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City, Amenities and Welfare

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Abstract

This chapter reviews the mechanisms through which amenities alter patterns of mobility and spatial distribution of population, and summarizes the role of amenities in urban development and on the inequality of labor welfare. The theoretical frameworks in the literature have gradually relaxed the assumption of frictionless spatial equilibrium, and papers can be categorized based on the endogeneity or exogeneity of amenities and the spatial scale of the research. A simple benchmark model and its extensions are used to illustrate how changes in amenities affect endogenous variables such as wages and rents, and drive the spatial sorting of labor. In this process, the endogenous amenities themselves are also subject to changes in the structure of the local labor force and the size of the regional population. Empirical evidence indicates that high levels of endogenous amenity can enhance the overall welfare of labor, but, under different conditions, they may amplify or diminish the inequality of welfare among heterogeneous labor groups, leading to uncertain changes in overall welfare that need to be assessed on a case-by-case basis. Therefore, amenities are a powerful tool for the government to regulate disparities in labor welfare. Additionally, the presence of amenities is a key factor leading to an inefficient spatial sorting of labor, which can be improved upon through specific policies.

JEL Classification: R20; R21; R28.

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1 Introduction

Urban amenities, broadly speaking, are city-specific attributes with either positive or negative contributions to consumption or production activities, typically outside of market mechanisms (Bartik and Smith, 1987). For example, climate, historical buildings' heritage, air and water quality, crime rates, local services such as education or health, the variety of local businesses (e.g., retail shops, restaurants) are urban features capable of influencing, to a different extent, consumption or production activities. Glaeser et al. (2001), who popularised the concept of “consumer city”, argue that two types of amenities are particularly important for urban success. On the one side, cities offer a rich variety of services and not tradable consumer goods; on the other side, all attributes related to the aesthetics and the physical setting play an important role, since they are valued by consumers. The former falls in the category of endogenous amenities, whereas the latter falls in the category of exogenous amenities.

Endogenous amenities are generally determined or influenced by the choices and behaviors of individuals or economic agents within a system. In the context of urban economics, endogenous amenities are often the result of investment, development, or changes in preferences driven by market forces or individual decisions (Epple et al., 2001). For example, high-quality schools, shopping centers, or recreational facilities in a neighborhood may be considered endogenous amenities because they are likely to be influenced by the demand and preferences of residents or developers. In contrast, exogenous amenities are amenities that are external to the economic system being analyzed and are not influenced by the choices or behaviors of individuals within that system. Exogenous amenities are typically considered as given or fixed in economic analysis and are not affected by changes in demand or individual decisions. Examples include natural features like proximity to a beach, mountain views, or favorable climate conditions that are not influenced by the actions of individuals or market forces (Kahn and Walsh, 2015; Wu, 2006). Hence, the key distinction between endogenous and exogenous amenities lies in whether they are influenced by the choices and actions of individuals within the economic system (endogenous) or are external and independent of those choices (exogenous). Understanding this difference is important when analyzing the impact of amenities on economic outcomes, such as housing prices, location choices, or, more generally, urban development.

In urban economics another important distinction concerns the degree of disaggregation of spatial units. While one strand of literature involving amenities deals with the spatial equilibrium between cities, another one focuses on the spatial equilibrium within a city, where the different spatial units are the neighborhoods. The difference in the spatial equilibrium between cities and within a city lies in the scale and scope of analysis. Intercity spatial equilibrium typically inves-

tigates the allocation of resources, population, and economic activities across different cities or regions. This analysis often considers factors such as transportation costs, trade flows, migration patterns, and regional economic disparities. On the other hand, intracity spatial equilibrium primarily focuses on factors such as land use, housing prices, daily commuting, and labor markets within the specific urban context. Traditionally, the literature focusing on the within city spatial equilibrium has employed the Alonso-Mills-Muth monocentric structure (Alonso, 1964; Mills, 1967; Muth, 1969) with a central business district (CBD) where consumers commute to work, and residential locations measured in terms of distance from the CBD. The between city spatial equilibrium modelling strategy has been centered around the aforementioned Rosen-Roback setting. A comprehensive overview of both approaches and their applications in urban economics is provided by Glaeser (2008). However, in some more recent quantitative urban models, the city is seen as a collection of distinct neighborhoods, that can differ in terms of natural advantages for production, amenities, land area, transportation infrastructure. Crucially, assuming a countable set of locations makes within-city models tractable in terms of a quantitative analysis that is similar to the one employed for between-city models. A stochastic formulation based on Eaton and Kortum (2002) is often assumed, as in Ahlfeldt et al. (2015). Excellent reviews of the quantitative urban economics literature are provided by Redding and Rossi-Hansberg (2017) and Redding (2023).

This chapter describes also a framework to help think about the causes and consequences of changes in the spatial distribution of labor, starting from the impact of amenities on the spatial sorting of the labor force. Economic shocks or policy adjustments that alter the spatial sorting of the labor force may also cause changes in endogenous amenities across locations, and changes in amenities may affect the relocation decisions of workers differently, and enhance or weaken the spatial sorting of the labor force under different conditions. These general equilibrium forces must be taken into account when assessing the overall impact of an economic shock or policy. Preliminarily, it is useful to make it clear what is the exact meaning of spatial sorting. The urban economics literature suggests that the spatial equilibrium distribution of heterogeneous labor is determined by the interaction of the spontaneous selection effect of labor in cities and the sorting of labor among cities. The interaction of these two mechanisms with agglomeration economies and location endowments shapes the productivity distribution, income distribution, and labor skill distribution of cities, driving labor to sort across locations, choose occupations, and choose places of residence from which to derive wage gains and pay for the cost of living. Regarding the interaction of selection and sorting effects, the literature generally suggests that sorting induces selection (Behrens and Robert-Nicoud, 2015), and that selection also affects sorting by changing the payoff structure of the labor force. Hence, while much of the literature makes a distinction between sorting and selection effects in theoretical terms, it is much more difficult to separately

identify these two effects empirically. For this reason, instead of making a specific distinction between sorting and selection, the use of the word spatial sorting is intended to refer collectively to the two effects.

Another issue addressed in this chapter is the relationship between urban amenities and the welfare of urban residents. On the one hand, the use of green spaces, such as parks and gardens, is associated with improved physical health, lower stress levels, and higher overall well-being, and the availability of quality healthcare facilities and educational institutions in cities is even more directly related to the quality of life of urban residents, with significant impacts on their well-being and overall satisfaction. On the other hand, there is also a strong link between urban amenities and economic outcomes. Cities with a wide range of amenities (e.g., cultural institutions, entertainment venues, and recreational facilities) tend to attract tourists, businesses, and investment (e.g. Oh et al., 2010; Bernini et al., 2020; Johnson and Rasker, 1995). This may lead to economic growth, job creation, and more affluent residents (Carlinio and Saiz, 2019). Conversely, cities with limited amenities may struggle to attract economic opportunities, resulting in lower levels of well-being for residents. The phenomenon of sorting and consequent unequal distribution of amenities among different communities or cities thus raises concerns about inequity and social cohesion. It is quite clear that the equitable distribution of amenities plays an important role in promoting social cohesion and reducing inequality within places. Ensuring that all residents, regardless of their socioeconomic status or geographic location, have access to basic amenities is essential for enhancing the inclusiveness, liveability and sustainability of cities, and in this respect amenities are a key concern of national and regional policy makers.

The chapter is structured as follows. Section 2 reviews the literature where some simplifying assumptions (homogeneous consumers or workers and exogenous amenities) are used. Section 3 turns to a more recent literature that removes restrictive assumptions in favor of more realistic features, such as workers heterogeneity in terms of some relevant characteristic and endogenous amenities. This section addresses the key issue of the spatial sorting of workers, which is a by-product of the introduction of heterogeneity. Section 4 reviews welfare analysis in urban models with amenities and, possibly, sorting. Finally, section 5 provides a summary.

2 Urban models with homogeneous workers and exogenous amenities

The so-called Rosen-Roback framework (Rosen, 1979; Roback, 1982) studies the distribution of agents across cities: urban amenities affect the utility of residents directly, and residents relocate across cities to level out welfare differentials. Amenities also affect productivity, with some differ-

ences in the assumptions concerning the production function between Rosen’s paper and Roback’s one. In this framework looking simultaneously at wages and rents helps disentangling the effect of amenities on consumers from the productive advantages that amenities can bring.

What follows presents a simplified version of the Roback (1982) approach provided by Ottaviano and Peri (2006). Their paper has a simple set-up to present the key insights of an urban model with amenities, and it provides evidence that cultural diversity at the city-level (defined in terms of the country of birth of people) can be considered a distinct amenity on its own. There are $c = 1, \dots, N$ cities and two factors of production, labor and land. Each worker offers a unit of labor in an inelastic way, and the amount of workers in each city is L_c . The total amount of land in each city is H_c . Although workers are identical in terms of all those attributes relevant to market interactions, it is possible to divide them into M “cultural identities”. Ottaviano and Peri (2006) indicate with d_c the degree of diversity in a city related to cultural aspects, and they base their cultural diversity index on the country of birth of people. Diversity is, as any other amenity, something capable of influencing both the utility function of the workers and the production function of output. For this reason, in the model the parameter d_c can be interpreted in terms of any urban amenity. The demand side is characterized by preferences defined in terms of land consumed by worker i in city c , H_{ic} , and a homogeneous commodity, Y_{ic} , which is traded between cities without transport costs and is the numeraire good (therefore in all cities $p_c = 1$):

$$U_{ic} = A_{Uc}(d_c)H_{ic}^{1-\mu}Y_{ic}^\mu.$$

Note the dependency of the quality of life shifter, A_{Uc} , on the amenity parameter d_c , which could be a vector of different urban characteristics that influence quality of life. Indicating with E_{ic} the total expenditure of worker i in city c , the following conditions related to expenditures are obtained:

$$r_c H_{ic} = (1 - \mu)E_{ic}, \quad Y_{ic} = \mu E_{ic}.$$

Finally, the indirect utility is

$$V_{ic} = (1 - \mu)^{1-\mu} \mu^\mu A_{Uc}(d_c) \frac{E_{ic}}{r_c^{1-\mu}}.$$

The existence of a spatial equilibrium between cities implies that, for two generic cities c and k and for a generic mobile worker i , there is the equalization of utility levels,

$$V_{ic} = V_{ik} = \nu. \tag{1}$$

The supply side is characterized by a production function of the homogeneous good with constant returns to scale,

$$Y_c = A_{Yc}(d_c)H_c^{1-\alpha}L_c^\alpha, \tag{2}$$

where the TFP, A_{Y_c} , also depends on the amenity, d_c . The land rents and wage bills are

$$r_c H_c = (1 - \alpha) Y_c, \quad \omega_c L_c = \alpha Y_c,$$

from which it follows

$$r_c^{1-\alpha} \omega_c^\alpha = A_{Y_c}(d_c) (1 - \alpha)^{1-\alpha} \alpha^\alpha. \quad (3)$$

In equilibrium, the expenditure of workers is equal to earned income, $E_{ic} = \omega_c$. Putting together the equations (1) and (3), the solution to the endogenous variables r_c and ω_c (after log-linearization) are

$$\begin{aligned} \log r_c &= \text{cost} + \frac{1}{1 - \alpha\mu} \log (A_{Y_c}(d_c) [A_{U_c}(d_c)]^\alpha) \\ \log \omega_c &= \text{cost} + \frac{1}{1 - \alpha\mu} \log \left(\frac{[A_{Y_c}(d_c)]^{1-\mu}}{[A_{U_c}(d_c)]^{1-\alpha}} \right) \end{aligned}$$

where cost is a constant term.

The analytic solution for the endogenous variables shows that the land rents r_c positively depend on both A_{Y_c} and A_{U_c} , while the wages ω_c positively depend on A_{Y_c} and negatively on A_{U_c} . From the joint analysis of the correlations at an empirical level between r_c and ω_c on one side and the amenity d_c on the other it can be deduced what is the dominant effect in cities. The four following cases are possible:

- $\frac{\partial r_c}{\partial d_c} > 0$ $\frac{\partial \omega_c}{\partial d_c} > 0$: $A'_{Y_c}(d_c) > 0$ dominates;
- $\frac{\partial r_c}{\partial d_c} > 0$ $\frac{\partial \omega_c}{\partial d_c} < 0$: $A'_{U_c}(d_c) > 0$ dominates;
- $\frac{\partial r_c}{\partial d_c} < 0$ $\frac{\partial \omega_c}{\partial d_c} < 0$: $A'_{Y_c}(d_c) < 0$ dominates;
- $\frac{\partial r_c}{\partial d_c} < 0$ $\frac{\partial \omega_c}{\partial d_c} > 0$: $A'_{U_c}(d_c) < 0$ dominates.

Ottaviano and Peri (2006) finds that US-born workers living in cities with higher cultural diversity are paid, on average, higher wages, and pay higher rents, than those living in cities with lower cultural diversity. This is consistent with a dominating positive effect of cultural diversity on the productivity of natives, $A'_{Y_c}(d_c) > 0$.

Another noticeable aspect initiated by the Rosen (1979) and Roback (1982) approach is the possibility, relying on hedonic price theory, to quantify the value of the bundle of amenities attached to each city. The imputed (implicit) prices of the different city attributes are obtained from regressions of wages and rents on amenities. They are then multiplied by the observed attributes at the city level and summed to obtain a quality of life index for each city. Blomquist et al. (1988) expand the framework to include agglomeration effects at the level of urban areas.

An extension of the original Roback (1982) setting is provided in the papers by Albouy (2009, 2016) and Albouy and Stuart (2020). The approach of these papers, in a nutshell, has two main enhancements to the standard framework: it explicitly models the role of federal income taxes and features a “home” (not tradable) sector, which can be interpreted as housing. The role of taxation is discussed later on in the section devoted to the welfare impact of amenities. In terms of the not tradable sector, which was already modelled in an extension by Roback (1982), Albouy (2009, 2016) improves the estimates of quality of life and the total amenities value thanks to the superior data quality. Lacking land rent data, he infers them from the model’s structure. Albouy and Stuart (2020) develop a comprehensive general equilibrium model based on neoclassical assumptions. Their model, starting from easily observed data such as wages, rents, population and land areas, provides estimates of the relative importance and the explanatory power of not tradable sector productivity, tradable sector productivity and quality of life.

3 Urban models with heterogeneous workers and endogenous amenities

When consumers or workers are assumed to be heterogeneous with respect to some dimension (e.g. skills, education, income, ethnicity), they can be expected to appreciate amenities differently and, hence, to sort differently into cities. The original papers by Rosen (1979) and Roback (1982) already contained a discussion of sorting and its implications for the estimation of the implicit prices of amenities and quality of life indices, although the issue was not thoroughly investigated in the empirical analysis. In more recent years sorting has gained more and more prominence in urban economics. In general, there are two main types of labor force sorting analyzed by the literature: one is based on the level of education or skill (Lee, 2010; Moretti, 2013; Diamond, 2016) and the other is based on income. For example, Lee (2010) found that in large cities, there is a higher proportion of high-skilled workers compared to low-skilled workers. Yinger (2015) discovered that income segregation, with most high-income families living in some neighborhoods and most low-income families living in others, is relatively common in the United States. However, the distinction between these two types of sorting is somewhat ambiguous because, in general, a person’s income is determined to some extent by the level of education or skill.

Another distinction that is important to draw is the one between exogenous and endogenous amenities. Broadly speaking, exogenous amenities can be defined as those urban features that do not react to changes in a model’s fundamental parameters but instead constitute themselves part of the model’s fundamentals. Endogenous amenities can be accordingly defined as those urban features that are modified by changes in exogenous parameters. A noticeable trend in urban

economics is to model more and more amenities as an endogenous urban variable.

A benchmark model with heterogeneous workers and endogenous amenities, that follows Di-amond and Gaubert (2022), can help to clarify the main issues. Workers are divided into two groups by skill level θ , the skilled group and the unskilled group, $\theta = \{S, U\}$. The shock to individual preferences of worker i while living at location c is ϵ_{ic}^θ , where the shock follows a Type II extreme value distribution with scale parameter $\kappa^\theta > 1$. Shocks are distributed independently and identically across different locations and across the same group of workers. Amenities are valued differently by different groups of workers, so the quality of life shifter is indexed with the skill level of workers as A_U^θ . Quality of life depends on both exogenous and endogenous factors; that is, let

$$A_{Uc}^\theta = A_{Uc}^\theta(\bar{d}_c, L_c^U, L_c^S),$$

where \bar{d}_c represents the exogenous amenity level of location c , while the endogenous factors including various aspects of urban life such as education, health-care, crime, pollution, entertainment, etc., change with the total size of the city and the labor force mix of the city.

Workers spend a different proportion of their wages on land, so the indirect utility of workers with skill θ becomes

$$V_{ic}^\theta = (1 - \mu^\theta)^{1-\mu^\theta} \mu^{\theta\mu^\theta} A_U^\theta \frac{\omega_c^\theta}{r_c^{1-\mu^\theta}} \epsilon_{ic}^\theta.$$

The variable λ_c^θ represents the share of type θ workers located at location c out of total labor force of a given type L^θ , thus λ_c^θ can be expressed as

$$\lambda_c^\theta = \frac{L_c^\theta}{L^\theta} = \frac{(A_U^\theta \omega_c^\theta r_c^{\mu^\theta - 1})^{\kappa^\theta}}{\sum_{c=1}^C (A_U^\theta \omega_c^\theta r_c^{\mu^\theta - 1})^{\kappa^\theta}}.$$

The expected utility can be written as

$$\mathcal{V} = \Gamma\left(\frac{\kappa^\theta - 1}{\kappa^\theta}\right) \left[\sum_{c=1}^N (A_U^\theta \omega_c^\theta r_c^{\mu^\theta - 1})^{\kappa^\theta} \right]^{\kappa^{-\theta}},$$

in which $\Gamma(\cdot)$ is the gamma function of Type II extreme value distribution.

The production function for homogeneous products of section 2 is adjusted as follows. First of all, land is dropped as a factor of production and productivity does not depend on amenities. This constitutes a simplification of the model. Second, workers with heterogeneous skill levels are assumed to enter the production function with imperfect substitutability between them,

$$Y_c = \left[(A_{Yc}^U)^{-\rho} (L_c^U)^{\frac{\rho-1}{\rho}} + (A_{Yc}^S)^{-\rho} (L_c^S)^{\frac{\rho-1}{\rho}} \right]^{\frac{\rho}{\rho-1}},$$

where $\rho > 1$ denotes the elasticity of substitution between workers with different skills. Finally, productivity specific to a certain skill type, A_{Yc}^θ , is determined not only by exogenous factors, but also by endogenous factors, such as the labor force mix. The exogenous productivity component

is denoted as \bar{A}_{Yc} , and the labor force structure by the number of skilled and unskilled workers, L_c^S and L_c^U respectively. Consequently, productivity A_{Yc}^θ can be expressed as

$$A_{Yc}^\theta = A_Y^\theta(\bar{A}_{Yc}, L_c^S, L_c^U).$$

Based on the above setting, the relative labor demand at location c is

$$\ln \frac{L_c^S}{L_c^U} = \ln \frac{A_{Yc}^S}{A_{Yc}^U} - \rho \ln \frac{\omega_c^S}{\omega_c^U}.$$

Workers make location choices after trading off wages, land rents, and amenities in different locations, eventually reaching spatial equilibrium. In equilibrium, firms' costs of production are equal to their benefits and the market is cleared. Since there are productivity and quality of life spillovers, the spatial sorting of labor may be amplified or inhibited.

Talking about sorting refers to the self-selection of a certain type of worker into locations with specific characteristics. Defining the difference of a given variable X across two locations $c = 1$ and $c = 2$ as $\Delta X \equiv X_1 - X_2$, the difference of the log of the relative share of skilled to unskilled workers can be written as

$$\Delta \log \frac{L^S}{L^U} = \frac{\kappa^S}{\kappa^S + \rho} \Delta \log \frac{A_Y^S}{A_Y^U} + \frac{\kappa^S \rho}{\kappa^S + \rho} \Delta \log \frac{A_U^S}{A_U^U} + \frac{\kappa^S \rho}{\kappa^S + \rho} (\mu^U - \mu^S) \Delta \log r + \frac{(\kappa^S - \kappa^U) \rho}{(\kappa^S + \rho) \kappa^U} \Delta \log L^U. \quad (4)$$

This difference can be expressed as a function of four different terms: the first term on the right side of the equation represents the difference in relative productivity of skilled and unskilled workers between locations, showing the comparative advantage of locations; the second term represents the difference in relative quality of life for skilled and unskilled workers between locations; the third term represents the difference in the incidence of cost of living across the two skill groups; the fourth term represents the difference in the scale parameter, affecting the mobility of workers with different skills. These terms stand for distinct sources of spatial sorting, since any non-zero term on the right side means that spatial sorting is driven by comparative advantage in production, the difference in amenity valuations, the difference in the expenditure on housing services, and heterogeneous mobility. The productivity and quality of life differentials are endogenous to the labor force mix, so equation (4) cannot be interpreted in a causal manner. But what does the literature say on the impact of amenities on spatial sorting?

In the literature, the locational trade-off faced by workers is typically characterized by the presence of cost of living (Couture et al., 2023) or commuting costs (Ahlfeldt et al., 2015) as decentralizing forces, while changes in local labor demand resulting from productivity shocks and the resulting skill-wage premium are common agglomerating forces (Baum-Snow et al., 2018). In this context amenities play a significant role in influencing residential choices of the labor force in general and spatial sorting in particular. High-level, high-quality local amenities act as

agglomeration forces (Gagné et al., 2022), while low-level, low-quality amenities do the opposite. High-quality amenities significantly enhance the quality of life and utility experienced by the labor force in their place of residence (Albouy and Stuart, 2020). As larger cities tend to have higher levels of amenities (such as more comprehensive infrastructure and better local services), the higher level of amenities in larger cities disproportionately attracts more high-skilled or high-income laborers, fueling its spatial sorting (Diamond, 2016).

Many studies have found that the mechanism by which amenities drive labor force sorting primarily stems from the varying valuations of amenities by different segments of the labor force. The literature has classified labor force groups based on various factors such as income, age, race, and skill levels. Some studies have divided labor force groups based on income and provided evidence that the poor (or less educated labor force) place greater value on basic amenities such as potable water and electricity, and are willing to make concessions in wages, choosing to reside in areas with lower average wages (Lall et al., 2009). Koster et al. (2016) estimate the impact of historical amenities on household sorting and found that affluent families in European cities are more willing to pay for historical amenities and prefer to locate in the historic districts in the city center compared to poorer families. Some studies have classified labor force groups based on age and education level and found that factors such as the concentration of high-skilled jobs in city centers, reduced crime rates, improved infrastructure, and new housing development have collectively contributed to the increased valuation of amenities in city centers by young college graduates, thereby driving the revival of many city centers in the United States. However, these factors are not as attractive to college-educated older individuals or those without a college education (Couture and Handbury, 2020). Some studies differentiate labor force groups based on race. Baum-Snow and Hartley (2020) analyzed the revival of city centers and found significant differences in the valuation of amenities in city centers among different racial groups, with minority populations, particularly those with education levels below college, showing a declining valuation of city center amenities in recent years. Representative studies that classify labor force groups based on skill levels include Su (2022) and Edlund et al. (2022).

From the literature, it is evident that both exogenous and endogenous amenities contribute to spatial sorting of labor. Exogenous amenities, such as hurricanes (Deryugina et al., 2018), temperature (Albouy et al., 2016), and coastline and hills (Lee and Lin, 2018) will influence the residential choices of labor and their households. For instance, Lee and Lin (2018) find that persistent and superior natural amenities enable local neighborhoods to maintain higher incomes even after experiencing various shocks, and greater natural variation between neighborhoods within cities can inhibit neighborhood change, resulting in more stable patterns of spatial income sorting and ultimately impacting regional income inequality. Albouy et al. (2016) discover that Americans

prefer an average daily temperature of 65 degrees Fahrenheit and are willing to pay more to avoid excessive heat rather than cold temperatures. Turning to sorting (or adaptation) the authors find that American households in the South are averse to cold (but there is no evidence that southern households are less heat averse than northern households).

Endogenous amenities also drive spatial sorting of the labor force. Moretti (2013) studies why the relative supply of college graduates increases in cities with high cost of living and found that the reason is the increasing attraction of these cities' amenities for college graduates. However, the increasing cost of living in these cities is the cost of consuming desirable amenities. Brueckner et al. (1999) derive theoretically when exogenous amenities in the city center attract more wealthy individuals to reside there, leading to the phenomenon of sorting of the high-income and low-income individuals within cities. They also allow for endogenous amenities, and study how they interact with exogenous amenities in terms of the sorting pattern. Brueckner and Rosenthal (2009) indicate that due to the better housing services provided by newly built housing, high-income families tend to prefer locations with newer dwellings, driven by their high demands for housing services. They predict that the redevelopment of city centers and the influx of high-income families would gradually spur a process of gentrification. Almagro and Domínguez-Iino (2022) provide evidence from Amsterdam, showing that the endogeneity of amenities reinforces spatial sorting.

Unlike exogenous amenities, endogenous amenities are influenced by the composition of the local labor force. In other words, the level of local endogenous amenities will simultaneously shape and respond to the local labor market structure. Bayer et al. (2007) use correlations between demographic characteristics and neighborhood quality to explain the apparent willingness of some households to pay for higher-educated and wealthier neighbors, implying that the level of amenities in the neighborhoods chosen by such households increases with the level of self-sorting of residents. Kuminoff et al. (2013) review a very large literature where group selection exhibited by heterogeneous agents during the sorting process affects the provision of amenities. Guerrieri et al. (2013) find that households prefer neighborhoods inhabited by wealthier families rather than neighborhoods inhabited by poor families because wealthier neighborhoods endogenously provide amenities that are more attractive. Glaeser et al. (2018) find that wealthy neighborhoods attract more businesses and lead to commercial intensification in their surroundings, resulting in the proliferation of local grocery stores, cafes, restaurants, and bars in gentrified neighborhoods. Measuring the level of comfort enjoyed by wealthy and poor households, Handbury (2021) provides cross-sectional evidence showing a strong correlation between the prices and product variety available in the local market (both across US cities and within these cities) and the tastes of different income groups. In this way the paper provides evidence of income-specific tastes for local consumption externalities.

Many scholars have noted that spatial sorting resulting in changes in regional population size

and population density significantly affects the availability of endogenous amenities. A large body of literature documents substantial spatial variations in the availability and diversity of goods and services associated with local population size (Chen and Rosenthal, 2008). Amenities that are difficult to trade across space share characteristics similar to local private goods, requiring not only a large number of people who prefer these amenities but also a large number of people in their vicinity. For example, the variety and density of restaurants and cuisines (Schiff, 2015) are determined by the local production and consumption of dishes. Some niche cuisines are only supplied when there is a sufficient demand from a significant number of people. Public amenities with collective attributes, such as schools and police protection, are often allocated through collective choice (Waldfogel, 2008), and therefore the provision of these amenities is also related to the size of the neighborhood, with larger groups having less difficulty accessing these amenities. Evidence provided by Handbury and Weinstein (2015) suggests that residents in large cities have access to a greater variety of tradable goods, and the overall prices of groceries are lower in large cities. Furthermore, some forms of nondurable entertainment exhibit high income elasticity (Aguiar and Bils, 2015), indicating that they are more easily accessible in large cities.

The tables that follow summarize some of the papers reviewed. The tables are not intended to be exhaustive of the literature, but condense some results that are worth to be singled out. For each paper an assessment of impact in terms of citations received is reported, a measure that should be taken with caution especially in the case of more recent papers that experienced a shorter circulation. In Table 1 papers focusing on the spatial equilibrium between cities are listed, while Table 2 focuses on the spatial equilibrium within a city. Both tables characterize the nature of amenities, either endogenous or exogenous.

4 Amenities and welfare

Early literature posited that individuals, through the process of free mobility, select their desired level and type of amenities, such as public goods and local government services, by choosing their place of residence. This process was believed to result in the efficient allocation of services and public goods, as individuals self-select into residential areas that best align with their preferences, leading to higher satisfaction and overall welfare (Tiebout, 1956). However, critics argue that such sorting can lead to inequitable outcomes, as individuals with higher incomes or more resources may have greater mobility and opportunities to access better amenities, leaving those with fewer resources with fewer choices and lower-quality amenities (Oates, 2005; Squires, 2011). These studies generally support the notion that higher levels of amenities lead to higher average welfare for the labor force, a setting that has also received empirical support in much of the literature. However,

Table 1: Summary of studies with inter-urban spatial equilibrium.

Reference	Type of amenities	Citations	Main findings
Albouy et al. (2016)	Exogenous	93	Americans favor a daily average temperature of 65 degrees Fahrenheit, and they will pay more on the margin to avoid excess heat than cold. American households in the South are averse to cold (but there is no evidence that southern households are less heat averse than northern households).
Bakkensen and Ma (2020)	Exogenous	34	Low income and minority groups are more likely to sort into high flood risk areas.
Beaudry et al. (2010)	Endogenous	90	Even if workers are perfectly mobile across localities, this will not necessarily lead to equal wages since localities may have other attributes that affect their attractiveness such as amenities.
Berry and Glaeser (2005)	Endogenous and exogenous	414	More generous welfare payments can be particularly attractive to the poor, and location-specific features such as consumer amenities can be more attractive to skilled individuals.
Black et al. (2009)	Endogenous	49	The return to education is relatively low in expensive high-amenity cities, and the marginal utility of money is lower for individuals in low-amenity cities than for individuals in the high-amenity cities.
Combes et al. (2008)	Endogenous and exogenous	525	Local non-human endowments play a modest direct role in determining local wages.
Diamond (2016)	Endogenous and exogenous	325	Observable amenities would endogenously respond to the skill-mix of the city and the increased skill sorting was further fueled by endogenous increases in amenities within higher skill cities.
Glaeser and Tobio (2008)	Endogenous	68	Rising amenity levels or an increasing willingness to pay for the amenities of a location will cause population and housing prices to rise, but nominal and real incomes will fall. However, if human capital were heterogeneous or if firms were attracted by consumption amenities, then nominal incomes might not fall with rising amenity levels.
Handbury (2021)	Endogenous	13	The variety of products offered in wealthier cities is higher than in poorer cities, especially for goods preferred by wealthy consumers. The prices of products favored by high-income households in wealthier cities are relatively lower with respect to the products favored by low-income households.
Moretti (2013)	Endogenous	197	The relative supply of college graduates increases in expensive cities because college graduates are increasingly attracted by amenities located in those cities.
Shapiro (2006)	Endogenous	686	About 40% of the employment growth effect of college graduates is due to growth in the quality of life.

Note: The number of citations is from Scopus as of October 2023.

Table 2: Summary of studies with intra-urban spatial equilibrium.

Reference	Type of amenities	Citations	Main findings
Almagro and Domínguez-lino (2022)	Endogenous	104 ^g	The endogeneity of amenities plays a crucial role in determining the welfare distribution across a city's residents.
Baum-Snow and Hartley (2020)	Endogenous	30	As college-educated whites move in, rising valuations of downtown amenities encourage other whites to stay downtown. Less-than-college-educated minorities have continued to leave, partly because of the relative improvement in suburban employment opportunities and partly because of the continuing decline in their valuations of downtown amenities.
Bayer et al. (2007)	Endogenous	497	Household preferences for better local school and more educated and wealthier neighbors attributes in the presence of sorting.
Brueckner et al. (1999)	Endogenous and exogenous	446	When the city center has a strong amenity advantage over the suburbs, the high-income group lives at central locations. This is robust to the inclusion of endogenous amenities in addition to exogenous amenities.
Couture and Handbury (2020)	Endogenous and exogenous	46	The rising tendency of young college graduates to reside near non-tradable services accounts for their movement toward city centers.
Couture et al. (2023)	Endogenous	219 ^g	As the wealthy get richer, the demand for high-quality amenities in downtown neighborhoods increases. The growing demand pushes up home prices and spurs the development of higher quality downtown neighborhoods.
Gagné et al. (2022)	Exogenous and endogenous	11	There is a causal relationship between the amenity level and consumer income, suggesting that richer households sort themselves into high amenity locations.
Guerrieri et al. (2013)	Endogenous	183	Individuals like to live next to richer neighbors, this generates an equilibrium where households segregate based upon their income.
Hoelzlein (2023)	Endogenous and exogenous	22	On the demand side, households with different incomes choose neighborhoods and local services.Á On the supply side, service establishments sort into neighborhoods while taking into account proximity to their consumers.
Lee and Lin (2018)	Exogenous	60	Highlight the role of natural amenities in neighborhood dynamics, suburbanization, and variation across cities in the persistence of the spatial distribution of income.
Su (2022)	Endogenous	11	The gentrification of central cities is substantially magnified by endogenous amenity change driven by the changes in local skill mix.

Note: The number of citations is from Scopus as of October 2023. In the case of working papers the number of citations is from Google Scholar and the superscript g is added.

the heterogeneity of the labor force introduces ambiguity in the resulting welfare outcomes. In other words, as shown in the papers reviewed below, more amenities can potentially either increase or decrease welfare inequality among the labor force.

Due to the heterogeneous preferences of different types of labor, when agglomeration increases, although all residents bear higher cost of living, some individuals may experience losses from changes in amenities while others may benefit from them. Some literature provides evidence of sorting that amplifies labor welfare inequality: Diamond (2016) finds that the provision of amenities in US cities is primarily driven by the preferences of high-skilled labor. In areas where high-skilled labor agglomerates, the level of amenities that aligns with their tastes gradually increases. As wages for high-skilled labor are higher than those for low-skilled labor, housing prices in areas with a concentration of high-skilled labor gradually rise, leading low-skilled labor to choose to leave or be forced to pay high rents for amenities they do not value. In other words, changes in endogenous amenities amplify the sorting of skilled workers caused by productivity changes and exacerbate welfare inequality between high and low-skilled labor. A similar mechanism is used by Couture et al. (2023), in which they quantify the extent to which welfare inequality between the poor and the rich is magnified by gentrification of US urban centers. They found that the endogenous provision of private amenities, which often align with the preferences of the wealthy, amplifies welfare inequality. However, the endogenous provision of public amenities, which often cater to the preferences of the poor, partially mitigates the expansion of welfare inequality. Zhang (2023) provides evidence of how endogenous changes in amenities in Chinese cities contribute to the widening gap in welfare between high-skilled and low-skilled labor. However, this is primarily due to China's unique household registration system, which imposes greater restrictions on the access to local amenities for low-skilled migrants. As a result, high-skilled labor is able to enjoy more desirable amenities and derive additional utility.

Some literature also provides evidence that sorting can lead to a reduction in labor welfare inequality: Almagro and Domínguez-Iino (2022) find that the welfare effects depend on the similarity of preferences for amenities among different age groups. The welfare gap between households with similar preferences tends to widen, while the gap between households with greater preference differences tends to narrow. This is because if different population groups have divergent preferences for amenities, they will be sorted into different locations. This not only increases the supply of amenities that align with their respective preferences but also allows them to enjoy lower housing prices by avoiding competition in the housing market.

The common characteristic of the aforementioned literature is that their analyses are based on the Rosen-Roback framework, where urban amenities directly affect residents' utility, and residents migrate across locations to balance welfare differentials. Some scholars have extended the standard

framework to argue that even if local residents have no direct interest in exogenous amenities, there may be indirect impacts on their welfare through endogenous consumption amenities. Lanzara and Minerva (2019) focus on the tourism industry in Italy in the context of cities that include both exogenous historical amenities and endogenous consumption amenities. They assume that local exogenous amenities enter the utility function of the incoming tourists, and the demand for land and consumption amenities by the incomers triggers increases in land prices and the variety of consumption amenities within the urban system. Residents' welfare is shown to depend on the degree of mobility, the heterogeneity of cities in terms of exogenous amenities, and the elasticity of substitution between different types of consumption amenities.

As the role of urban amenities in labor migration is being recognized, many studies have pointed out that governments can influence the flow of labor and consequently change the welfare levels of the workforce by adjusting the level of amenities across regions, depending on different policy objectives. For instance, Mourmouras and Rangazas (2013) construct a model to demonstrate how the government can allocate public services between two regions to achieve the goal of maximizing the overall welfare of the society.

Recently, a growing body of literature has focused on the efficiency of labor force sorting. Many researchers have found that inefficient sorting leads to significant welfare costs. There are several factors that can influence the efficiency of spatial sorting, such as neighborhood effects (Benabou, 1993; Durlauf, 2004), spatial policies (Neumark and Simpson, 2015), and amenities (Fajgelbaum and Gaubert, 2020).

In the literature focusing on amenities and sorting efficiency, the externalities generated by amenities are identified as one of the key factors contributing to spatial sorting inefficiency. Laissez-faire equilibrium is usually inefficient due to local externalities. This is because the welfare of each resident directly depends on the location choices of others, and to some extents workers not take into account the impact of their choices on the level of local amenities when choosing a place of residence. Therefore, the externalities generated by these location decisions result in inefficient spatial sorting (Fajgelbaum and Gaubert, 2020). Implementing policies targeting inefficient margins, such as transfer payments, can improve the efficiency of sorting, and increasing the spillover of amenities can further amplify the effect of transfer payments, leading to greater welfare gains for all labor groups and achieving more efficient sorting. However, if the externalities caused by endogenous amenities are excluded when constructing the model, an equilibrium without policy interventions such as taxes or transfer payments would be efficient (Colas and Hutchinson, 2021).

In addition to externalities, some studies have analyzed the efficiency of spatial equilibrium from the perspective of the wage-amenity trade-off. Albouy (2009) finds that in the presence of

nationwide taxation based on nominal wage levels, the geographic distribution of employment is inefficient and does not maximize overall welfare. The reason is that cities with more amenities (which also have higher quality of life) offer lower nominal wages and hence a lower tax burden. Workers are induced to migrate in inefficiently large numbers from high-wage areas to low-wage areas.

5 Summary

This chapter reviews the role of amenities in urban development and their welfare implications. In order to highlight some key mechanisms, a simple model with a homogeneous workforce is first presented, then it is extended to include a heterogeneous workforce. The literature is categorized along the dimensions of endogeneity versus exogeneity of amenities, and for each paper the spatial scale of the research (either inter-urban or intra-urban) is identified. Simple modelling is used to illustrate how changes in amenities affect endogenous variables such as wages and rents, and drive the spatial sorting of the labor force. Endogenous amenities are also affected themselves by the structure and the size of the local labor force. Empirical evidence from the literature suggests that while higher levels of amenities lead to higher average welfare levels for the labor force, the heterogeneity of the labor force makes it possible for higher levels of amenities to either increase or decrease welfare inequality across labor groups under different conditions, leading to unclear changes in the final welfare inequality. Understanding these mechanisms is essential, since it turns out that amenities are a powerful policy tool for the government to guide the mobility of the labor force and to change the gap in the level of welfare between groups of workers. In addition, it is important to understand the externalities brought about by amenities, as they are one of the key factors contributing to inefficiencies in spatial sorting, and specific policies can lead to more efficient sorting.

Cross-references

Conte, B., Climate Change, Migration, and Urbanization.

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Index

amenities, 2, 4, 6, 8, 12

commuting costs, 9

externalities, 16

extreme value distribution, 8

heterogeneity, 7, 8

inequality, 4

productivity, 4, 9

quality of life, 5, 7

rents, 6, 9

skill levels, 8, 10

sorting, 7, 9

spatial equilibrium, 2, 5

taxation, 17

wages, 9