

## Chapter 2

# Knowledge Society, Educational Attainment, and the Unequal City: A Sociospatial Perspective



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Modern society is increasingly described as a “knowledge society” (Stehr & Meja, 1984), or, from a more limited perspective, as a “knowledge economy” (Sörlin & Vessuri, 2007). Following from that, education, as a process of facilitating learning and knowledge acquisition (see Fröhlich & Gerhard, 2017), has gained in importance for the individual as well as for society, since educational achievements are strongly influencing job opportunities and the ability to partake in public, social, and political life. Education, however, is acquired in a certain socioenvironmental setting that has a decisive impact on educational opportunities and achievements. In the case of formal knowledge, organizations such as kindergartens, schools, universities, and other institutions of higher education play a crucial role because they are understood as key institutions in knowledge-driven societies.

In this paper, we argue that the socioenvironmental setting influencing education is strongly related to the urban context. It is the city itself, with special atmospheres of learning and education, a manifold distribution of and access to educational institutions, the existence of different neighborhoods and specialized city quarters, as well as a diverse range of protagonists in the field of informal learning that creates an educational environment highly relevant for knowledge production. In the general discourse urbanity and the urban milieu are often regarded as seedbeds for the production of creative ideas, smart development, and knowledge invention. Even more, the condensed presence of educational organizations, creative industries, and research-oriented industries is thought to stimulate prosperous urban development. Researchers, most dazzlingly Florida (2002), but also more evidence-based scholars (e.g., Gabe, Abel, Ross, & Stolarick, 2012; van Winden, van den Berg, & Pol, 2007),

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mainly portray this reciprocal relationship between knowledge society, socioenvironmental settings, and education in a positive light. They accept the city's knowledge sector as the main engine for growth strategies that lure people, companies, and investments. City policymakers deliberately try to foster this relationship by supporting knowledge-intensive industries, hosting educational and research institutions, and thereby attracting creative knowledge workers.

However, the picture might not be as positive as is often claimed. In accordance with several other studies, we contend that urban stakeholders and researchers have often tended to overstate the economic impact of knowledge institutions (Addie, Keil, & Olds, 2015; Siegfried, Sanderson, & McHenry, 2007). Although it is true that knowledge institutions create employment opportunities, these jobs, as well as the related economic effects, do not necessarily benefit the whole urban population. Furthermore, the appraisal of the knowledge society, with its ubiquitous disposition of knowledge that has led to an open, more egalitarian society, increasingly appears to be a myth: Knowledge and education are not available for everybody in the same way. Knowledge-based urban development, and the concept of a knowledge society more broadly, often create new inequalities. Even Florida, once the main proponent of the "creative city," now admits that these creative urban environments are also the most unequal ones (Florida, 2017).

In this paper, we combine a sociological and urban geographic perspective to try to disentangle the assumed positive connotation of the tripartite relationship between education, knowledge-based urban development, and individual well-being. What are the consequences of knowledge-induced urban growth, especially regarding social equity? How do cities with a strong knowledge sector develop in sociospatial terms? What can we learn from an interdisciplinary analysis of the educational system in the city? In order to answer these questions, we connect the debates on urban (re)development, knowledge society, and education by following three conceptual steps. To begin, we outline the concept of knowledge-based development by looking at the involvement of knowledge institutions in urban development from a broader perspective, based on a literature review in the first section of the paper. We then consider the possible disadvantages of the acclaimed growth of knowledge cities in the second section. As a third step, we analyze the role educational systems play in producing such inequalities. For this purpose, we analyze the spatial production of educational success in the city from a cross-disciplinary perspective. We argue that educational institutions play a major role in the marketization of urban space, and, thus, contribute to the increasing urban inequalities inherent to knowledge societies. Subsequently, in the fourth section of this paper, we detail a German case study to empirically support our argument by looking at the city of Heidelberg, which is considered to be a "knowledge pearl" in Germany. This city certainly shows a high overall growth rate and economic stability due to knowledge-led urban development—as the knowledge discourse suggests. At the same time, however, Heidelberg struggles with consistent patterns of inequality that increasingly question this rosy picture. Our case study is drawn from long-term observations in this city, an active involvement in urban planning issues—such as the spatial expansion of the University—as well as the relaunching of an urban growth model. In addition,

we draw on our experience with the operation of the real-world lab Urban Office of Heidelberg that has partaken in sustainable urban development for several years in close cooperation with the International Building Exhibition (*Internationale Bauausstellung*, IBA Heidelberg), the city of Heidelberg, and urban society activists (see Gerhard & Marquardt, 2015, 2017). We contend that such an empirical investigation is a necessary element in any conceptualizations of knowledge-related urban development. In the final section, we draw out some implications of our analysis for the wider concerns that are motivating this edited volume.

## Urban Development in Knowledge Society and the Role of Institutions of Higher Education

In post-industrial times, it is common to see knowledge as a fundamental resource for the development of cities. The transition from an industrial to a knowledge society has shaped the character of urbanity and has forced cities into global competition (e.g., Knight, 1995). They compete for creative talent, successful enterprises, financial support, job opportunities, and a better quality of life. In this contest, knowledge-based institutions such as schools, colleges, universities and other institutions of higher education, science and research centers, libraries, hospitals, and research-focused and creative industries all gain increasingly strategic importance for successful urban development (Florida, 2002; Scott, 2006). The support of these branches has become a focal point in local and regional policies (e.g., Anheier & Isar, 2012) and emerged into an important task in urban planning administrations (e.g., Evans, 2009; Fröhlich, 2021).

The provision and management of space for knowledge production, distribution, and integration has thus taken on new significance in recent years (Kujath, 2012; Yigitcanlar, 2009). It involves the supply of additional areas for offices and labs, for knowledge intensive enterprises, for creative start-ups, for institutions of higher education, and for attractive housing for the knowledge workers. A further aspect is the provision of opportunities for the informal exchange of knowledge in order to foster the development of creative milieus (Florida, 2005). Creative milieus are contexts for working and learning, living and perception, as well as cooperation and competition (Matthiesen & Mahnken, 2009; Merkel, 2012). They nurture the innovation-driving, creative, and cultural industries—all of these branches essentially being dependent on knowledge exchange (Kunzmann, 2004; Landry, 2008). Short distances between different organizations, available meeting points, and urban open spaces nourish a creative atmosphere, which then attracts further stakeholders. “Place matters, because a stimulating environment and a talented individual must come together and interact before a creative process can occur” (Meusburger, 2009, p. 98).

This also holds true in view of digitization. Face-to-face contacts can be reduced to a certain extent and the use of home offices is on the rise, but what is lost must be

replaced by new forms of trust relations that bear spatial implications (Grove, 2019). The development of new quarters as knowledge hubs is one option. Brownfield areas, for example, can be used to sustain knowledge parks, technology facilities, creativity centers, or institutions of higher education in one location, thus providing possibilities for networking and linkage. These networks are strongly linked to residential opportunities and urban neighborhoods. Another option is campus development by turning university sites into public arenas for discourses and knowledge production by a broad range of stakeholders with a great deal of expertise on different topics. Thus, a clear connection of place and knowledge is important: Cities are increasingly competing to attract creative minds and young people. To do that, a charming surrounding area, diverse cultural and sports activities, and public spaces are substantial aspects. Only when the provided amenities meet these needs can a city succeed in attracting skilled and educated people (Storper & Scott, 2009).

Many studies highlight universities and other higher educational institutions as key actors in the process of knowledge appropriation (e.g., Addie, 2018; Chatterton & Goddard, 2003; Goddard & Vallance, 2011). Leading global cities, for example, exhibit a comparably high rate in higher education institutions, and their economic success is attributed to the presence of high-ranking universities (Addie, 2018; Jöns & Hoyler, 2013). Silicon Valley seems impossible without Stanford University; the boom of Munich is bound to its excellent universities and other knowledge institutions; and, last but not least, China strategically locates key universities in important cities (Liu, 2019). This, however, also holds true and might be even more relevant for smaller and medium-sized cities where institutions of higher education became key players in the process of urban change (e.g., for Queensland University of Technology, Massachusetts Institute of Technology, Harvard, Twente, and Newcastle universities see Benneworth, Charles, & Madanipour, 2010; for Oxford, Leuven, and Pisa see Lazzeroni & Piccaluga, 2015; for Cachoeira see Baumgartner & Rothfuß, 2017).

Universities and colleges affect their host cities at multiple levels (Delanty, 2001; Maasen, Andreadakis, Gulbrandsen, & Stensaker, 2019). They decisively contribute to education and qualification within a city. Their members not only educate students and PhD candidates but also offer continuing training, public science, and knowledge transfer into civil society, administration, and industry (Marquardt, 2019). Through their role as a main employer in a region, they strongly foster economic development (Glückler, Panitz, & Janzen, 2019). At the same time, institutions of higher education also directly affect urban space. Nurturing in numbers—numerous universities were founded during the last century around the globe—and size, the quantity of students in cities has risen enormously as has the number of researchers (Hoelscher, 2012, p. 1714; Hoelscher & Harris-Hümmert, 2019). This again puts universities in strong competition for land with other urban stakeholders.

Thus, institutions of higher education become very influential for a city's socio-structural development. As Addie and colleagues have put it in a nutshell: "The sociospatial impacts of higher education's massification and commercialization, together with the deep restructuring associated with the new knowledge economy, are of paramount importance for our understanding of contemporary urban and

economic development” (Addie et al., 2015, p. 33). At the same time, however, the impact of knowledge-intensive institutions and industries on the urban context differs markedly, as shown in various analyses. Considering the involvement of the knowledge sector in the economic development of cities, van Winden et al. (2007) generate six types of knowledge-based cities in northwest Europe, reaching from *stars* (larger cities scoring high in all seven dimensions) to *knowledge pearls* (smaller cities within or near an agglomeration scoring high in all seven dimensions). The latter type is true for our case study of Heidelberg, as we will show later. In another quantitative study on North American city regions, Gabe et al. (2012) extract eleven different knowledge profiles according to their share of employment in knowledge-related industries. The profiles range from *making regions* (high score for knowledge on manufacturing) up to *teaching regions* (college towns with high knowledge on education and training). Knowledge-induced growth, therefore, comes in quite different forms and with a diverse range of outcomes, as visible if one focuses on knowledge-based urban development within the cities themselves. The clear prioritization of aspects of knowledge, such as creativity and innovation, favors certain areas (mostly in close proximity to the knowledge sites), whereas other areas are left out. Booming regions especially are marked by a strong disparity between knowledge quarters and peripheral neighborhoods, as discussed in the next section.

## The Dark Side of Prosperity: Urban Inequalities in the Knowledge City

The authors of a growing body of literature question the generally positive evaluation of knowledge-based urban development. Bontje and Musterd (2009), for example, criticize that it is mainly a fashion fueled by “scientist-consultants,” whereas a more pessimistic view is based on local experts from seven European city-regions. Similarly, Rausch and Negrey (2006) are skeptical about a positive relationship due to their empirical correlation analysis of Florida’s creativity ranking and economic data of the cities at which they looked. Even when one acknowledges the innovative capacity of knowledge institutions for a region, there is a “dark side of prosperity” (Walker, 2018). Knowledge-led growth produces uneven developments because not all parts of the urban society profit from it. There is, first of all, the strong structural fact that not all former blue-collar jobs can be easily transformed into white-collar service jobs. As researchers like Friedmann (1986) and Sassen (1991/2001) already observed and forecasted for the development of highly connected global cities, labor markets in cities are strongly polarizing related to the growth of the knowledge and information society. Even more, the advance of the service industries (especially the so-called FIRE Sector composed of finance, insurance, and real estate; quintessential for the global city) produces a growing demand of low-skilled services necessary to keep the urban infrastructure of the knowledge society running. From cleaning to security, from call centers to hotel receptions, demand for

low-skilled work is increasing—whereas wages are decreasing. As McDowell and Dyson (2011) have shown, this especially affects female workers, as well as migrants, who constitute a large part of the often unsecured, low-paid service industries (precarious jobs). At the same time, an erosion of the middle class can be detected because more people can reach upper levels of social mobility (due to broader education and knowledge), whereas others, whose skills are not needed anymore in post-industrial societies, are filtered down into the lower levels of social class.

Second, there is a strong sociospatial component to knowledge-induced growth. Described with different opalescent terms, such as urban redevelopment, downtown revitalization, or reurbanization, inner cities, which used to be the home of ethnic groups and heterogeneous milieus, are now being gentrified into upscaled neighborhoods catering mainly to the new urban knowledge workers. Formerly neglected neighborhoods are becoming cool places that still reveal “gritty” authenticity from their past (Zukin, 2011, pp. 35–37) while displacing people from groups less inclined to education or with lower-income from these districts. Wilson (2018) talks about “urban growth machines” that transform these neighborhoods into touristy places that appeal especially to the transnational elite.

Third, even when an overall positive quantitative impact of knowledge institutions on regional development is ascertained, the local innovative outputs differ from case to case (see, e.g., Warnecke, 2018). Some studies state that researchers looking for excellence in research cooperation are often oblivious of their regional environment and the local labor market (Kroll, Dornbusch, & Schnabl, 2016). Thus, only stronger regions might profit from an excellent university due to an already existing innovative and creative milieu. This is the case, for example, for university sites such as Stanford, Harvard, Leuven, Groningen, or Munich. In general, however, a local involvement and prosperous cooperation between town and gown cannot be taken for granted and the role model of Silicon Valley, borne out of the seedbed of a university, cannot be transferred to every case (Hall, 1997; Knight, 1995).

From a quantitative point of view, the measurement of a university’s economic impact on the surrounding region is highly dependent on the definition of the area, the use of indicators, and the role of multipliers (Siegfried et al., 2007). Furthermore, the assessment of the university’s regional effect is embedded in a neoliberal framework that accounts for purely economic output, but neglects social, political, and local contexts or consequences (Bose, 2015). Audretsch (2014) argues that the university’s role has shifted from an “entrepreneurial university to the university for the entrepreneurial society” (p. 313). Whereas the former was a call on universities to become more flexible, interdisciplinary, and application-oriented, as an “entrepreneurial” response to the increased demands on institutions of higher education from outside academia (Clark, 2001), the latter is a call to enhance entrepreneurial and human capital and facilitating behavior in an entrepreneurial society.

Last but not least, cities with strong universities and creative regional environments experience the highest pressure on the global real estate market. Silicon Valley and the Greater San Francisco Bay Area may sit atop galloping real estate

prices, but the sheer numbers and, even more, the sheer discrepancies of prices between and within cities in general are striking. North American cities in thinking or innovating regions (strong in IT, commerce, arts, and humanities but low in manufacturing; see Gabe et al., 2012) experience the highest growth rates of house or rental prices in comparison to all other cities. For Germany, Egner and Grabietz (2018) found two main factors that significantly impact high rents: mean income and the number of students. Higher prices, as we will show for our case study on Heidelberg, create substantial inequalities within the urban context and thus threaten the quality of life in many cities. When space is a scarce resource in competitive cities, intra-urban conflicts between different land uses arise. In addition, newly built quarters are especially tailored to the needs of academic singles, young couples, and families, providing urban flair through stylish restaurants, internationalized shops, and green spaces. This often comes with an upturn in rental and real estate prices—causing new social inequalities or even changing the character of whole quarters, as studies on “studentification” in Great Britain have shown (Smith, 2004).

Touristification, platform urbanism, and sharing economies are just a few more catchwords that, even though they sail under the flags of sustainability and authenticity, exert enormous pressure on local real estate markets. Cities as the growth engines of knowledge economies thus attract creative people and well-heeled visitors by promoting certain cool, fancy, or creative areas to the disadvantage of others.

For these reasons, the knowledge discourse needs to be closely related to the issue of urban inequalities and the factors that help (re-)produce them, such as the educational sector. While analyzing inequalities has a long tradition in urban studies (for an analytical overview, see Heynen, Aiello, Keegan, & Luke, 2018), the formation of the knowledge society has only received rudimentary attention in that context. There are, for example, a growing number of studies on social and spatial inequalities of educational opportunities and school access, especially for the U.S.-American context (see, e.g., a special issue in *Urban Studies*, Vol. 56, Issue 15, 2019). In addition, the authors of several studies have shown the connection between place of residence and the educational disadvantage of pupils with a migrant background (e.g., for Germany, Baur, 2013). These studies, however, are mostly embedded into segregation discourses that are related to race, class, and socioeconomic measures; their authors mostly provide quantitative evidence for a complex socio-spatial context of school segregation (e.g., Boterman, Musterd, Pacchi, & Ranci, 2019; Oberti & Savina, 2019; Owens & Candipan, 2019) and hardly ever frame their work within the broader picture of knowledge society. Thus, they lack a comprehensive, interdisciplinary approach with which to equally analyze educational systems, knowledge discourses, and uneven urban developments, as suggested in the next section.

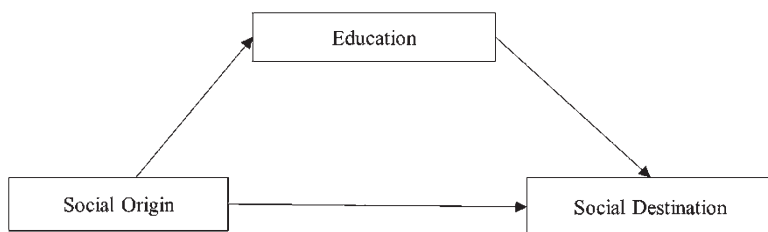
## Linking Urban Inequalities to Education

Education plays an increasingly important role in the knowledge society, as educational achievements result in benefits in many realms of life, including better and safer jobs, increased health and well-being in general, and more social and political engagement. However, educational achievements are still unevenly distributed and are, *inter alia*, dependent on socioenvironmental settings. These settings, and especially the spatial distribution of educational institutions and their use, are influenced by current trends towards knowledge-based urban development. Before looking at the socioenvironmental settings in more detail, we want to address the relationship between education and inequality as a reciprocal one more generally.

First, scholars well accept that education is actively producing social inequality: Formalized educational degrees are influencing access to labor markets, especially to higher positions (e.g., Hillmert, 2011), and many researchers have shown the positive impact of education on (economic) well-being on the individual level (e.g., Harmon, Oosterbeek, & Walker, 2003; Woessmann, 2016). From a meritocratic point of view, this relationship between educational success and individual well-being is seen as legitimate, as long as there are equal chances with regard to educational achievements. As the term knowledge society suggests, proponents regard education as the main mechanism transferring ability and effort via certified degrees into (access to) higher social positions, resulting in upward social mobility and thus differentiation. Education, therefore, is not only producing inequality, but, even more, it is also legitimizing it (see also Hadjar & Becker, 2016).

Second, contrary to this legitimization, authors of empirical findings prove that equal access to educational opportunities is a “myth” (Goldthorpe, 2003). The reason is that the relationship between education and social inequality also works the other way around: Social inequality or background is heavily influencing educational achievement. The interplay of social origin (O), education (E), and social destination (D) can be conceptualized in the O-E-D-triangle (e.g., Hadjar & Becker, 2016) (see Fig. 2.1).

Some empirical researchers have indeed shown a decreasing influence of social origin on education as well as on social destination during the twentieth century,



**Fig. 2.1** The relationship between social origin, education, and social destination. Source: Design by authors



especially in the 1960s and 1970s (Breen, Luijkx, Müller, & Pollak, 2009), but by no means a disappearance (Goldthorpe, 2003; Pollak & Müller, 2018). With regard to the overall picture in the last decades and today, Hadjar and Becker (2016, p. 252) even conclude: “The link between educational attainment and class of destination (E-D) decreased, while the (direct) link between class of origin and destination class (O-D) slightly increased.” Barone and Schizzerotto (2011), in their summary of a comparative study on five European countries, reach a similar result.<sup>1</sup> Bukodi and Goldthorpe (2013) differentiate three different dimensions of social origin: namely, class background, level of education, and social status. In their study comparing three British birth cohorts, they find (a) persistent levels of inequalities, which they link especially to “secondary” effects (Boudon, 1974), which are effects stemming not from differential performance in school, but from educational decisions; and (b) that “it is parental education that is of greatest, and increasing, relative importance” (Bukodi & Goldthorpe, 2013, p. 1034).

A first conclusion therefore is that contrary to modern society’s promise of reducing the inheritance of social status and an increasing reliance on education as a just means for social mobility, the knowledge society instead increases the influence of social origin, and especially parental education, on educational achievements. Why is this the case?

As already mentioned above, (educational) inequalities have a spatial or socioenvironmental dimension. An important aspect is the local availability of educational infrastructure and its quality. Burger (2019, p. 182), reporting on Europe, finds evidence “of the potentially damaging effect of a sociospatial separation of students, indicating that socioeconomic segregation . . . may contribute to some extent to the perpetuation of educational and, by extension, social disadvantage from one generation to the next.” Scholars are engaging in an extensive discussion on school choice and (changing) places of residence. While this topic is not new (see, e.g., already the classic studies by Coleman and others), there seems to be a growing significance in the context of the knowledge society. Lipman (2002, 2011), for example, relates inequality to the new political economy of education and argues that neoliberal school reforms in Chicago have exacerbated the already existing inequalities in the urban landscape. Candipan (2019; Owens & Candipan, 2019) showed that even with the introduction of free school choice or the establishment of charter schools in the U.S., inequalities between the schools—which were supposed to diminish—even increased, because higher-income parents tend to bypass schools with higher proportions of minority or low-income students and enroll their children outside their (gentrifying) neighborhood. This is because well-off parents are able and eager to use available information on school quality to send their children to good schools, and even possess the financial resources to move to another place if necessary.<sup>2</sup> For Germany, researchers have shown that “the absence of a desired school in the

<sup>1</sup> However, the setup of national educational systems seems to play an important role in the precise amount of these effects (see also Hadjar & Gross, 2016).

<sup>2</sup> As some anecdotal evidence: There is, for example, an app that helps one find the right accommodation in Oxford if one wants to live in the catchment area of a specific school.

immediate vicinity drastically increases the relocation rate. In addition, families with university degrees and without a migration background move more frequently to neighborhoods with few perceived signs of deprivation” (Oeltjen & Windzio, 2019, pp. 651–652).

From a relational perspective, educational achievement is not only influenced by the described family background and decisions, but more broadly by effects of collective socialization, such as the influence of local social networks (Zangger, 2018). There is sufficient evidence that disadvantaged districts can therefore become disadvantaging districts. Researchers have recently shown, however, that the opposite effect seems to be even more pronounced: Advantaged surroundings seem to foster advantaged children even more strongly (Helbig & Jähnen, 2018; Zangger, 2018, with an extended discussion). And although, in general, ethnic segregation is less pronounced in Germany than, for example, in the U.S., authors of a recent study have shown that social segregation is growing and especially affects families with children (Helbig & Jähnen, 2018). Interestingly though, the availability of private schools seems to possibly reduce spatial social segregation, as such schools allow better-off parents to stay in the quarter and send their children to these institutions. This, however, is producing another kind of segregation, contributing to what is sometimes discussed under the “qualitative dimension” in the concept of “effectively maintained inequality in education” (e.g., Lucas & Byrne, 2017; for Germany, Weiss & Schindler, 2017).

A second conclusion, therefore, is that the influence of social origin on educational achievements is created by the interplay of individual decisions and urban spatial structures. Our hypothesis is that knowledge-based urban development impacts these individual decisions as well as the polarization between different city quarters, thereby contributing to (new) urban and social inequalities.

In general, Germany seems to be a good case study for the analysis of the relationship between education, inequality, and the city for several reasons. First, authors of extensive reviews have shown “that a high degree of stratification . . . increases inequality in . . . educational attainment” (Combet, 2019, pp. 301–302). Germany has a highly stratified and diversified school system, combined with a strong focus on certificates in the labor market. Children, after their first four years in joint local schools (called *Grundschulen* with catchment areas), are selected into two tracks of secondary education: *Haupt-/Realschulen* (another 5 or 6 years of schooling, mainly preparing for vocational education and training) and *Gymnasium* (another 8 or 9 years, on the main road into higher education). Although access to the different types of schools is open for all children and does not depend on parental income or position, there are sturdy differences between social groups. The relationship between social origin and social destination is strong and highly mediated via education (Hillmert, 2011; OECD, 2016, p. 214; Weiss & Schindler, 2017). Second, with increasing numbers of private schools, a rapidly expanding higher education system, and other developments, the educational context has changed dramatically in recent years, combined with only sparse research in this field up to now (Helbig & Jähnen, 2018, p. 69).

Heidelberg is an interesting case in this respect, as it is a city with one of the highest participation rates in the *Gymnasium* (the highest track at the secondary educational level). It is also the location of one of Germany's most prestigious universities, which is at the same time the largest employer within the city, and it is a town with some of the highest housing prices. The sociospatial outcomes, therefore, might be especially visible.

## The Example: Heidelberg

In the previous sections, we have argued that education, knowledge society, and urban development are closely related and together produce and reproduce different layers of inequality. With our case study of Heidelberg, a midsized college town and internationally esteemed “knowledge pearl” in Germany (van Winden et al., 2007; see also Meusburger, 2016) that is potentially characterized as a “thinking region” according to Gabe et al. (2012), we contend that Heidelberg's knowledge-based urban development is inherently related to (educational) inequality and segmentation. The urban landscape is highly structured by the university and other knowledge institutions and their employees, urban space is negotiated as a competitive resource that produces conflicts and displacements, and housing in central areas becomes for many an unaffordable asset that—although homelessness is not the biggest issue in the German welfare context—increasingly affects quality of life issues. On the neighborhood scale, residents have strongly entrenched social statuses, mostly related to the educational background that is already visible at the elementary school level. Thus, the strong interplay of knowledge society, education, and urban development bears sociospatial outcomes that can be illustrated with the case study of Heidelberg.

Heidelberg, situated in the flourishing Rhine-Neckar metropolitan region, is increasingly distinguishing itself as a knowledge city. The university and other institutions of higher education, several prestigious national and European research institutions, and a research-based corporate landscape have contributed to Heidelberg's dynamic development during the last decades. Large numbers of job opportunities are connected to knowledge institutions and the tertiary sector is thriving. This progress attracts new inhabitants, as seen by the fact that the urban population increased from almost 140,000 in 2000 to more than 160,000 today. The number of students and academics living in the city is especially increasing. The share of students in the city population has grown from 21.5% (2010) to 24.1% in 2016, or from 30,893 to 37,624 students in absolute terms (Eurostat, 2020). In 2019, Heidelberg was judged the German city with the highest rate of academics among its employment population—44% (Burstedde & Werner, 2019). However, this also causes a high rate of social inequality. Ninety people with incomes in the millions are opposed to 28% of the population earning less than €10,000 a year (Stadt Heidelberg, 2018a). However, this high proportion of low earners is probably also due to the high number of students (ibid.). Do these disparities also become

spatially apparent in the city of Heidelberg when we include education as a further aspect?

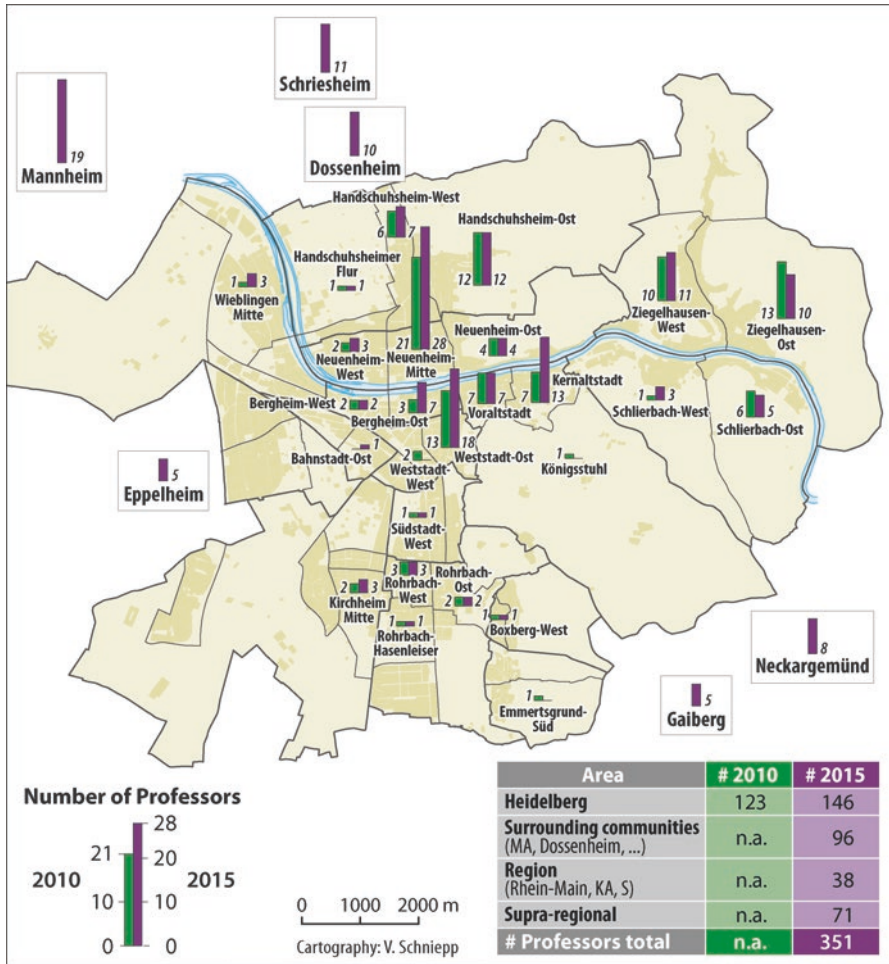
One of the central arguments made above applies to segregation along educational achievements. The spatial distribution of the employment population's educational degrees is characterized by strong discrepancies between the different neighborhoods in Heidelberg (see Table 2.1; see Fig. 2.2 for their location in Heidelberg). In 2019, three groups are distinguishable: In a first group of neighborhoods (Altstadt, Bergheim, Weststadt, Südstadt, Handschuhsheim, Neuenheim, and Bahnstadt), more than 70% of the working population hold at least an *Abitur* or *Fachabitur*, the educational level needed for university entrance qualification. A second group of neighborhoods, consisting of Schlierbach, Rohrbach, Kirchheim, Wieblingen, und Ziegelhausen, has a share of graduates with *Abitur* between 50 and 70%. On the other end of the educational spectrum lie the more peripheral locations with much lower rates: In Pfaffengrund, Boxberg, and Emmertsgrund less than 40% have this high school diploma (third group).

As laid out in Table 2.1, these differences have (slightly) increased over time: The overall share of the working population with at least an *Abitur* in Heidelberg rose by 8.3 percentage points by 2019. Above-average increases can be found in Bergheim (new social science campus on a redeveloped brownfield site) and Handschuhsheim (Group 1), as well as in Rohrbach and Wieblingen (which has the *SRH*, a growing private University of Applied Sciences, as well as a popular private *Gymnasium*, Group 2). The already low areas of Pfaffengrund, Boxberg, and Emmertsgrund (Group 3), as well as Südstadt, however, exhibit below-average

**Table 2.1** Share of employed people with (*Fach-*)*Abitur* as highest educational degree by place of residence (in %, 2014 and 2019)

Neighborhood	2014	2019	Change
Altstadt	68.8	76.6	7.8
Bahnstadt	77.8	86.0	8.2
Bergheim	62.8	71.5	8.7
Handschuhsheim	62.7	72.0	9.3
Neuenheim	77.0	81.4	4.4
Südstadt	65.2	71.1	5.9
Weststadt	70.9	78.0	7.0
Kirchheim	43.4	51.5	8.1
Rohrbach	51.1	59.7	8.6
Schlierbach	59.6	67.6	8.0
Wieblingen	45.4	55.6	11.2
Ziegelhausen	50.7	58.5	7.8
Boxberg	25.7	31.8	6.1
Emmertsgrund	23.2	29.0	5.8
Pfaffengrund	29.9	35.9	6.0
Total Heidelberg	54.7	63.0	8.3

*Note.* Source: Design by authors. Data from Stadt Heidelberg, Statistics of the Federal Employment Agency



**Fig. 2.2** Places of residence of university professors at Heidelberg University (absolute numbers, 2010 and 2015). Source: Design by authors. Data from Heidelberg University

growth rates. Interestingly, Neuenheim has the lowest growth rate, but was in 2014 and still is in 2019 the quarter with the second highest share of citizens with *Abitur*. A potential explanation might be that Neuenheim is a very settled urban area with the highest overall rents in Heidelberg.

Interpreting these numbers, a clear spatial pattern becomes obvious: The (most prestigious) neighborhoods adjacent to the three university locations (Neuenheim and Handschuhsheim next to the modern science campus, Bergheim and Weststadt next to the new social science campus, and the old city center Altstadt with the humanities dispersed throughout it) exhibit the largest shares of higher-educated citizens and, in most cases (with the exception of Neuenheim), show above-average growth rates. This results in increased polarization within the city.

Examining the places of residence of professors of Heidelberg University reveals a pretty similar picture (see Fig. 2.2). Most live in the affluent neighborhoods that are close to the University, very few live in the Southern part of the city, and literally none reside in Emmertsgrund, the poorest high-rise housing area. This trend increased between 2010 and 2015, with the highest gains for the first group of city quarters (Weststadt +3, Bergheim +4, Altstadt +6, and especially Neuenheim +8) and losses only in Ziegelhausen (-2) and Emmertsgrund (-1). In addition, a further trend is also becoming apparent: a trend towards suburbanization driven by searches for single-family housing in attractive locations. Out of 351 professors at Heidelberg University, 96 live in suburbs, and 109 are even commuters from other cities. Again, it is striking to note the spatial concordance between neighborhoods with high numbers of university professors living in them and neighborhoods whose inhabitants have the highest educational degrees.

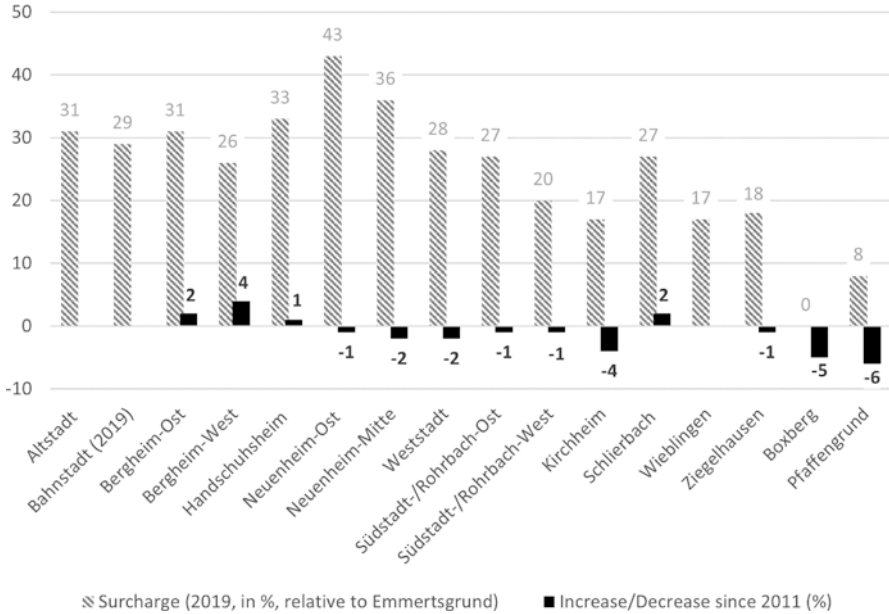
As argued above, knowledge-based urban development and related segregation, evidenced here with regard to educational disparities, should also play out in economic terms. And, in fact, the comparison of rent indexes across the different city quarters displays similar patterns once more. Calculating the lowest rent in town as the standard (found in Boxberg and Emmertsgrund in 2019), we find strong deviations from that norm (see Fig. 2.3). Neuenheim and the adjacent areas of Handschuhsheim, Bergheim, and Altstadt (Group 1) have average rent prices more than 30 or 40% above the calculative norm. We also detected gentrification processes in Bergheim, with the newest campus site, which used to be a mixed-use neighborhood with low rents that are now gradually disappearing from the urban landscape, undergoing the largest increase in rents between 2011 and 2019 for the whole of Heidelberg. Boxberg (-5%), Kirchheim (-4%), and Pfaffengrund (-6%), on the other side, move closer to the least expensive quarters (Group 3).

The residents' varying involvement in the labor market in the different neighborhoods accentuates this pattern: The lowest unemployment rates can be found in the above-mentioned prestigious neighborhoods, whereas they are highest in Emmertsgrund, Boxberg, and Pfaffengrund. Overall, a spatial divide exists between a high socioeconomic status in the north and the less-educated, much lower income south/west.

To what extent do these disparate socioenvironmental contexts impact Heidelberg's educational inequalities? In the paragraphs above, we reported on studies whose authors have shown that deprived neighborhoods can become depriving neighborhoods. From the described patterns, we argue that this is increasingly also the case in Heidelberg, with the most highly educated people increasingly concentrating in certain quarters, often near central knowledge institutions such as universities. Although we are not able to track relocation processes of individuals within Heidelberg, there is aggregated data that people in the age group 30–39 (47%) and those with small children (58%) were especially prone to moving house within Heidelberg during the last 5 years (Stadt Heidelberg, 2018b).<sup>3</sup> As Oeltjen and

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<sup>3</sup>These are often former students who find a job after graduation and start a family.



**Fig. 2.3** Rent index zones in Heidelberg and their changes, 2011 and 2019. Source: Design by authors. Data from Stadt Heidelberg (2011, 2019)

Windzio (2019, see above) have shown, well-educated parents especially choose privileged neighborhoods with good schools when moving, whereas less educated parents with lower incomes have to move to deprived neighborhoods due to the huge differences in rents.

Looking at the distribution of *Gymnasiums*, we find three in Neuenheim (one public, two private ones), two in Altstadt (both public), three in Rohrbach (two public, one private),<sup>4</sup> and one in Wieblingen (private). A special characteristic in Heidelberg is the huge share of pupils in private *Gymnasiums* (around 50%). Even more interesting, however, are the school transition rates for pupils from elementary school (*Grundschule*) to *Gymnasium*, where the strongly inherited character of educational degrees becomes obvious (see Table 2.2). As the (public) elementary schools in Germany have catchment areas, these figures are directly related to the respective neighborhoods.

The concordance between the different neighborhood groups is striking. Elementary/primary schools (grade 1–4) in the first group of neighborhoods (high proportions of college degrees) possess much higher shares of kids going to the high schools in town (*Gymnasium*), with figures (well) above 80% in all schools of Altstadt, Neuenheim, and Handschuhshheim, and at least in one school in Weststadt. For example, Mönchhofschule in Neuenheim and the Friedrich-Ebert-Schule in the

<sup>4</sup>One of the public institutions is a *Gesamtschule*, combining a *Gymnasium* with other school tracks; the private one was traditionally connected to the American soldiers located in Heidelberg.

Altstadt sent all verifiable pupils to the *Gymnasium* in 2018/19, and the Heiligenbergschule all but seven pupils. This is in clear contrast to other neighborhoods, especially in the southern, more peripheral parts of the city (e.g., Waldparkschule or Emmertsgrund, Group 3), where only few pupils reached that level. The professional future and thus expected income of the latter will be strongly influenced by this fact (see previous section).

Interpreting these numbers over time, an entrenchment of these patterns becomes visible: There are (further) increases of around, or even above, ten percentage points for school transfer to the *Gymnasium* in the Altstadt, Weststadt, and Wieblingen, but also in Kirchheim (still low overall level) and (one school in) Rohrbach. Decreasing shares are reported for Boxberg (see the respective footnote, though), Emmertsgrund, and Bergheim; all three also have the lowest absolute figures of pupils overall. The overall pattern of strong disparities is maintained and, in many cases, even solidified. The only exceptions to this striking picture are Schlierbach and one school in Rohrbach.

Further socioeconomic measures could be discussed here at length, but the main message is clear: The case of Heidelberg is marked by a strong relationality between education, knowledge society, and uneven urban development. City areas near university locations have the highest rates of well-educated inhabitants, the highest rents, and the highest level of pupils reaching the highest level of school education. City quarters that are further away from university amenities are less well off. If we correlate these aspects statistically, we find strong to very strong relationships between the different variables.<sup>5</sup> For example, the coefficient of determination ( $R^2$ ) for employed people with *Abitur* is 0.5 for professors' residency, 0.9 for rent surcharges, and 0.7 for school transitions to *Gymnasium*. The figure for rent surcharges and school transitions is 0.69. This latter number means, for example, that nearly 70% of the variance between neighborhoods with regard to school transitions is related to rent differences. Where longitudinal data is available, this relationship seems to strengthen over time. The university, therefore, is an important player in present urban society. Due to the university's very strong expansion during the last decades, with a new campus in Bergheim and an enormously growing campus in Neuenheim, the city is changing quickly. The city administration's emphasis on fostering the development of the university and other knowledge-focused stakeholders and on supporting the transformation into a "knowledge city Heidelberg" fails to include some of the city neighborhoods and, to a large extent, the people living there. By concentrating on promoting science, these districts continue to be disadvantaged places.

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<sup>5</sup>We leave out the Bahnstadt as a very new (the very first inhabitants moved there in 2012) and specific neighborhood. See our discussion in the conclusion. Correlations, however, decrease only slightly when taking it into account (0.31, 0.9, 0.62, and 0.67 respectively).



**Table 2.2** School transfers from elementary school to *Gymnasium* in Heidelberg (in %, 2013/14 and 2018/19)

Neighborhood	Elementary School	2013/14	2018/19	Change
Kirchheim	Geschwister-Scholl-Schule	35.1	34.9	-0.2
	Kurpfälzschule	44.4	56.7	12.3
Rohrbach	Eichendorffschule	62.7	78.9	16.2
	IGH Primarstufe <sup>a</sup>	26.0	30.3	4.3
Schlierbach	Schlierbach Grundschule	84.4	75.8	-8.6
Wieblingen	Fröbelschule	61.7	74.6	12.9
Ziegelhausen	Grundschule Ziegelhausen	72.2	69.7	-2.5
<i>Overall Heidelberg</i>		62.7	63.9	1.2

<sup>a</sup>Figures for Boxberg, Emmertsgrund, and Pfaffengrund as well as the IGH are especially low, as they send around a quarter of their pupils to the so-called *Gemeinschaftsschule*, which opens a path into the *Gymnasium* at a later stage for some pupils

*Note.* Source: Design by authors. Data from Stadt Heidelberg, Amt für Schule und Bildung, different years

## Conclusions/Extrapolations

Educational institutions, and especially universities, play an increasingly important role in the knowledge society. As we have detailed in this paper, educational achievement, but also educational institutions themselves, are heavily intertwined with issues of social and spatial inequality. Cities are those places where these reciprocal processes are culminating in the most visible way. The authors of a wealth of literature have already dealt with urban inequalities, including in recent urban studies. This literature ranges through discourses on the global, the neoliberal, the postcolonial, and the mega city. In addition, educational scientists increasingly focus on unequal access to schools and educational systems. What is lacking, however, is a broader view to combine these different strands of research in order to develop a more complex picture of urban inequalities in the knowledge society. In this paper, we have argued that a reciprocal relationship exists between social origin and social destination, one that is especially pronounced in the currently acclaimed knowledge city. Although knowledge is a broad term and seems to be increasingly available for

everybody, its utilizers differentiate between groups of people and stratify individual well-being. Departing from the “meritocratic myth” that knowledge and education offset the direct causation of social origin and social destination, we claim that education in knowledge societies contributes to a stratified and polarized population—especially in cities.

In our case study of Heidelberg, we tried to pin down some aspects of this interplay. Even though Heidelberg is a city with a considerably wealthy population and an overall low rate of people dependent on welfare state transfer payments, we find a largely uneven distribution of knowledge opportunities in the city. Especially in the context of neoliberally interpreted knowledge policies, the already well-off are those profiting the most from the growing educational sector. Looking at educational success, for example, we have found a connection between neighborhood and school career. (Growing) segregation within the city leads to differing educational opportunities for people, especially children, in the different neighborhoods. The availability of good schools influences middle-class parents’ decision on places of residence, and rising rents limit access to better-equipped districts to the already well-off. As a result, neighborhoods adjacent to university facilities especially benefit.

These identified effects will probably be further strengthened by the current urban policy with its emphasis on knowledge. Heidelberg started developing a new city neighborhood, Bahnstadt, in 2009, with the first residents moving there in 2012. However, the focus on sustainable construction entails high rents for housing, so that a fairly homogeneous population emerged—many double income couples, families, and the well-educated (Herrmann, 2020). Well-equipped educational facilities, often with additional support from foundations, are established in this already privileged neighborhood. Other social groups and city areas are left behind. Great attention is also paid to another strand of urban development in Heidelberg: the future-oriented planning process of the campus *Im Neuenheimer Feld*. This campus hosts university faculties and further research institutions, hospitals, a technology park, and other knowledge-based stakeholders. Again, a large part of the city’s resources is tied up in this planning process with a focus on the university and other knowledge actors. In addition, in 2012, the city started a 10-year developing process, called *Internationale Bauausstellung* (International Building Exhibition, IBA) with the topic of “*Wissen-schaft-Stadt* [Knowledge-based urbanism].” The aim is to develop “urbanistic projects for the knowledge society of the future” (Internationale Bauausstellung Heidelberg, n.d.). One important project is the transformation of the Patrick Henry Village, a military brownfield area in the Southwest of Heidelberg. Under the slogan “Knowledge City of Tomorrow,” the IBA is developing a vision for a modern city district that will be both a place to live and work and a model for sustainable and innovative urban development. All in all, the urban development in Heidelberg shows the important role of the university and other knowledge institutions within the process of urban development. For the city, the support of the university and other knowledge-intensive stakeholders is important to succeed in the inter-urban competition—a declared goal of the

municipality—and shall pave the way to a promising future. This future, however, is not open to everybody.

Although the empirical details on Heidelberg are important, we want to conclude this paper by addressing the increasing role universities or other higher educational systems are playing in the global network of knowledge exchange and societal development. It is the task of university members and researchers to contribute to a more nuanced understanding of the impact of knowledge on inequality and to become aware of their own role in this process. Instead of mainly serving the economy, they need to foster a more complex understanding of knowledge society. This results in rising demands for urban and societal engagement on the part of universities. Today's universities act as local entrepreneurs, engage in school education and public health, and provide technology transfer. They take on civic roles and get involved on a regional level. Under the heading of a "third mission," this new role is emphasized in the context of the knowledge society. Apart from teaching and education (first mission) and research to produce knowledge (second mission), the transfer of knowledge into the society is receiving increased attention (Berghaeuser & Hoelscher, 2020). During the last years, one can find a shift from a mere technological knowledge transfer into enterprises towards demands for multifaceted engagement in the host city. Knowledge transfer receives a stronger local dimension when universities are asked to link their activities to the local socioeconomic context and thereby take responsibility for urban society.

This change becomes especially obvious in the course of new research formats, such as urban living labs or real-world labs that have incorporated the role of transmitters between research, education, and civil society action into the very heart of their structures (Gerhard & Marquardt, 2017). Such formats are used to define the collaboration between town and gown, between city and university, in a new way; they are thus becoming increasingly popular across the world. Municipalities, enterprises, universities, and citizens are working together to meet the formidable challenges societies face today. This provides new opportunities for research and learning, but also complicates the relationship. Universities and other educational institutions have to become more self-reflective in this regard, especially when, as they nurture and promote urban growth, they are simultaneously driving some parts of urban society apart. Therefore, the shift from an "urban university" to a "university in urban society" (Addie, 2017)—one that is thus anchored in a city and taking on regional responsibilities while being aware of the host city's needs—seems an important step towards preventing new social inequalities in a knowledge society.

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