

Article

Housing Choices of Young Adults in Sweden

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Abstract: This study investigates why young adults live with their parents in Sweden. As young adults' living arrangements affect decisions about marriage, education, childbirth, and participation in the workforce, more knowledge for policymakers is crucial to implementing effective policies to support young adults and promote financial independence and well-being. Using a data set from 1998 to 2021 at the municipal level in Sweden, we used a spatial autoregressive panel data model to examine the proportion of young adults living at home and the regional disparities. The study uncovered intraregional variations that illustrate how different municipalities in Sweden exhibit different patterns of young adults living at home. Our findings reveal that economic factors such as unemployment significantly impact this pattern. Housing market dynamics, demographic factors, cultural differences, and location-specific characteristics also play an essential role in explaining this pattern. These findings suggest that the key drivers are the lack of rental housing, high unemployment rates, a high degree of urbanisation, interregional migration, and social capital (such as social cohesion and inclusion).

Keywords: young adults; housing; living at home; spatial autoregressive panel data model; Sweden

1. Introduction

This article aims to analyse why the proportion of young adults living at home varies between regions and times within the same country (the numerator consists of individuals aged 21–24 who are registered as living with at least one parent at the same residence; the denominator consists of the population aged 21–24). Young adults have difficulty finding housing, and an increasing proportion choose to reside in their family homes or are compelled to do so [1,2]. Although the preceding generation may have aspired to leave home and achieve independence sooner, the economic and social landscape has changed. For many young people, living at home has become a more practical and viable alternative [3,4]. The choice of the initial housing arrangement for young adults is crucial. For example, the first housing choice significantly affects their housing situation even eight years after leaving home [5] and can have long-term consequences for decisions related to childbearing and higher education [6].

In many countries, the housing market poses significant challenges, especially for young adults wishing to enter the housing market [1,4]. Various thresholds, such as the need to save for a down payment, high income requirements for rent, interest costs, and amortisation [7], limit housing affordability. This situation is exacerbated by a general housing shortage that drives up housing prices and rents [8].

Typically, when describing the housing market and its shortages, one refers to high housing prices, rental costs, and a lack of available vacancies. However, the percentage of young adults still at home may not always be a reliable indicator of housing shortages [9]. Although there are exceptions, there is limited knowledge about the factors influencing the proportion of young adults who remain at home. In Europe, we observe a higher percentage of young adults living at home in southern and eastern Europe than in northern Europe [4,10]. Economic factors can explain some of these patterns, although cultural differences can also explain many [11]. Researchers have explored the impact of financial



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factors on young adults' decision to live at home [12], with high student loan debt, limited job opportunities, and increasing living costs contributing significantly.

Furthermore, the current economic climate, marked by job instability, inflation, and stagnant wages, makes it increasingly difficult for young adults to pay the expenses associated with independent living. Although many studies examine migration decisions using individual-level microdata, and some analyse national trends, few investigate interregional and intraregional differences within a country.

Understanding the driving forces behind the proportion of young adults living at home with their parents is crucial. This living arrangement can have profound social, cultural, economic, demographic, and psychological implications [13]. For example, it can influence how young adults are perceived by their peers and society [14], as well as their self-perception. It can also impact decisions related to marriage, education, childbirth rates, participation in the labour force, and overall productivity [6]. In addition, it can delay the development of independence and autonomy. Understanding these driving forces can help policymakers develop policies that support young adults and their families, such as providing affordable housing or financial assistance.

Sweden, the focus of our case study, has a relatively well-developed welfare system and high-quality housing, making it more socially acceptable for young adults to live with their parents without feeling stigmatised or seen as financially dependent. Furthermore, Sweden's high level of gender equality can influence young adults' decisions regarding living arrangements. However, the country also faces relatively high housing costs, particularly in urban areas, which can challenge young adults just starting their careers or pursuing higher education, as they may lack the financial resources to live independently.

The available data are disaggregated at the municipal level. Sweden comprises 290 municipalities, and we have collected data from 1998 to 2021. These extensive data cover numerous economic cycles, including downturns and upswings. They include many variables, with the main focus being the proportion of young adults living at home. Other variables include socioeconomic, demographic, cultural, and housing market factors.

The econometric model employed is a spatial autoregressive panel data model with spatially lagged errors. We also use a spatial weight matrix. Given the high correlation among variables within different categories, principal component analysis will be applied to reduce the number of explanatory variables. Our analysis aims to identify the critical underlying factors that explain the variation in the proportion of young adults who live with their parents over time and between regions. Factors such as the shortage of rental housing, high unemployment rates, urbanisation levels, interregional migration, and social capital, in the sense of social cohesion and inclusion, play a fundamental role in explaining why young people stay at home more frequently.

Although the research question is not new, our study contributes by analysing aggregated data at the regional level over an extended period of time. Although some studies use individual-level data and others examine aggregated data at the national level in a cross-sectional manner, the regional and temporal dimension, in particular, remains underexplored, and our study fills this research gap. In addition, we have included numerous factors in our model that have not been previously tested. Finally, we have established a spatial autoregressive panel data model to control for spatial dependence. Furthermore, we have used principal component analysis to reduce the number of underlying factors and categorise them into housing market, socioeconomic, demographic, cultural, and location factors, a unique approach not previously undertaken in this context.

The article is formatted as follows. In Section 2, a summary of the literature in the field is provided, while Section 3 presents methodological choices. Section 4 presents and discusses the results, and the article ends with the conclusions in Section 5.

2. Review of the Literature

The transition to adulthood has changed in recent decades, and one of the most notable changes is the pattern of leaving and returning home. In the past, it was common for young adults to leave home after completing their education, find a job, and start their own independent lives. However, young adults often delay leaving home, and some even return to live with their parents after a brief period of independence (Goldscheider and Goldscheider, 1999) [15] or much later (Sompolska-Rzechuła and Kurdyś-Kujawska, 2022) [4].

In this section, we will try to synthesise and analyse the literature on the proportion of adults living at home, highlighting the fundamental theories, concepts, and findings in the field. In addition, we want to identify gaps in the literature and explain how our study will address those gaps.

The literature will be categorised into two themes: pull and push factors. Pull factors might include a strong family bond, a desire to stay close to friends and family, or a need for support from parents. These factors can force young adults to stay with their parents and maintain close family ties. However, push factors could include a desire for independence, career opportunities in another location, or a desire for a change of scenery. These factors can lead young adults to move away from their parents and seek new experiences.

2.1. Pull Factors (Stay Home)

An early analysis by Aquilino (1990) [16] found that family structure and parental characteristics in the United States are significant factors that affect the probability of coresidence. The results indicated that the likelihood of residency is higher for adult children who have never married, are divorced or separated, or have lower levels of education. Furthermore, they found that the probability of residency was higher for older widowed parents or those with health problems. They also suggested that the findings highlighted the importance of family structure and parental characteristics in understanding the likelihood of parent–adult child coresidence. Recent research indicates that young adults' education and employment status correlate with their residence status [17].

The obligation to provide a home to elderly parents and adult children in need varies greatly depending on family experiences [18]. Those who grew up in intergenerational coresidence were more committed to providing it themselves, and nonfamily living in young adulthood, particularly for women who left home before marriage, decreased support for intergenerational coresidence. The changing societal norms concerning individualism and independence have contributed to a decline in support for intergenerational coresidence, mainly as people live longer and marriage ages increase. Goldscheider and Lawton (1998) [18] suggested that there is a decline in the degree to which these obligations are felt, particularly for those who did not experience intergenerational continuity in their upbringing.

Choi (2003) [19] examined the factors influencing whether ageing parents and adult children decide to live together. They found that parents were more likely to initiate coresidence if they had health problems or financial difficulties, while adult children were more likely to start coresidence if they were unmarried or had children.

Later, Messineo and Wojtkiewicz (2004) [20] analysed the trend of adult children living with their parents in the United States from 1960 to 1990. They found that, contrary to popular belief, the propensity of adult children to live at home with their parents had not increased over time. Over three decades, they used data from the United States Census to analyse the prevalence of coresidence or the living arrangements of adult children with their parents. Although there was an increase in coresidence during the 1970s, the prevalence of adult children living with their parents remained relatively stable from 1960 to 1990. This suggests that the perception of an increasing trend in coresidence may be due to several factors, including changes in family structure and the rising age of first-time homebuyers. However, the findings indicate that the prevalence of coresidence has not increased with time.

On the other hand, Iacovou (2010) [11] analysed the factors that influence young people's decision to leave their parents' home and how they vary between European countries. The author found that economic factors such as affordable housing and job opportunities are essential, although parental preferences also play a role. They showed that young people in all countries prefer independence and that parental income is associated with a lower probability of leaving home for partnerships when children are "too young" and a higher probability at older ages. However, the age at which parental income becomes associated with a higher probability of leaving home for partnerships varies greatly between northern and southern European countries, suggesting that family ties are stronger in the south [10]. The study also finds a disjuncture between parents and their children's preferences for independence, particularly in southern Europe.

2.2. Push Factors (Move Away–Move Back)

Blumenberg et al. (2016) [21] examined the factors that influenced the mobility of young people and adults in the United States from 1990 to 2009 and found that factors such as education, employment, and family structure significantly impact mobility. Specifically, they found that education had become increasingly important for young people and adults in terms of mobility and suggested that this may be due to the increasing importance of knowledge-based industries in the economy, which require a highly educated workforce. Employment is also a significant factor in relation to mobility, particularly for adults, because job opportunities are often a primary reason people move. Finally, the family structure has changed and significantly affected mobility. Specifically, single-parent households are less likely to move than two-parent households, possibly due to the financial and social support provided by having two parents.

Many young adults are also moving home to their parents. Research suggests many reasons why young adults return home after moving out from their parents, including economic difficulties, job loss, relationship breakdowns, and educational pursuits [22].

More recent research shows that divorce is associated with an increased probability of coresidence, particularly for men, those with low educational levels, and those who live close to their parents [23]. However, using data on individuals in Sweden, they found that economic factors do not solely drive the decision of adult children to move back in with parents; adult children are also influenced by the strength of family ties and a sense of intergenerational solidarity [23]. This suggests that intergenerational coresidence can be seen as a manifestation of latent family solidarity, where adult children seek support from their parents during times of hardship, including divorce.

2.3. Research Gap

Based on the findings of Aquilino (1990) and Messineo and Wojtkiewicz (2004) [16,20], more research could be performed to understand the underlying reasons for coresidence patterns, such as examining the impacts of economic factors and cultural norms. Furthermore, future research could investigate whether the observed trends in coresidence are consistent between different demographic groups and geographic regions and how they may be affected by changes in societal norms and values over time.

Many of the previously published articles use disaggregated data and analyse individual-specific characteristics that make a young adult choose to stay or move. Few studies relate the percentage of young adults living at home with more aggregated regional data within a country that allows analysis of the importance of available dwellings in the housing market.

3. Methods

This section presents the data used to test the hypotheses, the included variables, and the analytical approach.

3.1. Data Source and Sample

Our secondary data are available from Statistics Sweden (SCB). The data are aggregated at the municipality level, and we analysed the years 1998–2021. The variables of primary interest are the proportion of adults living at home in the population as a percentage of the total population by region.

3.2. Variables and Measurements

What can explain the variation in the proportion of young adults living at home over time and between regions? The literature review emphasises, above all, socioeconomic factors as crucial to the decision to stay or move away from home, and only a few studies have explicitly analysed what the housing market looks like, that is, whether it is possible for young adults to find housing or if the thresholds are too great to take the first step towards owning a home. Therefore, we will focus more on the variables of the local housing market. We will include variables that describe the socioeconomic situation and show demographic and cultural differences.

Housing market conditions: The housing market will be characterised by housing prices (HP), the number of houses (HS), and the proportion of rental apartments (HR) in the municipality. Higher house prices and fewer dwellings are expected to have a negative impact on the proportion of households with young adults living at home. On the other hand, larger rental apartment markets are expected to decrease the proportion of young adults living at home. For example, Filandri and Bertolini (2016) [10] emphasise that the influence of housing systems, labour markets, welfare states, and the social classes of individual origin are different in each country. The welfare state is equal within a country, but the housing and labour markets vary regionally, which can explain the regional differences in the proportion of young adults living at home.

Economic and educational differences: We will include income (I), taxes and transfers (TR), education level (HC), and employment status (E) as a proxy for socioeconomic factors that impact the proportion of young adults living at home. Young adults are less likely to leave their parents' homes if the unemployment rate increases [24]. Young adults with a higher income will move away from home to a greater extent than those with a lower income and are less likely to return to the parental home [25].

As one of the education variables (HC1), we used the proportion of people eligible to enter an upper secondary school in the population, measured as a percentage by municipality and year. The second variable (HC2) is the proportion of people eligible for a higher education at the university level in the population, measured as a percentage by municipality and year.

A higher income level in the municipality and lower income taxes are expected to have an inverse impact on the proportion together with the educational level, while unemployment is expected to increase the proportion of young adults living at home. The rationale behind the fact that the level of education can affect whether young adults live at home is that it can impact long-term income. Increased financial stability increases the possibility of moving away from home. If you can study at a university, it also increases the likelihood that you will move as a consequence of your higher studies.

In Sweden, there are 16 universities spread across many municipalities, and there are 12 colleges. More young people will be in these locations, and the demand for smaller apartments will increase. If the supply does not grow, for example, through the creation of more student housing, many young adults will be forced to stay at their parents' homes. We have included a variable (UNIV) that indicates the municipality's number of students in higher education.

Demographic differences. We also include the proportion of men who live in the municipality (M) and their average age (A). Based on earlier research, more men are expected to increase the proportion of households with young adults living at home, while older people are expected to decrease the proportion.

Cultural differences: Grundy (2000) [26] stressed that economic and cultural factors are necessary preconditions for adult child/elderly parent coresidence. However, measuring cultural differences between regions can be complex and challenging, as culture is a multidimensional concept encompassing many factors, such as beliefs, values, customs, language, and traditions. The proportion of people born abroad could be used as a variable to measure cultural differences between municipalities within the same country. The proportion of people born abroad can reflect the diversity of cultural backgrounds within a municipality, which can indicate different cultural practices, values, and norms [27]. Therefore, we include the proportion of immigrants born abroad (FB).

Research shows that voting participation and social capital influence each other to the extent that increased social capital increases the propensity to vote, although voting also affects social capital [28]. We have included three measures of participation in voting at the EU (VoteEU), national (VoteSwe), and local municipal levels (VoteMuni).

Locational differences: We also include the degree of urbanisation (URB) and the population density (DEN) in the model. Garasky (2002) [24] showed that there was a difference in young adults' propensity to move depending on whether they lived in an urban area or the countryside. Furthermore, Blumenberg et al. (2019) [26] showed that young adults were likelier to live in urban neighbourhoods than older adults. The coordinates (XC and YC) are also included in the model to mitigate some of the spatial dependence on the data.

3.3. Analytic Approach

In the empirical analysis, we will indicate the proportion of young adults living at home in many municipalities and regions over time. Many municipalities depend on, for example, the housing situation and the labour market in neighbouring municipalities. There is a considerable commute between municipalities, which means there is a spatial dependence between the municipalities. To consider this, we have estimated a spatial autoregressive model for panel data. Since we have many independent variables, we have performed a principal component analysis (PCA) within each category of variables because PCA can help identify the most significant dimensions (principal components) that capture the most variance in the data. This can lead to simpler models and improved computational efficiency.

Principal Component Analysis: Our study uses various variables, including housing prices, housing stock, income, and employment status, which exhibit strong mutual correlations. This creates a challenge in isolating the individual impact of each variable. To navigate this, we employ factor analysis, a statistical approach that uncovers the underlying structures among observable variables. This technique entails scrutinising the correlations between variables to generate new composite variables called factors. These factors then take the place of the original variables in our analysis.

This method unveils the latent framework of variables based primarily on their interrelations [29]. Variables that strongly load on a factor are intrinsically associated with that factor. Conversely, the correlation between factors generally tends towards zero. Principal component analysis can be performed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The former takes an exploratory stance and is intended to unveil the underlying factors and their arrangements. On the other hand, the latter adopts a confirmatory position, thus evaluating whether a postulated factor arrangement fits the data.

In our study, we opt for EFA due to our primary objective of reducing the variable count and generating novel factors. By analysing the intervariable correlations, we reveal the underlying relationship structure. This, in turn, allows us to categorise the variables into factors based on their shared correlations. This process involves assessing the variance of each variable and how much is shared with others. The variance of a variable can be partitioned into three parts: shared variance, unique variance, and unexplained variance.

Our analysis can be conducted on the total variance (factor analysis) or the shared variance (principal component analysis) among the variables. The latter approach is appropriate for reducing the variable count, especially when the unique variance is relatively minor compared to the total variance.

We begin by creating the first factor, which is a linear combination of variables that captures a substantial portion of the overall variance. Subsequent factors are then formed by linearly combining variables to account for as much of the remaining variance as possible. This sequence continues until the number of factors aligns with the number of variables. The decision regarding the number of factors to retain is based on a criterion based on the explanation of variance. Factors with eigenvalues exceeding one are significant, whereas those below one are considered less significant. These significant factors will serve as attributes in our equation of living with your parents.

Spatial autoregressive panel data models: We will analyse and test the hypotheses with a spatial autoregressive panel data model. A spatial autoregressive panel data model is a statistical technique for analysing spatially dependent data over time [30–35]. This model is used to examine how behaviour in one municipality is affected by the behaviour of its neighbouring municipalities. The advantage of using a spatially autoregressive panel data model is that it accounts for the spatial relationships between municipalities, leading to more accurate and robust estimates [33]. In addition, it allows for identifying spatial spillover effects that may not be apparent in other types of panel data models. However, this approach also has some limitations. For example, the model assumes that the spatial relationships between municipalities are invariant over time, which may not be valid. It also requires a relatively large sample size and can be computationally intensive, which may limit its practical application in certain situations.

Our dependent variable (Y) is the proportion of households with young adults living at home, which will be related to the independent variables in the municipality where they live. However, if spatially lagged, the independent variables will also be tested to see whether they affect the proportion of young adults living at home in neighbouring municipalities. Moreover, the housing market in one municipality may affect the dependent variable in neighbouring municipalities. Therefore, we included a spatially lagged dependent variable and a spatially lagged error term in the model [33]. The model will also include fixed or random effects [36]. In general, the model we estimate will have the following form:

$$\begin{aligned} Y_{i,t} &= \alpha_{i,t} + \rho WY_{i,t} + \gamma WX_{i,t} + \beta X_{i,t} + \varepsilon_{i,t} \\ \varepsilon_{i,t} &= \lambda W\varepsilon_{i,t} + \mu_{i,t} \end{aligned} \quad (1)$$

where Y is the dependent variable, X is a vector of independent variables, and W is the spatial weight matrix. The spatial weight matrix is a row-standardised weight matrix based on the contiguity between municipalities. The parameter a represents the fixed or random effect that varies across space (j) and over time (t). The parameter r equals the dependent variable with the impact of the spatially lagged dependent variable, g equals the impact of the spatially lagged independent variables, and l represents the impact of the spatially lagged errors. The fixed effect model will be estimated using the maximum likelihood approach [35], and the random effect model will use a generalised spatial two-stage least squares approach [37].

To summarise, our methodological process is illustrated in Figure 1.

Figure 1 shows a schematic representation of the methodology used to examine the determinants that affect young adults living with their parents. The diagram is structured into three primary segments. (1) Push and Pull Categories, which are the primary justifications for young adults residing with their parents based on earlier literature. The housing market, socioeconomic factors, human capital (such as education, training, intelligence, skills, and health), demographics, cultural aspects, and social capital are all included in these categories. (2) Operationalisation, which includes information on the variables and data used in the analysis. In addition to the housing stock and rental apartments, it includes demographics, income, unemployment, and education and incorporates cultural indicators

that include migration and voting participation. The data source used for this analysis is Statistics Sweden (SCB), which has recorded the data at the municipality level from 1998 to 2021. (3) The analytical approach describes the principal component analysis (PCA) and the spatial econometric model, the two main analytical methodologies we use. The PCA is implemented as a method of data reduction by using the correlation between the variables, thereby reducing the number of factors/components. The spatial econometric model incorporates factors with eigenvalues greater than one. The spatial econometric model section describes how a spatial autoregressive model with random or fixed effects is utilised for hypothesis testing to account for spatial heterogeneity and dependence. The relationship between the dependent variable (Y), the vector of independent variables (X), the spatial weight matrix (W), and the spatial latent error terms (ϵ) is described by the equation that must be estimated. The Greek letters represent the estimated parameters.

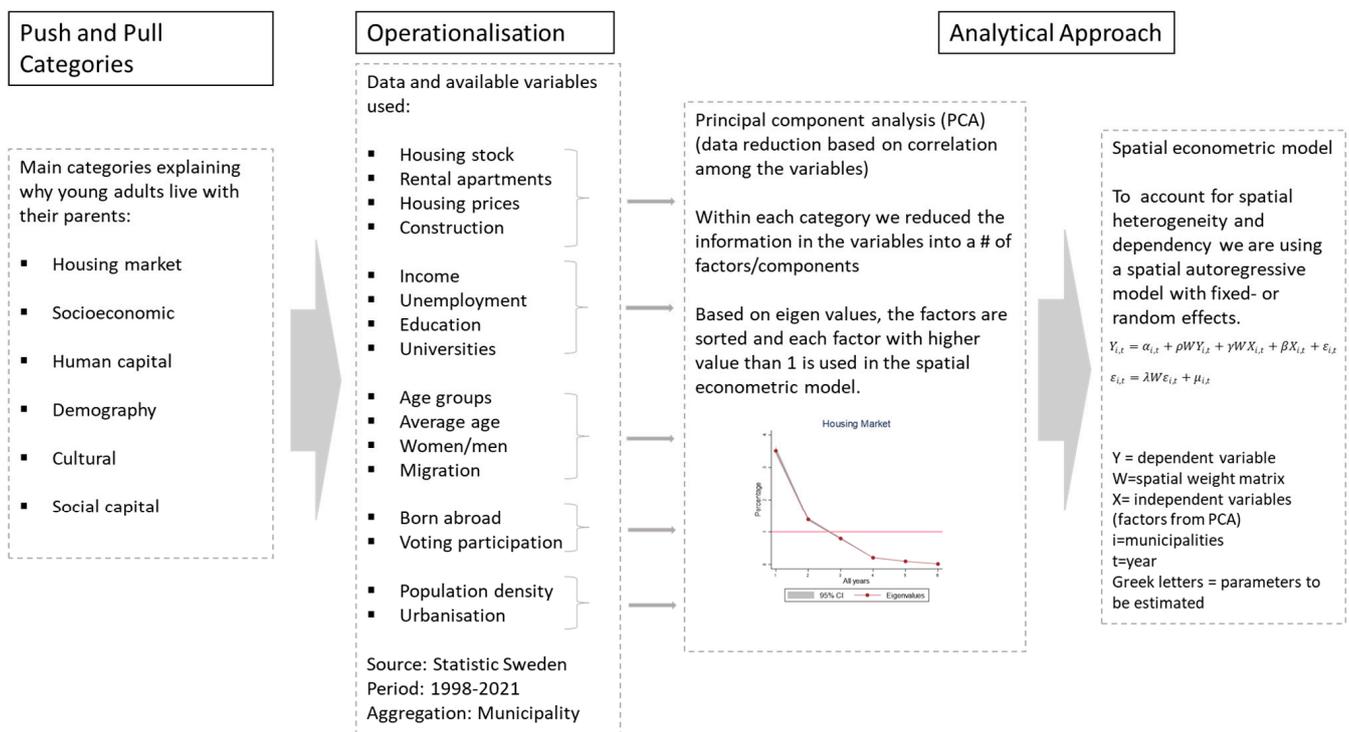


Figure 1. Methodological process.

4. Results

The following section presents the results of the regression analysis, including the coefficients and significance levels of each variable. We will also interpret the results in light of the research question and objectives and explain what the results suggest about the factors associated with the proportion of adult children living at home. We will divide the section into descriptive statistics, factor analysis, and the spatial autoregressive panel data model.

4.1. Descriptive Statistics

Table 1 presents the variables included in the survey as well as descriptive statistics. The panel consists of 6960 observations. The proportion of households living in rented accommodation was, on average, across all the municipalities and years, just over 22%. However, the variation is significant, with a standard deviation of 8%, although the range extends from barely 3% to as much as 80%. If we measure the number of rental units and the total housing stock instead, we can observe that the variation is significant between municipalities, as the population size varies widely. The proportion of rental properties in the entire housing stock was approximately 27% on average but ranges from a low of 2.22%

to 83.61%. The extent of the rental housing market in the municipality was expected to have a negative impact on the proportion of young adults who live at home. The larger the rental housing market, the greater the opportunity to leave home. We can also note that the share of rental properties in a municipality increased with the size of the rental market and the housing market; this signifies that the housing markets in metropolitan municipalities have a rental housing market that is not only larger in number but also more extensive if measured as a share of the total housing market.

Table 1. Variable definition and descriptive statistics.

Variable	Unit	Mean	Std. Dev.	Min	Max	Moran's I
Young adults at home	%	40.62	9.981	13.7	77.6	79.81
Housing Market Conditions						
Living in rental housing	%	22.321	8.32	2.7	80.4	2.26
Rental housing stock	Number	5495.706	15,969.719	82	263,138	0.02
Housing stock	Number	15,807.972	33,514.224	1125	505,845	
House prices	1000 SEK	1470.575	1331.521	198	13,345	268.69
Construction multifamily housing	Number	70.721	291.065	0	5382	4.99
Socioeconomic and educational differences						
Unemployment	%	13.054	3.912	3.9	31.5	36.86
Long-term unemployment	%	1.363	0.634	0.1	5.1	92.46
Income 1	Index	5.154	1.069	3.2	20.2	91.82
Income 2	1000 SEK	229.453	53.723	134.2	598.3	137.91
Income tax	%	32.122	1.32	26.5	35.15	326.37
Health	Index	37.328	11.019	9.9	81.7	96.67
Proportion eligible for secondary school	%	88.091	5.559	54.8	100	28.18
Proportion eligible for university	%	79.813	12.402	26.9	100	58.75
University student	Number	224.773	1034.039	0	13,902	3.92
Demographic differences						
Population	Number	32,705.341	65,296.481	2387	978,770	5.89
Proportion aged 20–64 born in Sweden	%	53.567	2.733	43.3	63	37.93
Migration	Number	176.136	560.936	−4966	13,054	2.61
Men	%	50.631	1.027	47.7	58.5	67.33
Average age	Year	42.622	2.604	35.1	51.4	179.79
Cultural differences						
Proportion aged 20–64 born abroad	%	63.326	3.903	42.2	76	147.41
Proportion born in Western Europe	%	0.75	0.54	0	5.84	91.24
Proportion born in Eastern Europe	%	1.03	1.01	0	6.73	321.34
Proportion born in the Middle East	%	2.09	2.42	0	22.69	77.24
Proportion born in Africa	%	0.73	1.01	0	6.70	80.48
Voting participation EU	%	41.939	7.885	0	73.6	113.75
Voting participation Sweden	%	83.33	3.781	67.2	93.9	44.95
Voting participation municipality	%	80.938	4.064	57.8	92.9	38.57
Location differences						
Population density	Ratio	138.31	485.682	0	6171	245.40
Urbanisation	%	74.759	14.482	30	100	73.79

Note. The table defines the variables in the survey and provides descriptive statistics regarding the average, standard deviation, and minimum and maximum, respectively (range), and Moran's I statistics. The spatial weight matrix is based on contiguity. We use the Stata 17 command `spmatrix` to produce the spatial weight matrix, `asdoc sum` to produce the descriptive statistics table, and `estat moran` to calculate Moran's I. The Moran's I test for spatial dependence shows the χ^2 estimate. High values indicate spatial dependence.

To measure how affordable the housing market is, we have also analysed the average housing prices for single-family homes in the municipality. Although it is a segment that may not appeal to young adults, it is a good approximation of housing prices in general. The average purchase price was SEK 1.47 million, although the standard deviation is high, approximately SEK 1.33 million. Housing prices were highly correlated with the size of the housing market; larger housing markets and population agglomerations are associated

with higher prices. Housing prices were also highly correlated with income level; the higher the average income in the municipality, the higher the housing prices.

Finally, we have included the number of apartment buildings in the municipality for all the years studied in order to characterise the local housing market. Less new housing is expected to make it more difficult for young adults to enter the market. Although new construction may not directly target this group, cheaper housing may be available through the filtering process. The number of newly built homes is only 70 on average, but the standard deviation is as high as 291 multifamily homes. Many municipalities show zero construction of apartment buildings in specific years. More construction is positively correlated with the size of the housing market, where more people live in rental properties and higher housing prices.

The average income amounts to 5.15 base amount (which corresponds to SEK 48,300 in 2022), with a standard deviation of just over 1 (the range is from 3.2 to 20.2). The average income measured in SEK is around 230,000. We can note that the average income is highly correlated with the unemployment rate, the number of those eligible for higher studies, and the age group 20–64 for all born in Sweden. As expected, all the correlations are negative. We can also observe that income is lower in municipalities where the rental market is more dominant than the owner-occupied market.

The spatial and temporal variation in unemployment is also significant. On average, unemployment was 13% in all the municipalities and years, with a standard deviation of just under 4%. Long-term unemployment averaged 1.3%, although the variation is significant, with a standard deviation of about half the average. At its lowest, it has been 0.1% in one municipality during a given year, and at its highest, 5.1%. Unemployment is expected to increase the proportion of young adults living at home with their parents.

The percentage of people eligible for an upper secondary school education in the population is, on average, high (approximately 88%), and the variation between municipalities and years has a standard deviation of 5%. However, some municipalities have a low percentage of just over 50%. The percentage of those who passed upper secondary school and are eligible for higher studies at a university is somewhat lower, at just under 80%. However, the variation between municipalities is significantly higher, with a standard deviation of 13%. The correlation between edu1 and edu2 is 0.43 (statistically significant at the level of significance of 99%). The correlation between the education variables and income is lower but positive (0.13), while that between the education variables and unemployment is higher (0.23–0.33).

Regarding the age structure, we can observe significant differences between those born in Sweden and those with a foreign background. The proportion of the 20–64 age group born in Sweden is just under 54%, while the proportion of the group with a foreign background is 63%.

The main variable of interest is the proportion of young adults living at home. The average proportion is approximately 40%, but there is some variation between municipalities and over time. Figure 2 shows the distribution among municipalities and over time.

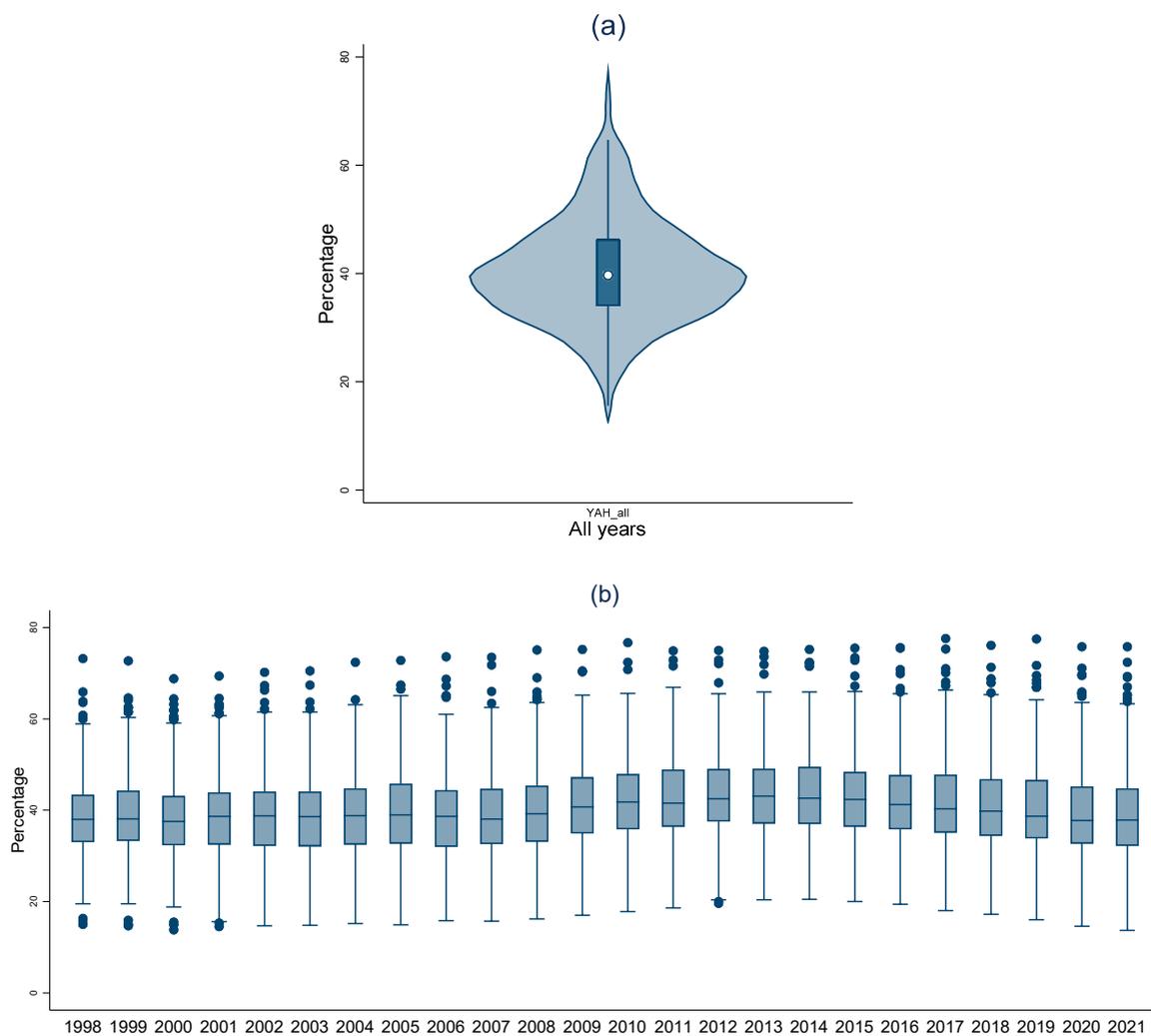


Figure 2. Young adults living at home are distributed across municipalities and over time. The figure (a) represents the distribution between municipalities (all years). It is a so-called Violin plot [38] (Hintze and Nelson, 1998), where we, in the middle, have a box plot [39] (Tukey, 1977) with the median, 25th, and 75th percentiles, and outliers (dots). The contour around the box plot shows the cumulative distribution. The plot (b) shows the box plots per year from 1998 to 2021.

Research by Maroto and Severson (2020) [40] suggested that the proportion of young adults living at home has increased in Canada since 2001. We cannot support these findings in Sweden. The distribution between municipalities regarding the proportion of households with young adults at home is relatively stable, as Messineo, M. J. and Wojtkiewicz, R. A. [20] found for the US. The median value is approximately 40%. Half of the municipalities are in the 35–45% range, although some have significantly higher or lower values. Over time, the proportion has been roughly the same for the past 25 years. At the end of the 1990s, households with young adults in the home represented only 40%. The proportion rose to just over 40% during the 2010s and fell again. The variation between municipalities has also been relatively constant over the years. One difference that can be observed is that the number of outliers (1.5 standard deviations higher or lower than the median) on the downside was more significant in the late 1990s. Since the beginning of the 20th century, these outliers have disappeared. The number of upside outliers has remained unchanged over the years. One conclusion that can be drawn from this is that the housing market is not that problematic for young adults, at least not according to the measurements, as the proportion of households with young adults does not vary as dramatically as it is perhaps claimed to be in the political debate. The second conclusion is that, in most municipalities,

roughly the same proportion of young adults live at home, although some municipalities have problems making it difficult for young adults to enter the housing market. As a consequence, the housing policy could be specific rather than general.

The spatial dependence between municipalities can be illustrated using maps (Figure 3) or, more formally, by Moran's I test for each variable, which is presented in Table 1. The Moran's I statistics based on the contiguity spatial weight matrix show that almost all the variables have a spatial dependence. Visually, we can observe that more young adults live with their parents in the metropolitan regions of Stockholm, Gothenburg, and Malmö as a proportion of all young adults (darker red–orange colour). However, we can also see that many young adults in more sparsely populated areas in northern Sweden live with their parents.

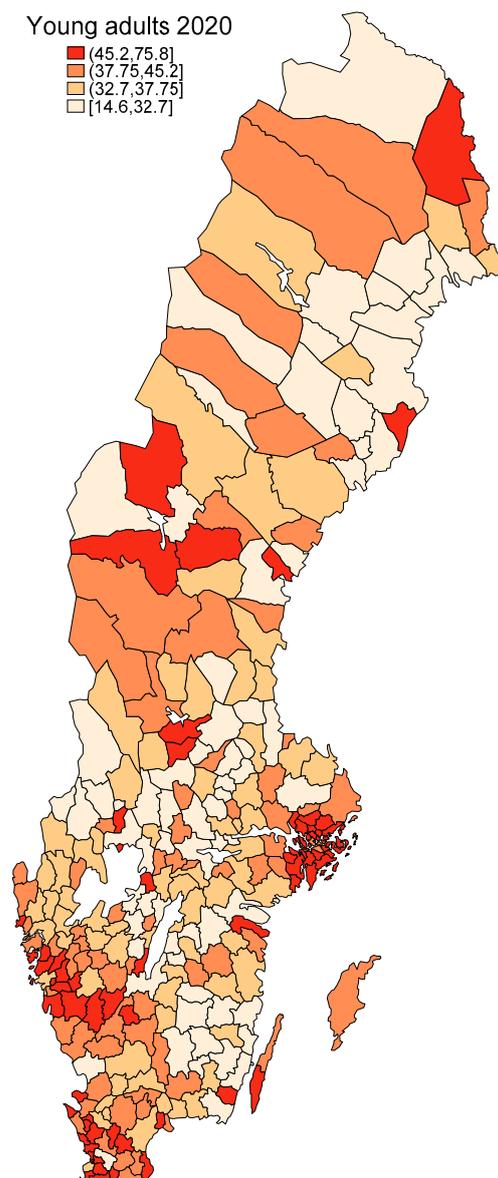


Figure 3. Spatial distribution of young adults living at home. The map shows Sweden and the spatial distribution of young adults living at home in 2020, which ranges from 14.6% to 75.8%. Municipalities with a dark red–orange colour show the highest ratios [45.2–75.8%], which are above the average in Sweden. Municipalities with an orange colour [37.75–45.2%] cover the average ratios in Sweden, while light orange [32.7–37.75%] and yellow municipalities [14.6–32.7%] are below average. The maps have been constructed using the Stata command `grmap`.

4.2. Principal Component Analysis

The housing market, socioeconomic and demographic factors, and cultural differences can explain the proportion of households with young adults at home. In the explanatory model, we have several variables that can individually explain the variation in the proportion between municipalities. However, the problem is that many of these variables correlate and partially measure the same thing. Therefore, we have used principal component analysis to reduce the number of independent variables, and it was performed separately within each category. The use of PCA in regression analysis has been around since the early 1970s (Jolliffe, 1982) [41]. Later examples of it can be seen in other studies such as (Mandell and Wilhelmsson, 2011), (Nakamura, 2020) and (Barreca et al., 2020) [42–44].

These analyses show that the variables are reduced to two or three depending on the category (see Figure 4, which shows the scree plot for each category).

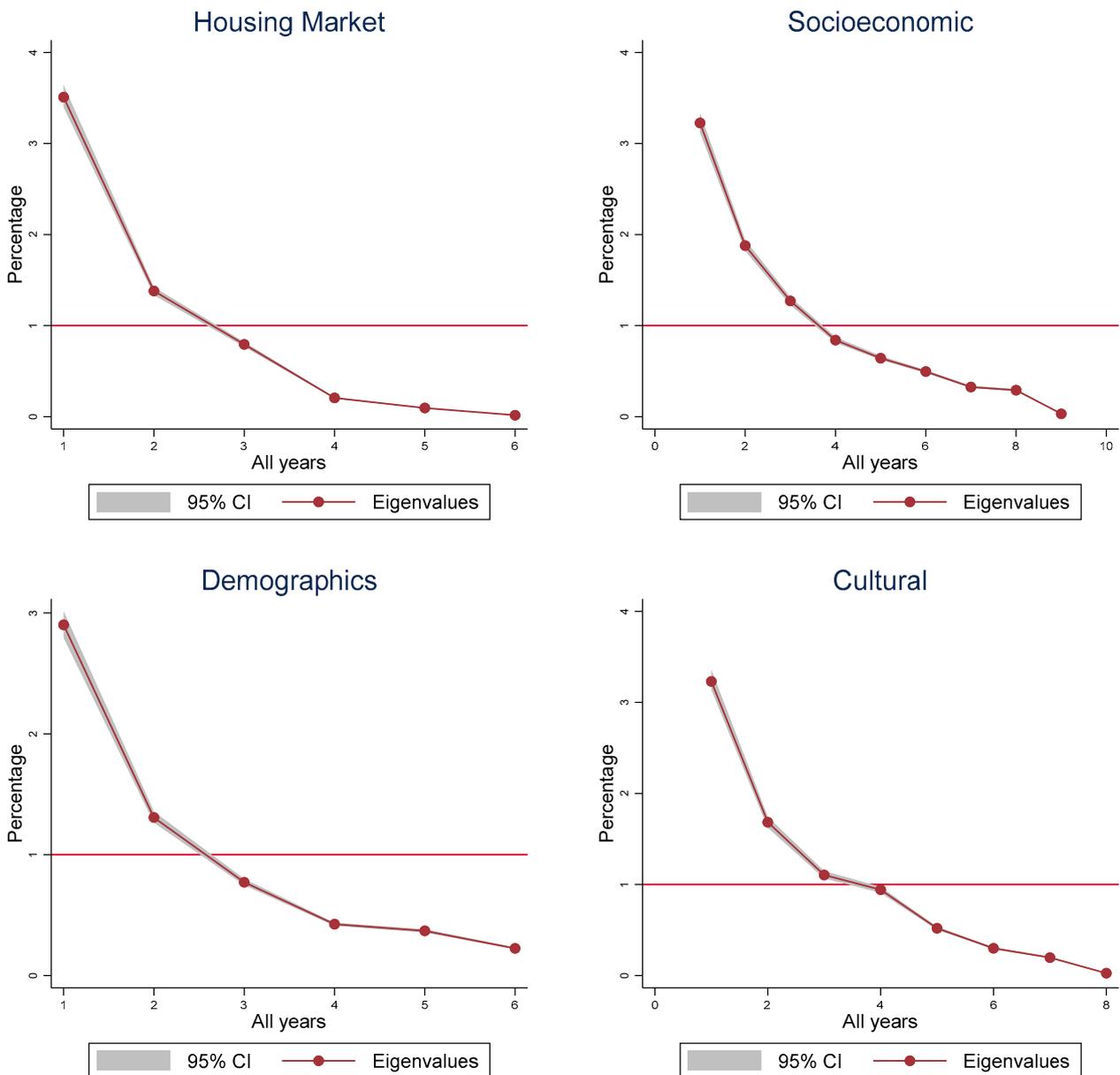


Figure 4. Cont.

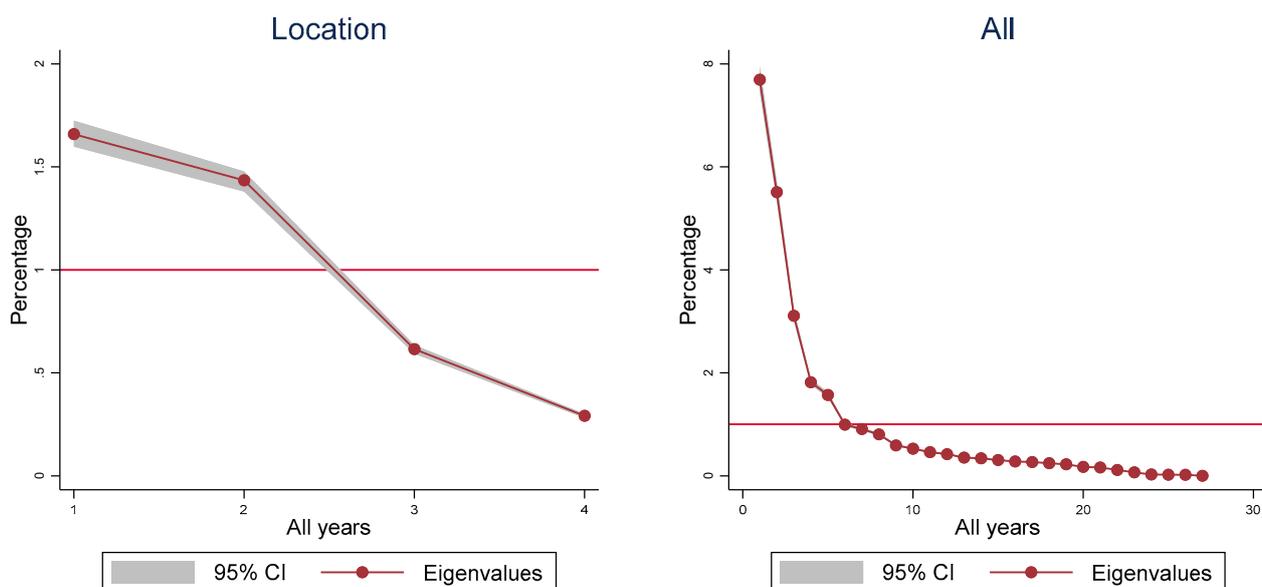


Figure 4. Scree plots of the eigenvalues after PCA for each category. The scree plot was introduced by Cattell (1966) [45] and shows the eigenvalue for each component from the principal component analysis. Here, we use the cutoff value of 1 to decide the number of components to be used in the later spatial autoregressive panel data models. The first five show the eigenvalues sorted from the largest to the lowest from the principal component analysis from each category (Housing Market, Socioeconomics, Demographics, Culture and Location), and the last figure shows the eigenvalues from a principal component analysis of all the variables. We used the commands `pca` and `screplot` in Stata.

The result of the principal component analysis within each category of variables shows that 2–3 components explain enough of the total variation between the included variables in the category. Within the Housing Market category, we use six original variables regarding the local housing market. The PCA analysis shows that two components explain enough of the variation. Based on the scoring coefficient, the following variables have a coefficient exceeding the absolute value of 0.3 for component 1: housing stock, rental housing stock, share of rental housing, and construction of apartments in multifamily houses. Component 2 consists of the following loaded variables: rental housing stock, share of rental housing, housing prices, and housing construction with a negative load on the component. We call the components (1) Housing stock and (2) Rental housing stock.

Within the socioeconomic category, the result shows that the nine included variables can be summarised into three components. The first component comprises income (negative loading), unemployment, and health problems (positive loading). The second component includes unemployment, long-term unemployment, and income taxes, while the eligibility variables regarding education are loaded negatively. Finally, the third consists of long-term unemployment and the number of students in universities and colleges, while the income tax is loaded negatively. We have named the components (1) Low income and unemployment, (2) Low education, and (3) Long-term unemployment based on the variable with the highest score in each component.

The PCAs concerning the demographic category result in two components. The first refers to the proportion of the working-age population, migration to the municipality, and population size (name: Age 20–64). The second component can be described as the population size, migration, and average age of the municipality (name: Population and migration). The two components are similar, with the difference being that the first has the proportion of young adults in the municipality instead of age as in the second. The proportion of men in the municipality is not included in any of the components.

In the category of cultural differences, the first component refers to the percentage of people who have voted in various elections (name: Voting participation) and the second component includes the variables Born in Eastern Europe and Born in the Middle East (name: Eastern Europe, Middle East). The third component includes only the percentage of adults with a foreign background (name: Born abroad). In the Location category, the first component refers to the coordinates (name: Coordinates) and the second relates to the degree of urbanisation and population density (name: Urbanisation and density).

4.3. Spatial Autoregressive Panel Data Model

We will estimate a spatial autoregressive model with a spatially lagged dependent variable with fixed and random effects and a spatial weight matrix defined based on contiguity. The results are presented in Table 2. All the models include all the components of the principal factor analysis.

Table 2. Spatial autoregressive panel data model with components from each category.

	(1)		(2)	
	Random Effect	t-Value	Fixed Effects	t-Value
Housing Market				
Housing stock	−0.0280 ***	(−7.22)	−0.0171 **	(−4.43)
Rental housing stock	−0.0629 ***	(−19.70)	−0.0382 ***	(−12.47)
Demographic				
Age 20–64	−0.0127 **	(−3.56)	−0.00544 *	(−1.83)
Population and migration	−0.000497	(−0.17)	−0.00219	(−0.90)
Socioeconomic				
Low income, Unemployment	0.0332 ***	(11.65)	0.0190 ***	(11.62)
Low education	−0.00975 ***	(−4.77)	−0.0142 ***	(−9.87)
Long-term unemployment	−0.000717 **	(−0.27)	0.000883	(0.54)
Cultural				
Voting participation	0.0379 ***	(13.45)	0.0252 ***	(12.80)
Eastern Europe, Middle East	0.00911 ***	(3.34)	0.00337	(1.84)
Born abroad	0.0193 ***	(6.41)	0.0115 ***	(4.89)
Location				
Coordinates	−0.00216	(−0.27)	0.0833	(1.14)
Urbanisation and density	−0.0365 ***	(−4.83)	−0.0478	(−1.87)
Constant	3.896 ***	(131.40)		
W				
lnyah_all	−0.0714 ***	(−7.67)	0.800 ***	(52.24)
e.lnyah_all	0.635 ***	(40.85)	−0.560 ***	(−13.66)
Constant (sigma_u)	−0.171 ***	(−22.73)		
Constant (sigma_e)	0.0793 ***	(107.19)	0.0748 ***	(93.38)
AIC	−12,426.6		−13,274.0	
Observations	6380		6380	

Note. Two models have been estimated. The first refers to a spatial autoregressive fixed-effects model, and the second is a spatial autoregressive fixed-effects model. We used a spatial weight matrix based on contiguity in both models. We have used Stata's *spmatrix* and *spxtregress* commands to estimate the models. The models include both a spatially lagged dependent variable and a spatially lagged error term. The dependent variable is the natural logarithmic proportion of young adults living at home in each municipality and year. The independent variables are the components within each category (Housing market, Socioeconomic, Demographic, Cultural, and Location) estimated using principal component analysis. t-statistics in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

The models presented in Table 2 are spatial autoregressive models in which the spatial lagged dependency and the error variable are included. The model in Column 1 is a random-effects model and the model in Column 2 is a fixed-effects model. We note that the parameter estimates regarding the spatial variables are statistically significant but have reversed signs depending on whether it is a random- or fixed-effects model. We have tested

the specification with the Hausman test, and the fixed-effects model generally provides a better fit for the data, suggesting that controlling for time-invariant differences between municipalities is important in this analysis.

The results indicate that components from each category (Housing Market, Demographic, Socioeconomic, Cultural, and Location) have varying impacts on the proportion of young adults living at home. Interpreting the effects of the various variables on the proportion of young adults living at home with their parents is difficult since the variables are included in the components of the PCA. An alternative would have been to include all the variables in the model, although that would have made it difficult to interpret the effects due to the multicollinearity problem. Therefore, we have chosen to use PCA to reduce the number of independent variables in the spatial model.

The results show that the variables in the housing market statistically affect the proportion of young adults living at home. For example, similar results can be found in recent studies by [46,47]. The parameter estimates for both housing market components are negative, which means that the housing stock size, the proportion of rental properties, and the proportion of people living in them negatively impact the proportion of people living at home. An interpretation could be that if the housing stock increases and the proportion of people living in rental properties increases, it is easier for young adults to move away from home and thus enter the housing market. It should be noted that housing prices are not included, which could be interpreted as showing that housing affordability in the ownership market is less important. On the other hand, the availability of apartments, and above all rental apartments, is more important for young adults to enter the housing market.

Only Component 1 (Age 20–64) has statistically significant parameter estimates for the demographic factors. The parameter is negative, which means that the larger the working population in the municipality, the larger the population of the municipality, and the higher the immigration in the municipality, the fewer young adults live at the parental home. The results are in accordance with, for example, Blumenberg et al. (2016) [21]. The effect was not expected, but it can be interpreted as immigration regions with a more significant proportion of young adults who have moved away from their home municipality and their parents' home.

Regarding the socioeconomic component, we can note that the parameter estimates are positive for Component 1 (Low income and unemployment). This means that if income and unemployment problems increase in the municipality, the proportion of young adults living at home increases. Unemployment and health problems are closely connected [47], and previous studies indicate a connection between job literacy, health problems, and the housing market [48]. Component 2, which measures the lack of human capital (low share of university-eligible young people) in the municipality, has a negative parameter estimate. As Component 2 increases, the proportion of young adults living at home decreases. The interpretation here might be against this expectation, although it can also be interpreted as the larger the number of people eligible to continue higher studies, the larger the number of people who choose to stay at home. However, we can notice that the parameter estimate is significantly smaller than for Components 1 and 3. An interpretation is that human capital partially counteracts the effect of long-term unemployment. If long-term unemployment increases and the municipality is a university town, Component 3 shows that the proportion of young adults living at home increases.

Cultural differences between municipalities, measured as the percentage of voters in elections and the percentage of adults with a foreign background, also impact young adults living at home. Furthermore, the higher share of people born in Eastern Europe and the Middle East increases the proportion of young adults who live with their parents.

The more people who vote in various elections (EU, national, and municipal) has a positive impact, which means that more young adults live at home. This was perhaps somewhat unexpected, but the result is relatively strong since the parameter estimate is statistically different from zero. On the other hand, social capital affects health, unemploy-

ment, and income [46,47], making interpretation complex. Our results indicate that social capital can also impact the choice to move away from home.

The proportion of young adults with a foreign background also positively impacts the proportion of young adults who live at home. It is difficult to discern whether this is a cultural difference or due to something else, although the model controls for factors such as unemployment, income, and eligibility for higher studies. Finally, we can state that the degree of urbanisation and population density have a negative impact on the proportion of young adults living at home. In the big cities, fewer people live at home as more young people have moved to the region. However, the impact of the urbanisation rate and density is not statistically significant in the fixed-effects model.

Using maps (see Figure 5) of the statistically significant components, we can illustrate which factors are essential to explain the proportion of young adults living at home. In the following, we present four maps regarding the components: Rental housing stock, Low income and unemployment, Long-term unemployment, and Voting participation.

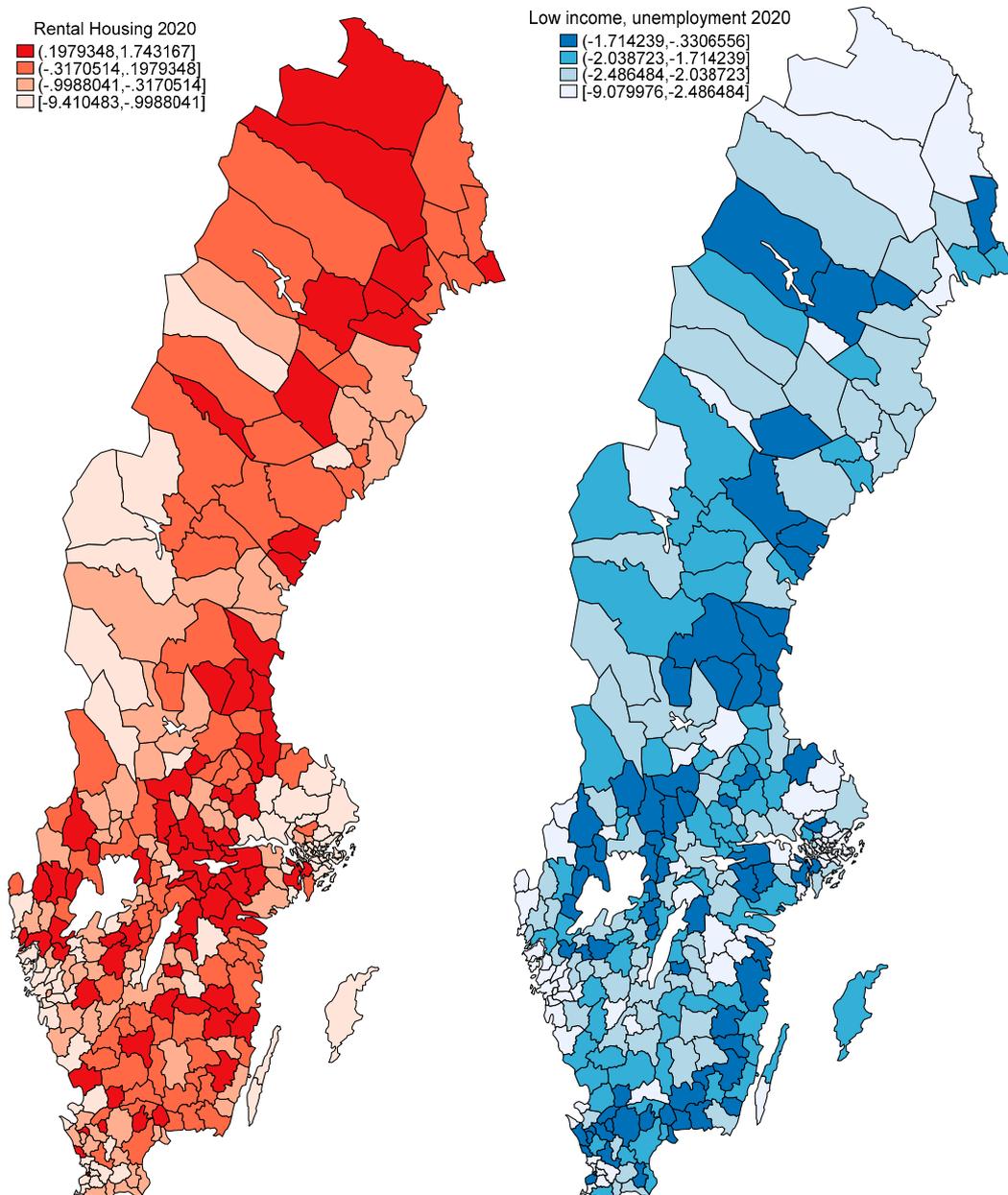


Figure 5. Cont.

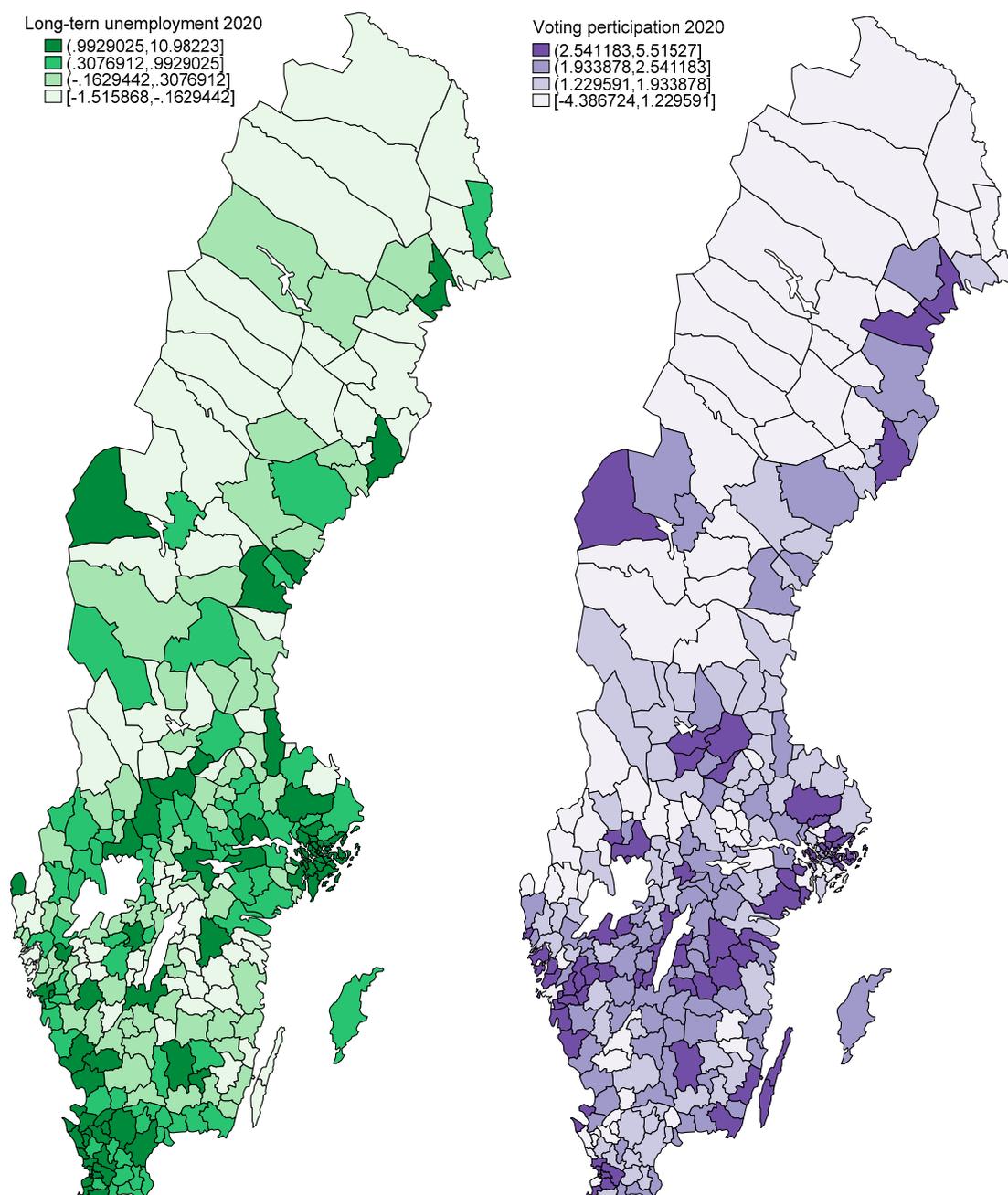


Figure 5. Maps based on components from the principal component analysis. The maps show Sweden in 2020 and the spatial distribution of the four components used in the spatial autoregressive model, namely the components Rental housing (red), Low income and unemployment (blue), Long-term unemployment (green), and Voting participation (purple). All the variables are components of the principal component analysis, and the statistics range from minus to plus values, with an average of zero over the 1998–2021 study period. The maps have been constructed using the Stata command `gmap`.

The interpretation of the maps is as follows. The redder the region, the larger the rental housing stock, indicating that this component is less important in explaining why young adults live at home in these regions (based on the results in Table 2). Light-red municipalities indicate that it is more important to analyse the availability of rental housing. This is especially common in three metropolitan areas: Stockholm, Gothenburg, and Malmö. Dark blue means that there are low-income and unemployment problems in the region. According to the econometric results in Table 2, low income and high unemployment lead

to a higher share of living with parents because it is economically challenging to move away. Therefore, the lighter the blue colour, the fewer labour market-related problems there are to keep young adults living at home.

Dark green indicates a higher long-term unemployment rate. We know that long-term unemployment has a positive impact, according to the results in Table 2, on the share of young adults living with at least one parent. We note that high long-term unemployment can be observed in metropolitan regions. This relates to the fact that the percentage of people born abroad is also high in these areas, and it is more common there to have more long-term unemployed people since they are the furthest away from the labour market. The purple scale map refers to the Voting participation component. The darker the purple, the higher the degree of voting participation. We know that this component has a positive impact on the outcome variable. It may not be a causal effect, since high voter participation may mean that social capital is undoubtedly higher, but it may also signify that, in these areas, people live in larger dwellings and are more often eligible for higher studies, which may mean that it is both financially and physically possible to stay at home with their parents.

By analysing regional differences over time regarding the proportion of young adults living in parental homes, we can identify several underlying factors that explain the variations in time and space. The lack of rental housing, low income, high unemployment, high degree of urbanisation, intraregional migration, and social capital explain why more young adults stay at home.

We analysed aggregated data, which can provide large patterns, but at the same time, it places limitations on interpreting the impacts of individual factors. Furthermore, there is a multicollinearity problem since many variables measure approximately the same thing; we thus have a high correlation between individual variables. We have tried to remedy this with principal component analysis, although differentiating between different effects makes that more difficult. Many regions are connected to a larger labour market, meaning many people live in one municipality but work in another. Problems in the housing market in a municipality will undoubtedly also affect the housing market of surrounding municipalities. However, through our approach of estimating spatial autoregressive models, the problem of spatial dependence has been minimised. Finally, there may be endogeneity problems, making interpreting causality difficult. However, we assess that the endogeneity problem is relatively limited.

5. Conclusions

The purpose of this study was to analyse the proportion of young adults living at home over time, as well as the regional variations within a country. The case study focuses on Sweden, a country with relatively few young adults living at home but where the proportion has varied over time and significant differences exist between different municipalities.

Descriptively, we can note that the proportion of young adults living at home has been relatively constant over the years, with low temporal variation, although the variation between regions has been significant. The proportion of young adults living at home is high, especially in metropolitan regions and sparsely populated areas in northern Sweden. The above means that (1) the problem has not grown over the years, so it is not worse now compared to before, and (2) general measures to mitigate the problem in Sweden are unnecessary; more specific measures for the metropolitan regions are probably more accurate. The housing situation in sparsely populated areas should be handled separately and may not be solved cost-effectively with general measures.

We examined various factors that influence the living arrangements of young adults. We employed spatial autoregressive models, differentiating between random-effects and fixed-effects models. In particular, the findings reveal that variables in the housing market significantly impact young adults. Factors such as the size of the housing stock, the proportion of rental properties, and the number of people living in rental properties all play

a role in influencing whether young adults live with their parents. Mackie (2016) [48] drew a similar conclusion about the future challenges we face as a society. He concluded that the “*private rented sector and further provision of shared housing*” are the key to improving access and the possibility of reasonable and affordable housing for young adults. Surprisingly, our empirical results show that housing prices are not explicitly included, suggesting that housing affordability in the ownership market may not be as important as the availability of apartments.

In addition, we explore socioeconomic and demographic factors. Lower income and higher unemployment, health problems in a municipality, and specific factors such as increased long-term unemployment and income taxes influence young adults’ likelihood of residing with their parents. The fact that unemployment is an important factor was also confirmed by (García-Andrés et al., 2021) [17], although their results indicate that it only applies to men. Interestingly, some unexpected trends emerged, such as the counterintuitive impact of human capital on this living arrangement. Demographic factors also play a role, with the population size, immigration, and cultural differences affecting young adults’ living situations.

Our research uncovered a complex interplay of factors that shape young adults’ living choices, highlighting the importance of the dynamics of the housing market, socioeconomic variables, and demographic and cultural considerations in this context. In some regions, labour market measures need to be implemented above all to increase the opportunity for young adults to move away from home, while in other regions, housing market measures need attention, such as a better match with the housing market or the construction of more rental housing.

Our research on young adults living at home in Sweden revealed some important policy implications that need to be discussed. Access to rental housing must be prioritised in policies, particularly in urban areas such as Stockholm, Gothenburg, and Malmö. This could include implementing policies to stimulate the creation of rental units or providing financial assistance through subsidies to help develop rental housing. Our study contends that while housing prices may not be as important in the ownership market, the appropriate availability of affordable rental options is critical. One possible answer to the problem is to provide support specifically targeted to people renting for the first time.

Policies must be tailored to support young people’s assimilation and self-sufficiency, with particular emphasis placed on those of working age and immigrants. Various efforts, such as occupational training programmes, language acquisition and cultural assimilation courses, as well as assistance in the pursuit of additional education, could be undertaken to solve this problem. It is impossible to overestimate the necessity of addressing low income, unemployment, and poverty. This may involve implementing tactics such as increasing employment opportunities, providing unemployment compensation, and establishing retraining efforts. Furthermore, encouraging higher education and stimulating the acquisition of new skills could be useful methods to offset the negative repercussions of extended unemployment. Implementing educational and vocational training programmes has the potential to provide beneficial consequences. However, cultural differences in living arrangements must be acknowledged and appreciated. Policies must be sensitive to the needs and preferences of various cultural groups, including many young people of foreign origin.

Different policies may be required to handle the distinct issues facing urban and rural areas. There is frequently greater emphasis placed on resolving housing and employment possibilities in metropolitan areas, although improving connectivity and facilitating access to key services may be more critical in rural areas. Policies must be tailored to the specific needs of various regions by considering each geographical area’s unique challenges and peculiarities. A complete approach is required that considers numerous factors, such as housing, employment, education, and cultural considerations. Coordination of policy in several areas, such as housing, employment, and education, is critical.

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