



The contribution of locational factors to regional variations in office-based physicians in Germany



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ABSTRACT

There is considerable literature showing that regional variation in the number of office-based physicians is rather explained by factors such as financial attractiveness of a region or employment opportunities for spouses than by health care needs of the population. It remains unclear, however, how much of the variation is explained by each of these determinants. The aim of the present study is to estimate the percentage contribution of a variety of determinants to the measured variation in Germany. Physician density is regressed on a well-defined set of explanatory variables that were identified as determinants of physician location. Regression-based decomposition was applied to decompose the variation in physician density into the percentage contribution of each of the determinants. The results show that varying health care needs of the population explained less than 5.2% of the variation in physician density. Percentage of population with private health insurance explained 14% of the variation in GP density and between 2% and 6% of the variation in specialists' density. For specialists, a higher share of variance was attributable to the variables measuring sociocultural amenities of a region compared to GPs.

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1. Introduction

The total number of physicians is increasing in many industrialised countries [1], but with significant inequalities in the regional distribution of physicians. Whereas several mainly urban areas record a significant oversupply, some remote areas are facing a lack of physicians [2–4]. This phenomenon counteracts one of the main goals of many publicly financed health care systems which is equal access to health care [5,6]. In addition, an unequal distribution of physicians is a persistent policy concern both in terms of efficiency and equity [7–9]. Efficiency concerns may be raised if a high physician density is associated with a high use of medical services, regardless of need (i.e., through

supplier induced demand). Equity concerns may be raised if high-physician density coincides with both, better medical outcomes and higher average income but not with higher need for health care.

There are a number of regulatory policies aimed at a needs-based distribution of health care providers [10–12]. In Germany, regulations for market entry of physicians accredited to the statutory health insurance (SHI) are specified in the so-called *needs-based plans*. According to these plans, target physician-to-population ratios per region are defined as the average number of physicians per group in private practice in 1990,¹ weighted by a demographic factor. If the physician density in a region exceeds 110% of these target physician-to-population ratios, an

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¹ The reference year for anesthesiologists was 1997, for specialized internists and GPs was 1995 and for psychologists was 1999.

oversupply has been established and a region is closed to new entries. In addition, the regional Associations of Statutory Health Insurance Physicians can adapt the target physician-to-population ratios to regional specifics, such as the socioeconomic structure or the infrastructure of a region. For details regarding the German system of entry regulation see Busse and Blümel [13]. However, these regulations are frequently criticised because the target physician-to-population ratios preserve considerable differences in densities between districts in the past and factors such as gender, morbidity or socioeconomic status are not adequately taken into account [14]. In addition, there is no incentive for physicians to work in rural or remote areas [15].

Economic location theory suggests that demand for services and costs of production are fundamental factors considered in locational decisions [16]. Accordingly, physicians choose to practice where demand for services is relatively high in order to maximise their income. However, it has been argued that a physician's choice for a region is also determined by other factors than profit [17]. These factors are, for example, recreational opportunities [9,18], distance to nearest training centre [9], distance to central cities [17,19], a higher educational level of the population [20], and other quality of life factors [21,22]. As a result, the unequal distribution of physicians is not proportional to differing health care needs of the population [11,15].

Only few studies have analysed the relative importance of the factors determining the choice of practice location. In a survey among prospective physicians the majority of the respondents state that living environment for the family and the closeness to the workplace of the partner [23] are the most important reasons for practice location. Recreational facilities, and cultural opportunities were also mentioned [24]. Evidence on the importance of financial conditions, however, is mixed [23,24].

The aim of the present study is to decompose the variation in physician density into the percentage contribution of a set of explanatory variables that have been identified in previous studies to be associated with physician location. This analytical approach allows for assessing the relative importance of need for health services or financial incentives in relation to other regional factors that are associated with physician density.

2. Methods

2.1. Data

Regional supply of physicians was measured by the number of physicians per 100,000 inhabitants (physician density) on district level in Germany in 2012. Separate models for GPs and specialists were estimated as these groups may differ in relation to their choice of practice location. The following specialist groups that are planned on district level in Germany were considered in the analysis: Urologists, Psychologists, Orthopaedists, Neurologists, Dermatologists, ENT-Specialists, Gynaecologists, and Ophthalmologists. Data on physician density was provided by

the Central Institute of Ambulatory Health Care in Germany (Zentralinstitut für die kassenärztliche Versorgung-ZI).

A broad range of factors that may motivate a physician to locate in a certain area was considered and divided into five broad categories: Need, financial incentives, urbanisation, labour and educational opportunities, and quality of leisure.

Need for health care in a region was defined according to the demographic factor used in the German Federal needs-based planning. The demographic factor was calculated by summing up the share of people aged younger than 65 and the share of people aged 65 or older in the district times the factor for average need for services in that age group. This sum is divided by the sum of the share of people aged younger than 65 in Germany and the share of people aged 65 or older in Germany times the factor for average need for services in that age group. The factor for average need is the relation between health services utilisation of the population aged 65 or older and health services utilisation of the population aged younger than 65 and is based on physician claims data of the last 12 quarters [25].

Financial incentives were measured by the proportion of privately insured residents because a physician can generate higher levels of remuneration for health services provided to patients in private health insurance (PHI) than to patients in statutory health insurance (SHI) [26]. The proportion of patients in PHI is based on data held by the Federal Insurance Authority. The estimation of this variable is described in Sundmacher and Ozegowski [26].

To consider differences in the degree of *urbanisation*, the number of major regional centres and the degree of rurality of a district (i.e., the share of inhabitants in communities with a population density less than 150 inhabitants per sq. km) were included. In general, urban areas tend to have more physicians because of, among other factors, the economic, social and cultural amenities of urban as opposed to rural areas [19,22].

Labour and educational opportunities are measured by the Gross Domestic Product (GDP) per capita and the share of school leavers with higher education entrance qualification. Whereas GDP is a proxy for a whole host of amenities reflecting the labour opportunities in a region, the share of school leavers with high education may be relevant for physicians who care for their children's educational attainment. Areas of higher GDP or education may also reflect sociocultural characteristics of a community which are attractive to physicians [22].

The number of tourist accommodations per squared kilometre and the share of recreational area were used to measure the *quality of leisure*. Recreational area is undeveloped area, such as green areas, parks, and campsites, intended for sport activities and recreation.

As patients may use health care across district borders, it was additionally controlled for the proportion of *commuters* in relation to all employees in the district. The proportion of commuters is highly and positively correlated with the share of health care services rendered for patients living in neighbouring districts out of the total of services provided in that district [27].

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