of the determinants of commuting time are carried out separately for male (m) and female (f) workers. In a log-linear model, log commuting times (C) for year (j) are regressed on three groups of explanatory factors. First, X includes individual characteristics like age, labor market experience, occupation, vocational qualification, working time as well as task requirement levels of the job. Second, F incorporates firm specific characteristics like industry, share of females and share of young employees in the firm as well as the human capital intensity of the firm (the share of unskilled, of professional assistants and of experts employed). Third, the categorial variable Wo_Ao indicates in which regional area (rural or urban) an individual works and lives in. These three groups of determinants are henceforth referred to as endowments and are viewed as observable indicators of gender differences partly explaining the commuting gap. Formally, the regression equations look as

follows, with β representing the estimated coefficient of the characteristic indexed by m and f, and ε_i denoting the error term which is adjusted to produce clustered standard errors at the individual level:

$$C_{m,j} = \beta_0 + \beta_1 X_{m,j} + \beta_2 F_{m,j} + \beta_3 Wo\_Ao_{m,j} + \varepsilon_{m,j} \quad (1)$$

$$C_{f,j} = \beta_0 + \beta_1 X_{f,j} + \beta_2 F_{f,j} + \beta_3 Wo\_Ao_{f,j} + \varepsilon_{f,j} \quad (2)$$

Second, the resulting coefficient estimates, in combination with the gendered endowments, are used to decompose the gender difference in the average commuting time ($\bar{C}$). This is achieved by replacing gender-specific log mean commuting times with the right-hand side regression results of equations (1) and (2). Following Blinder (1973), rearranging terms yields the following expression:

$$ln\overline{C_{m,\mathrm{j}}} - ln\overline{C_{f,\mathrm{j}}} = \underbrace{\sum_j \left(\overline{C^J_{m,\mathrm{j}}} - \overline{C^J_{f,j}}\right)\beta^j_{m,\mathrm{j}}}_{\text{explained part}} + \underbrace{\sum_j \left(\beta^j_{m,\mathrm{j}} - \beta^j_{f,\mathrm{j}}\right)\overline{X^J_{f,\mathrm{j}}} + \left(\beta^0_{m,\mathrm{j}} - \beta^0_{f,j}\right)}_{\text{unexplained part}} \quad (3)$$

The overall or unadjusted GPG is thus split into two components. The first component represents the part of the commuting gap attributable to gender differences in observed endowments, whereas ($\bar{C}$) denotes the average characteristics by gender and year. It is therefore termed the explained part. The second component is called the unexplained part or adjusted commuting gap and shows which part of the gap is due to the fact that the same endowment generates different market returns for male and female workers. This component also includes the constant. It captures the influence of all unobserved determinants on the commuting gap that we cannot control for in our model due to data restrictions. Such determinants may be household responsibilities, personal preferences or modes of transport.

The models are estimated for each year of our observation period (2000 to 2017) as our descriptive results show changes not only in the commuting times over the years but also in the development of the commuting gap.

First estimation results

First decomposition results show that the explained part of the commuting gap increases during the observation period. Whereas in the year 2000, 19 percentage points of the raw gap of 34.6 percent can be explained by our incorporated variables, in the year 2017 it is more than 23 percentage points of the raw gap of 31.9 percent. Hence, the unexplained part decreased from 15.7 to 8.5 percentage points.

Gender differences in the spatial location of the place of residence and place of work are a significant determinant of the overall commuting gap. This specifically pertains to the place of residence in rural regions, which explains about 2 percentage points of the overall gap in the year 2000.

If the share of women who live and work in rural regions was a high as the share of men, women would commute even less and the commuting gap would be even higher. This result implies that women select themselves into urban areas, where commuting time is lower due to a higher density of jobs and where there is better childcare infrastructure.

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