

Housing tenure, residential mobility and adolescents' education achievement: evidence from Sweden

Jie Chen

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Abstract The purpose of this paper is to examine the impact of housing tenure and residential mobility on adolescents' academic success. Based on longitudinal data analysis from Sweden, we find large disparities of high-school graduation rates from adolescents living in different housing tenures and experiencing different residential mobility. After controlling for a rich set of family, individual and community background variables, a positive homeownership effect and a negative residential move effect are established. The IV method to control for the potential endogeneity of tenure choice does not weaken the estimated effect of homeownership. Based on these findings, relevant policy implications are discussed in the final section.

JEL Classification R20 · R23 · R31

1 Introduction

Adolescence is a critical transitional stage of human development that occurs between childhood and adulthood. An adolescent's educational achievement can have a decisive impact on his or her future well-being and labour productivity (Caspi et al. 1998). It is, therefore, of vital importance from a policy perspective to identify factors that potentially impact an adolescent's academic performance. In academic literature, family background and school quality have been traditionally recognized as crucial to educational achievement (Kane 1994; Maurin 2002; Dearden et al. 2002). Recently, however, additional attention to non-traditional factors is being researched. In particular, effects of neighbourhood characteristics have been studied from various perspectives in recent

J. Chen (✉)

Center for Housing Policy Studies and Department of Industrial Economics,
School of Management, Fudan University, Guoshun Road 670, Shanghai 200433, China
e-mail: jiech@fudan.edu.cn

years (Haveman et al. 1991; Borjas 1995; Harding 2003; Jackson and Mare 2007). In Sweden alone, numerous empirical studies have provided strong evidence of the impact of neighbourhoods on adolescents' socio-economic development (Andersson 2004; Andersson and Subramanian 2006; Musterd and Andersson 2006; Brännström 2008; Galster et al. 2008).

Within the broad academic literature of urban and housing studies, there is an emerging focus on examining the impacts of housing factors on adolescent's human development. There are two issues that deserve further in-depth investigation: one is whether housing tenure has a causal effect on adolescents' schooling outcomes (Green and White 1997; Boehm and Schlottmann 1999; Harkness and Newman 2002, 2003; Galster et al. 2007); another is whether frequent residential moves experienced during one's upbringing period have a harmful impact on adolescents' chances of graduation (Astone and McLanahan 1994; Humke and Schaefer 1995; Temple and Reynolds 1999; Pettit and McLanahan 2003; Gasper et al. 2009).

Until now, formal studies on the relationship between housing and educational outcome are still rare in European literature. Sweden, a country famous for providing equal opportunities to all children (Erikson and Jonsson 1996), also lacks careful studies on this topic. However, previous studies have pointed out that significant difference in high-school graduation rates still exist in Sweden even after controlling for a variety of variables including school quality and neighbourhood characteristics (Andersson and Subramanian 2006; Brännström 2008). This paper, therefore, attempts to bridge this knowledge gap.

In this paper, we provide an integrated analysis of the impacts of housing tenure and residential mobility on adolescents' educational development. Previous research tends to examine either the influence of housing tenure or the impact of frequent moves, but rarely both¹. However, housing tenures and residential mobility are in fact very closely related to each other (King 1980; Ioannides 1987). Further, homeowners generally tend to move much less frequently than renters (Strassmann 1991; Van Ommeren and Leuvensteijn 2005). Thus, the effect of homeownership without controlling for impacts of residential mobility is questionable. Similarly, the effects of residential mobility will remain in doubt if one does not distinguish between homeowners and renters.

With an integrated analysis as such, it will be possible to reconcile conflicting theories in previous studies and yield more insight on this issue. The remainder of this paper is organized as follows: Sect. 2 gives a brief literature review; Sect. 3 explains the methodology used in this paper; Sect. 4 introduces our data source and supplies the sample description; Sect. 5 presents our estimation under various regression settings and their interpretations; finally, in Sect. 6, we present our concluding remarks.

2 Theory and literature review

Harkness and Newman (2003) discuss several possible mechanisms through which homeownership could affect adolescents' academic success and distinguish between

¹ Aaronson (2000) and Lien et al. (2008) are two rare exceptions. But both literatures are only focusing on homeownership effects.

direct, indirect and interactive homeownership effects. In the direct homeownership effect, there is substantial evidence that the quality of housing and the maintenance level of owner-occupied housing are on average better than those of rental housing (Galster 1983; Lien et al. 2008). As expected, homeowners are more willing to invest in the physical and emotional environment than renters (Galster 1983; Haurin et al. 2002). Therefore, assuming identical family income and socio-economic background, adolescents that grow up in owner-occupied homes on average enjoy more privacy, less crowding, more stability, and a favourable study environment than ones growing up in rental housings and are, therefore, expected to achieve higher academic achievement (Goux and Maurin 2005). Further, as home equity can be used as both a hedging tool against family financial turbulence and a collateral asset to relax the financial constraint of adolescent's education needs, becoming a homeowner could, therefore, provide some supportive benefits to smooth adolescents' education progress.

For the indirect homeownership effect, literature typically stresses that homeownership and neighbourhood characteristics affect children and adolescents' well-being. The influence of neighbourhoods have on teenagers can be attributed to peer effect or epidemic model of behaviour development (Crane 1991). For example, psychologists and sociologists have accumulated evidence to suggest that adolescents' human development is heavily affected by the socio-demographic and physical contexts of neighbourhood. These variables include the quality of public services, the socio-economic composition of neighbours, demographic stability and safety levels of communities, and the richness of neighbourhood amenities (Haveman et al. 1991; Harding 2003; Andersson 2004; Andersson and Subramanian 2006; Jackson and Mare 2007). On the other hand, economists point out that positive externalities associated with neighbourhoods require costly investments (Borjas 1995). Because investment in neighbourhoods social infrastructure require time to development but ultimately lead to high property values, homeowners tend to have a greater incentives to invest in neighbourhood-specific social capital than renters (DiPasquale and Glaeser 1999). For example, there is clear evidence suggesting that high homeownership communities are associated with both improved property maintenance and reduced neighbourhood dynamics (Rohe and Stewart 1996). Dietz and Haurin (2003) provide an excellent inter-disciplinary review of homeownership effect literature.

Finally, interactive homeownership effect refers to two concepts: one argues that the magnitude of favourable impact of homeownership varies in different neighbourhoods (Aaronson 2000); the second one suggests that homeownership only has a positive effect if certain additional neighbourhood conditions are met (Harkness and Newman 2003).

On the other hand, Kane (1994) is arguably the first one to suggest a positive linkage between homeownership and children/adolescents' educational success in academic literature. However, only recently have researchers attempted to formally identify the impact of homeownership on children and adolescents' schooling outcomes. A pioneer in this line of research, Green and White (1997) report the advantage of homeowners have in mitigating adolescents drop outs from school, even across three different data sets and after controlling the endogenous tenure selection biases. In later works, Boehm and Schlottmann (1999) control for the impact of neighbourhood characteristics by using average home value; Aaronson (2000) includes controls of tenure duration and

mobility frequency to address the endogeneity between homeownership and mobility; [Haurin et al. \(2002\)](#) control the impacts of home environment; [Harkness and Newman \(2002\)](#) use IV methods to examine whether the homeownership effect is due to unobserved characteristics of homeowners and whether it differs across income groups; [Harkness and Newman \(2003\)](#) study the interactions of tenure status and neighbourhood characteristics; and [Lien et al. \(2008\)](#) compare children with peers of the same age cohort in the same neighbourhood in Taiwan and control the impacts of physical housing environment. Across different data sets, education systems and social environments, these works consistently show a positive homeownership effect. Further, several studies find that high level of neighbourhood stability enhances the positive effect of homeownership on children and teenagers' educational outcomes ([Aaronsen 2000](#); [Harkness and Newman 2003](#); [Lien et al. 2008](#)).

At the same time, psychiatrists and sociologists have long attempted to identify the impact of residential mobility on children and adolescents' education achievements. See a review of earlier literature on this topic in [Humke and Schaefer \(1995\)](#). In recent literature, there is ample empirical evidence that frequent long-distance residential moves trigger residential and educational instability. School switching and loss of peer friend network have a damaging influence on children and teenagers' education development ([Haveman et al. 1991](#); [Astone and McLanahan 1994](#); [Pribesh and Downey 1999](#); [Temple and Reynolds 1999](#); [Jackson and Mare 2007](#)). For example, [Haveman et al. \(1991\)](#) suggests that the number of moves is correlated with high-school completion. In addition, [Jackson and Mare \(2007\)](#) point out that frequent moves increase children's exposure to disadvantaged neighbourhoods. However, there are also some studies producing conflicting empirical results ([Pettit and McLanahan 2003](#); [Gasper et al. 2009](#)).

As mentioned previously, a methodological weakness in previous works is that they generally failed to consider the impacts of housing tenure and residential mobility simultaneously, which likely resulted in biased estimates of the impact parameter.

The central challenge of all empirical work is to prove a causal relationship rather than a simple statistical correlation. However, some family characteristics simultaneously affect tenure decisions and adolescents' educational achievement. For example, evidence suggests that parent's personality, self-esteem, responsibility and aspiration for children's success could all be systematically different between homeowners and renters ([DiPasquale and Glaeser 1999](#)). Thus, the alleged effects of homeownership could likely be artefacts of self-selection across households.

Similar criticism applies to previous identifications of residential mobility effects too. Households that move frequently are often associated with unstable working situations or unsteady family structures or low skills to set-up solid social networks ([Astone and McLanahan 1994](#); [Humke and Schaefer 1995](#)), all which may potentially shadow the educational development of adolescents. By looking at a housing experiment in Los Angeles, [Pettit and McLanahan \(2003\)](#) find that families that moved from public housing appear to be less successful at developing social ties than families that did not move. [Gasper et al. \(2009\)](#) also suggest that the statistical relationship between mobility and problem behaviours among US adolescents appears to be spurious rather than causal. It is more likely the result of family differences in mobile and non-mobile youth. However, these family characteristics are usually hard to identify

let alone quantify and are, therefore, omitted from the empirical models. Until now, the endogeneity issue is still a major challenge.

3 Identification strategy

In this paper, we employ a discrete variable to proxy adolescents' schooling outcomes. The variable we use is whether a teenager has graduated or finished upper secondary education (*gymnasial utbildning* in Swedish) by age 19. There is possibility that some adolescents make a rational decision to stay longer in high school or even drop out early (Holmlund et al. 2008). Further, one may suggest academic grades of high-school graduation, or something similar, as a better measurement of adolescents' academic accomplishment (Brännström 2008; Kauppinen 2008; Sykes and Musterd 2010).

Despite these limitations, we are confident that graduation statistics are a good indicator for adolescents' schooling education in terms of both opportunity and achievement. The first reason is that the Swedish education system offers equal access and opportunity throughout the country (Erikson and Jonsson 1996). In addition, since schooling education is costly, efficiency consideration should be applied (Astone and McLanahan 1994). Finally, it is worth mentioning that Aaronson (2000) employs the same dependent variable as we do.²

In this study, we construct an econometrics model where the probability of one individual's high-school graduation at age 19 is linked to his or her housing tenure and residential mobility experienced during adolescence, after controlling for family and individual background variables. The unobservable probability of individual (i 's) graduation with a high-school degree by age 19, (y_i^*), can be specified in the following manner:

$$y_i^* = \alpha_0 + \alpha_1 H_i + \alpha_2 M_i + \beta' X_i + \tau_i + \varepsilon_i \quad (1)$$

where H_i is the indicator of owner-occupied living, M_i is the indicator of residential mobility, X_i is a vector of individual, family and community characteristics during individual (i 's) adolescence, τ_i stands for the individual-specific *unobservable* characteristics that impact individual i 's education performance, such as her or his learning capability, attitude to schooling education and parental probability towards tenure and mobility, etc; ε_i is the stochastic error term that assumes independent of other factors. As the dependent variables are observed in binary numbers, it is more common to apply a probit model rather linear probability regression.

The major concern in this study is to identify the parameter α_1 and α_2 , which measure the impacts of homeownership and mobility on adolescent i 's high-school graduation probability, respectively. However, an unbiased estimate of parameter requires there is no correlation between the variable and the error term (Davidson and MacKinnon 1993). But, as the omitted unobservable variables usually are not

² The high-school completion by age 20 is one of the seven child outcomes to be studied in Harkness and Newman (2003). We tried this indicator too and found similar results as the current ones.

independent of control variables, this condition is violated and the regression results can likely be biased. See Eq. 2 for reference.

$$\hat{\alpha}_{i,\text{OLS}} = \alpha_i + \frac{\text{cov}(\tau_i, \beta' \sum X_i)}{\text{var}(\tau_i)} + \frac{\text{cov}(\tau_i, \varepsilon_i)}{\text{var}(\tau_i)} \quad (2)$$

That is, we could not distinguish how much the OLS estimate of α_i is driven by the true underlying relationship between housing variables and education results, and how much is due to omitted unobservable variables.

Additionally, even assuming without omitted variables but if the variables of homeownership or mobility contain serious measurement error, their estimates will also be biased (Davidson and MacKinnon 1993). For example, imagine that instead of decoding true homeownership status H_i correctly, we record $H_i^* = H_i + v_i$, where v_i is measurement “noise”. Then, we end up estimating the following regression:

$$\begin{aligned} y_i^* &= \alpha_0 + \alpha_1 (H_i^* - v_i) + \alpha_2 M_i + \beta' X_i + \varepsilon_i \\ &= \alpha_0 + \alpha_1 H_i^* + \alpha_2 M_i + \beta' X_i + (\varepsilon_i - \alpha_1 v_i) \\ &= \alpha_0 + \alpha_1 H_i^* + \alpha_2 M_i + \beta' X_i + u_i (= \varepsilon_i - \alpha_1 v_i) \end{aligned} \quad (3)$$

Since both control variable H_i^* and error term u_i depend on v_i , they are correlated.

In both cases, a correlation between the independent variable and the error term, the so-called endogeneity problem, leads to biased estimates (Davidson and MacKinnon 1993). Adding more control variables could alleviate problems due to omitted variables but could not address problems due to measurement errors.

To address the endogeneity problem, the most widely accepted solution is to search instruments for the suspected endogenous variable (Wooldridge 2002). Valid instruments should affect the suspected endogenous variable but should not have a direct impact on the outcome variables. Then, we can choose to first regress the suspected endogenous variable on a set of exogenous instruments and insert the predicted variables into the Eq. (2) and run the regression. In this way, we can produce unbiased estimators. Whether the suspected variable is endogenous or not is testable through including the first-stage regression residuals in the second-stage regression and tests its significance; the validity of instrument is also testable (Davidson and MacKinnon 1993). But, to avoid inefficient standard errors, the IV estimator is usually obtained by one-step manner in most statistics package.

4 Data construction and sample description

The data in this paper are extracted from LINDA, the Swedish Longitudinal Individual Database. LINDA contains annual information on roughly 3% representative of Swedish population and complements every 5-year national survey data since 1960. Because it is tax-register based, the quality of data is exceptional good. In addition, panel attrition bias has been carefully addressed (Edin and Fredriksson 2000).

The data set contains information of the following categories: demographic characteristics of household heads (gender, age, marital status, citizenship, date of

immigration, date of last change in marital status); household composition (family size, number of adults, number of children/adolescents under age 18); all types of household income; household wealth (assessed value for real estate, stock, security, home asset, etc); all legal and paid taxes; all received social benefits; education levels and labour market information of household heads; residential locations that detailed to parish level.

In LINDA, each individual record is allocated a unique personal identity number, and a common family identity number indexes individuals within the same household. We can then directly tie children/adolescents to their family household head and other family members.³ In few exceptions where adolescents younger than 19 have chosen to live independently, they are registered as household heads themselves.

At the timing of writing, the LINDA family data were available only between 1991 and 1998 and thus limits the maximum interval of time that we could keep track in this paper. With this constraint, we chose to examine the education performance of youth aged 19 in 1998 and tracked their residential history experienced between ages 12 and 18. The LINDA 1998 family database provided 10,619 observations that aged 19 in 1998, and 9,498 of them were continuously tracked since 1991. As a panel data, LINDA provides a convenient way to keep track of household head's marital status and family composition history.

The first task of data construction is to produce an accurate measure of individual's education attainment level at age 19. Details of this measurement are described in the appendix. Household's residential mobility is derived from overtime change of household registration address.⁴ The panel feature of data makes it possible to identify both the original and destination location.

In LINDA, a household's housing tenure status can be identified from the type of real estate tax payment paid by the household head. In Sweden, three different tenure forms coexist: private homeownership, cooperative ownership and rental. Real estate tax is levied on the former two types at different rates but none on rental housings. Cooperative ownership is a special type of housing tenure and exists within various forms in the United States, Canada, Germany and Nordic countries, among others. In Sweden, all residents can legally become members of a housing cooperative (*bostadsrättsförening*) and then obtain the right (*bostadsrätt*) to occupy their respective housing unit in this cooperative. The common sources of cooperative housing are owned by the cooperative entity, and cooperative member's term of living in the cooperative is subject to an occupancy contract. Further, residents living in cooperatives need to share the operational and financial expenses of the cooperative through monthly contributions. All these features make cooperative membership appear like a lease contract. But, the difference is cooperative members can live in their housing unit for unlimited time. More importantly, the right to occupy a cooperative housing unit can be traded freely on the open market, can be financed by mortgage and can be

³ In most cases, the household head is the child's father or mother, either biological sense or lawful. We can also distinguish foster-child from data. However, only four such cases were found in the sample, and thus, the effect of growing up in stepfamily is ignored.

⁴ Only inter-municipality move is recorded, and intra-municipality mobility is not accounted. A residential move outside of one's original county is regarded as a long-distance move.

collateralized. The *user right*'s cost floats with the housing market and closely matches the trend of private home prices (Kemeny 1978b; Turner 1997). That is to say, it functions as a form of home equity. Therefore, cooperative ownership is comparable to be the same thing as private homeownership (as opposed to renting) in Sweden. Thus, the two tenures are usually grouped together in one homeowner category in Swedish literature (Kemeny 1978b; Åsberg 1999). We apply the same method in this study. One should note that the guaranteed rights of permanent living and the function as equity are the heart of the direct homeownership effect discussed in Harkness and Newman (2003).

Table 1 describes some key characteristics of the sample data. The key features of the sample data set are summarized in column (2), and there are several noticeable observations. First, the sample data suggest that 69.61% had completed their high-school education by age 19 (data from year 1998). This figure is very close to Swedish national profile of 71.58% in the same year (SCB-Statistics Sweden online database). Second, it illustrates that the total homeownership ratio among the total sample is remarkably high, about 70%.⁵ Although Sweden is a country famous for proposing tenure neutrality as a key cornerstone of its housing policy (Kemeny 1978b; Turner 1997), homeownership still dominates Swedish households' housing choice in recent decades, especially among young adults (Åsberg 1999). Third, the sample households are fairly immobile. The average annual mobility rate is only 5%, and only a quarter of households had at least one residential move in 7 years. It should be noted that there is substantial variation in mobility rates over the time. The highest level occurred in 1996 when 6.49% of the households moved, and the lowest is for 1993 when only 2.2% moved (not reported here). This is consistent with what Lundborg and Skedinger (1998) observed as the annual mobility rate of 3% during the 1980s, with the highest being 6% and lowest 0.9%. Compared to a high annual mobility rate in the US of about 20% and average levels of 10% in industrialized countries (Strassmann 1991), Swedish people are clearly much less mobile.

To give readers an idea about how the characteristics vary across groups with different housing experiences, we stratify the data into three pairs of sub-samples: all-time homeowners versus all-time renters;⁶ households that had not experienced any residential move (non-movers) versus those who experienced at least one move (movers); household with per capita income higher than the mean (high income) versus those with income lower than the mean (low income). The key information of the three pairs is also summarized in Table 1.

Comparing column (3) and (4), it is clear that the high-school graduation rate of all-time homeowners is much higher than that of all-time renters, 75% versus 59%. Moreover, the annual residential mobility rate of all-time homeowners is significantly lower than that of all-time renters, 3.6% versus 6.1%. This is consistent with previous findings in Swedish and international academic literature (Lundborg and Skedinger

⁵ According to SCB (Statistics Sweden) online database, the total homeownership (single-family homeownership plus cooperative ownership) ratio in Sweden during the 1990s was around 60–65%.

⁶ All-time homeowners consist of 64% of sample and all-time renters take a share of 24%. Thus, only 12% observations experienced tenure switching during the study period.

Table 1 Sample means of data and sub-sample data

Variables	All	All-time homeowner	All-time renter	Non- mover	Mover	High- income	Low- income
% High-school graduated at 19	0.696	0.752	0.59	0.706	0.668	0.743	0.662
% Homeowner, 12–18	0.707	1	0	0.732	0.636	0.794	0.644
% Mobility rate, 12–18	0.051	0.036	0.061	0	0.198	0.045	0.054
Number of moves (unit: times)	0.307	0.217	0.37	0	1.202	0.275	0.33
% At least one move, 12–18	0.255	0.203	0.281	0	1	0.236	0.269
% At least one long move	0.094	0.087	0.088	0	0.367	0.083	0.101
% girl	0.465	0.461	0.463	0.457	0.488	0.482	0.453
Siblings, age 12 (unit: number)	1.36	1.37	1.35	1.35	1.4	0.91	1.69
% Independent by 18	0.015	0	0.02	0.008	0.038	0.013	0.017
% Immigrant parent	0.061	0.021	0.17	0.055	0.077	0.032	0.082
Household head age, 1991 (unit: years)	42.19	42.54	41.63	42.39	41.58	43.60	41.15
% Head younger than 37, at 1991	0.186	0.148	0.258	0.172	0.226	0.091	0.256
% Head older than 47, at 1991	0.192	0.193	0.202	0.2	0.168	0.249	0.15
% Single parent	0.09	0.064	0.146	0.087	0.099	0.07	0.104
% Single mother	0.047	0.022	0.106	0.041	0.064	0.034	0.056
% Parent divorced	0.124	0.062	0.202	0.104	0.184	0.087	0.151
% Parent death	0.013	0.011	0.014	0.013	0.013	0.015	0.011
% Parent new marriage	0.284	0.312	0.218	0.297	0.247	0.258	0.303
% Parent with high-school education	0.386	0.447	0.254	0.404	0.335	0.542	0.272
% Parent with university education	0.281	0.326	0.177	0.291	0.25	0.416	0.182
Per capita income (unit: 100,000 SEK)	0.715	0.752	0.617	0.722	0.696	0.962	0.535
Family wealth (unit: 100,000 SEK)	1.612	2.17	0.497	1.752	1.203	2.957	0.627
% Metropolitan living	0.269	0.212	0.419	0.31	0.149	0.33	0.225
% Municipality homeowner rate	0.707	0.798	0.489	0.711	0.697	0.71	0.706
% Municipality mobility rate	0.051	0.047	0.055	0.022	0.133	0.049	0.051
Municipality-level average family income (unit: 100,000 SEK)	3.072	3.095	3.008	3.097	2.999	3.269	2.928

Due to space limitation, the standard deviations of variables are not reported here but available upon request. The dependent variable, whether successfully graduated from high school, was measured at age 19 (year 1998). All time-varying variables are measured by their time-average values. Family income, family wealth and other monetary values in each year have been deflated by annual CPI before taking average. The unit is 100,000 SEK and equivalent to approximately 15,000 USD in the 1990s

1998; Van Ommeren and Leuvensteijn 2005) and supports our supposition that tenure and mobility decisions are highly correlated and their effects should be investigated simultaneously. Further, it is shown that homeowners tend to have a relatively older and higher-educated household head and more stable family structure than renter households. There is also a considerable divergence when examining ethnicity, family income and wealth between homeowners and renters. The residential location distribution also differs as follows: homeowners do not cluster in metropolitan areas as

much as renters but prefer to live in regions with higher homeownership ratio and more stability. Overall, the socio-class distribution between renters and homeowners in Sweden during the 1990s was remarkably distinct, or at least no longer as homogenous as what [Kemeny \(1978b\)](#) described for the period before 1980s. This reminds us that at a large proportion of the education gap could be attributable to the differentiations of household characteristics.

However, when comparing non-movers and movers (column 5 and 6), we find that the gap of high-school graduation rate is not large, only 4%. The disparity of homeownership ratio is also small across the two groups: 73% versus 64%. Excluding the divorce rate and the ratio of metropolitan living, there are no noticeable discrepancies between the two groups. Thus, the accounting of mobility effect is not forthright.

Finally, we examine column 7 and 8. For adolescents' high-school graduation, high-income households do not have a clear advantage relative to low-income adolescents, 74% versus 66%. This observation partly substantiates the success of the Swedish education policy providing equal opportunity to all ([Erikson and Jonsson 1996](#)). But, the homeownership ratio between high-income and low-income sample diversifies substantially, 79% versus 64%. However, the mobility rate does not differ much, 4.5% versus 5.4%. The ratio of stable family composition and household head's education level is as expected higher among the high-income sample, while the low-income observations have higher proportion of immigrants, more children and tend to cluster in metropolitan and poorer regions.

In our empirical analysis, homeownership is estimated by the percentage of years living in owner-occupied housing during the age 12–18, and the impact of mobility is obtained by the per cent of years of moves during the same period. Both are measured in continuous forms, in a manner that is consistent with previous works. However, this yields some problems. From [Table 1](#), it is easy to see that the two housing variables are not normally distributed. For example, 74% experienced no residential moves during the study period and a change in tenure was also rare. However, in a previous version of this paper, we did analysis by measuring housing variables in discrete forms, (i.e. whether spending the majority of life living in homeownership and whether experiencing any move during the study period), and we produced similar findings. To facilitate these interpretations as well as keep results comparable with other works, we chose to use the current continuous measurement of housing variables.

As discussed earlier, there are reasons to suspect the homeownership variable could possibly be endogenous to an individual's education outcome. Following the strategy in [DiPasquale and Glaeser \(1999\)](#), [Aaronson \(2000\)](#) and [Harkness and Newman \(2002\)](#), we use region-year average homeownership rates to instrument for individual homeownership indicators. The region-year average homeownership rate is expected to pick up regional variations in relative ownership cost and other regional-specific housing consumption trends that may affect families' homeownership. However, there is no prior evidence suggesting these factors are correlated with unobservable family characteristics or omitted components in the error terms of adolescent's educational outcome.

5 Estimation results and discussions

5.1 The standard estimates: whole sample

Table 2 presents partial derivatives of high-school graduation probability from a variety of probit regression models with different sets of controls for individual characteristics, household head background, family structure and stability, family income and wealth, and location and neighbourhood characteristics.

Without any controls, column (1) records the marginal effect of living in owner-occupied housing on high-school graduation probability for a base case adolescent (see the footnote of Table 2) is about 16%, and likewise, column (2) displays that the marginal effect of mobility is about 33.5%. Both estimates are strongly statistically significant.

However, as indicated in column (3), when the effects of tenure and mobility are simultaneously examined, both coefficients drop, suggesting there will be a coefficient size bias if one examine only one factor. Nonetheless, the homeownership effect drops only slightly, while the mobility effect plunges from 34 to 24%. In addition, as displayed in column (4), when detailed indicators of household characteristics are controlled, the sizes of the two effects drop further. Adding controls of family income and wealth, however, does not add more changes. Additional controls of neighbourhood features (including community location, mean income and residential stability) are found to further reduce the size of homeownership effect but increase the size of mobility effect. Noticeably, although both effects are consistently statistically significant across column (1)–(6), the size of homeownership effect through column (3)–(6) only changes moderately, while the variation in mobility effect estimate is substantial. This suggests that the size of homeownership effect is fairly robust and unlikely attributable to individual/household/region characteristics, while the size of mobility effect is somewhat sensitive to model setting and control variables used.

Although the main investigation into this paper is about the effects of housing situation on graduation rates, there is a need to discuss briefly the impacts of background control variables. Comparing results in column (4)–(6), we reach the following conclusions: First, most coefficient estimates of background control variables are remarkably consistent, in both signs and magnitudes. Consistently, we find estimated coefficients of background factors were insensitive to data used and indicators of housing variables. Second, most of these coefficient estimates are associated with signs expected in academic literature as well as common knowledge. Later we give some quick comments on the impacts of background control variables.

Column 4 and 6 consistently suggest that girls enjoy a substantial advantage in high-school completion, a stylized fact widely recognized (Lien et al. 2008). High-school outcomes of adolescents growing up in big families seem to be marginally inferior to those with small number of siblings, probably due to less attention from parents and a less private environment (Astone and McLanahan 1994). However, in contrast to US studies (Aaronson 2000; Harkness and Newman 2002, 2003), family income and wealth is found trivial for Swedish adolescent's education outcomes, which substantiates the equal opportunity policy of Swedish education system across income groups (Erikson and Jonsson 1996).

However, the negative effect of metropolitan living is unexpected. But after further investigations, we have reasons to suspect the metropolitan disadvantage is largely attributable to the relative difficulties of obtaining homeownership and higher residential instability in Swedish metropolitan areas (cf. Table 1). Finally, the findings that

Table 2 The standard estimates of homeownership and mobility effects on adolescents' education outcome—whole sample

	(1)	(2)	(3)	(4)	(5)	(6)
<i>Partial derivatives of probit model estimation (z statistics in brackets)</i>						
% Homeownership, 12–18	0.160*** (14.92)	/	0.153*** (14.08)	0.099*** (8.33)	0.098*** (8.28)	0.087*** (7.18)
% Years moved, 12–18	/	−0.335*** (6.99)	−0.241*** (4.97)	−0.129*** (2.59)	−0.128** (2.57)	−0.161*** (3.23)
Girl dummy	/	/	/	0.075*** (7.83)	0.075*** (7.81)	0.076*** (7.90)
Independence by age 18	/	/	/	−0.290*** (6.78)	−0.289*** (6.77)	−0.29*** (6.80)
No. of siblings at age 12	/	/	/	−0.025*** (5.38)	−0.026*** (5.27)	−0.025*** (5.15)
Immigrant dummy	/	/	/	−0.128*** (6.06)	−0.128*** (6.06)	−0.123*** (5.83)
Young household head dummy	/	/	/	−0.037*** (2.77)	−0.037*** (2.75)	−0.038*** (2.84)
Old household head dummy	/	/	/	−0.025* (1.89)	−0.025* (1.95)	−0.024* (1.85)
Single parent since born	/	/	/	−0.104*** (4.01)	−0.104*** (4.00)	−0.105*** (4.06)
Single mother since born	/	/	/	0.011 (0.37)	0.012 (0.37)	0.011 (0.36)
Parent divorced after birth	/	/	/	−0.110*** (6.91)	−0.110*** (6.87)	−0.108*** (6.76)
Parent dead after birth	/	/	/	−0.098** (2.24)	−0.098** (2.24)	−0.101** (2.30)
Parent with new marriage	/	/	/	−0.008 (0.67)	−0.008 (0.65)	−0.008 (0.66)
Parent with high-school deg	/	/	/	0.043*** (2.64)	0.042*** (2.60)	0.046*** (2.82)
Parent with university degree	/	/	/	0.006 (0.36)	0.007 (0.39)	0.008 (0.44)
Per capita income	/	/	/	/	−0.005 (0.39)	0.003 (0.21)
Family wealth	/	/	/	/	0.001 (1.00)	0.001 (1.09)
Metropolitan living	/	/	/	/	/	−0.047*** (4.04)

Table 2 continued

	(1)	(2)	(3)	(4)	(5)	(6)
Municipality income	/	/	/	/	/	-0.006 (0.72)
Municipality mobility	/	/	/	/	/	-0.050*** (5.71)
Log-likelihood	-5,722	-5,808	-5,709	-5,563	-5,562	-5,553
Observation	9,498	9,498	9,498	9,498	9,498	9,498

Dependent variable: whether adolescent graduated from high school with a degree by age 19

* significant at 10%; ** significant at 5%; *** significant at 1%

There are three age categories of household heads: young (aged below 37 at 1991), reference (aged between 37 and 47), old (aged above 47 at 1991)

The marginal effects are computed for a male adolescent living in a native household with two parents, without marital change and death, household head with middle-school education, aged between 37 and 47 at 1991, earning average family income and accumulating average wealth, and residing in non-metropolitan area with national-average mobility rate and national-average family income

high residential turnover rates in communities have damaging effects on adolescents are consistent with [Aaronson \(2000\)](#) and [Harkness and Newman \(2003\)](#).

According to [Table 2](#), although including additional controls of family and neighbourhood characteristics would probably further lessen the estimated effects of homeownership and mobility, it is unlikely that any such controls will drive them to insignificance.⁷

5.2 The standard estimates: sub-samples

To investigate how the impacts of tenure and mobility vary over households with different housing and family characteristics, we stratify the data into three pairs of sub-samples. The impacts of individual, household and community background variables, although sizes vary moderately, keep almost consistent signs and statistical significance across sub-samples. Therefore, their coefficients estimates are not reported in [Table 3](#).

The first comparison is between the non-mover and mover group. We see that the homeownership effect is much larger in the mover group than in the non-mover group. Comparing all-time homeowners and all-time renters, the mobility effect remains

⁷ As the rental housings in Sweden are usually multi-family apartments while most private homes are single-family dwellings (see for example [Turner 1997](#)), one may naturally doubt whether the tenure effect found here is actually driven by differences of dwelling types (including housing quality and housing space) across tenures rather than the tenure itself. But, the homeownership category in Sweden includes the cooperative ownership, which is primarily composed by multi-family apartments. Further, when we drop the cooperative owners from homeowner group (about 15% of the observations), major conclusions do not change at all. On the other hand, according to SCB, approximately 15% of rental housings and 35% of cooperative buildings were single-family dwellings during the 1990s. Therefore, the difference of housing quality is not distinctive across tenures. Finally, our IV estimator is robust to potential measurement error bias in homeownership status. Thus, the difference of housing quality across tenures should not be a serious problem in this paper.

Table 3 The standard estimates of homeownership and mobility effects on adolescents' education outcome—sub-samples

	Non-movers	Movers	All-time owners	All-time renters	High-income	Low-income
<i>Partial derivatives of probit model estimation (z statistics in brackets)</i>						
% Homeownership, 12–18	0.074*** (5.26)	0.133*** (5.29)	/	/	0.023 (1.18)	0.114*** (7.05)
% Years moved, 12–18	/	/	0.128 (1.16)	−0.273*** (2.76)	−0.253*** (3.23)	−0.102 (1.52)
Log-likelihood	−4,128	−1,410	−3,366	−1,442	−2,210	−3,308
Observation	7,074	2,424	6,092	2,272	4,015	5,483

* significant at 10%; ** significant at 5%; *** significant at 1%. The control variables are same as column (6) in Table 2. The way to compute marginal effects is also same as in Table 2

negative for renters but positive for homeowners, suggesting the mobility effect may matter only for renters but not for homeowners. Combining the two findings, we could assume households that have a stronger inclination to become homeowners on average care more about housing quality and neighbourhood amenity than those prefer to rent housing (Rohe and Stewart 1996; Haurin et al. 2002). Therefore, the positive homeowner effect may buffer adolescents against the damaging impacts of mobility. This expectation is consistent with the buffering hypothesis, which was first raised in Aaronson (2000) and further discussed in Harkness and Newman (2003)⁸. The contrast between high-income and low-income groups indicates that the homeownership effect becomes trivial for rich households, while the mobility effect is insignificant for poor households, which is consistent with Harkness and Newman (2002).

5.3 The robustness check: the IV estimates

This section aims to give a robustness check on whether the suspected endogeneity between the tenure indicator and schooling outcome variables in the regressions may have biased our previous coefficient estimates. The county-year average homeownership ratio is used to instrument for individual's homeownership status, which is suspected to be endogenous to the schooling result.⁹

Admittedly, mobility variables can also be endogenous because an adolescent's high-school completion probability could be correlated with household's unobservable tendency to move. Actually, all housing variables are potentially endogenous, and the finding instruments to each suspected endogenous variable are both infeasible and unnecessary. See the discussions about the endogeneity bias of housing variables in

⁸ Aaronson (2000) argue that the positive homeowner effect is strong in any neighbourhood and can buffer children against the damaging impacts of distressed neighbourhood.

⁹ Sweden is geographically divided into 290 municipalities and 21 counties. Therefore, each county is composed by multiple municipalities. As Sweden is a small country itself, the average size of a county, in terms of both population and geography, is small too.

Lien et al. (2008). However, in our data, the chance of serious measurement error in mobility indicators is much less than that of in tenure indicators. On the other hand, as shown in Table 3, when we stratified data into sub-samples of all-time homeowners and all-time renters, the mobility effect seems to matter only for renters but not for homeowners. In addition, as shown in Tables 2 and 3, the size of homeownership effect is not sensitive to whether and how the mobility effect is controlled. Therefore, we have reason to expect that unbiased estimates of homeownership may not require prior correction of the endogeneity issue of mobility. Furthermore, previous work suggests that the endogeneity of residential mobility is a minor issue in children's education attainment regressions (Aaronson 2000; Lien et al. 2008). Actually, from a policy perspective, whether homeownership is important for adolescents has more important practical implications than whether mobility matters (Aaronson 2000; Harkness and Newman 2003). Finally, we have tentatively applied the Durbin–Wu–Hausman χ^2 diagnostic test of endogeneity (where the instrument is the region-year average mobility) and find there is no strong evidence that the mobility indicator is endogenous to the outcome variable. Therefore, we choose to ignore the endogeneity issue of mobility in this paper.

To address the endogeneity bias of homeownership, following DiPasquale and Glaeser (1999), Aaronson (2000) and Harkness and Newman (2002), we apply the IV method, where the instrument of tenure indicator is the region-year average homeownership. This motivation is based on the assumption that the variable will pick up regional variations in relative ownership cost and other regional-specific housing consumption trends that may affect family homeownership, while there should be no strong reason to expect that these factors are correlated with unobservable family characteristics or error terms of adolescents' educational outcome regression. The validity of the instrument choice is testable.

Before applying the IV estimator, there is a need to investigate whether the IV estimator should be employed as well as whether we are using a valid instrument. Therefore, the Wu–Hausman F test (Wu 1973; Hausman 1978) and Durbin–Wu–Hausman χ^2 test (Durbin 1954; Wu 1973; Hausman 1978) are used to assess whether the homeownership indicator is truly endogenous to the outcome variable. A rejection will indicate that the IV estimator should be employed; otherwise, the ordinary estimator can be trusted (see Wooldridge 2002, pp. 483–484). According to the test statistics in Table 4, the IV estimator is found necessary for the whole sample and low-income sub-sample but not for other sub-samples, suggesting the endogeneity issue of homeownership may be a concern only for the low-income households.

Anyhow, to produce robust checks against previous results, we still apply IV estimator for all groups. Further, the Anderson canonical correlation likelihood-ratio statistics is applied to test whether we are using relevant instrument. In all cases, they are suggesting the instrument is highly relevant and the equations are exactly identified (see discussions of instrument relevance and equation identification in Wooldridge 2002.)¹⁰ Note that whether we are using a weak instrument is also testable from

¹⁰ Adding additional instruments may produce over identification problems and unnecessarily complicate the problem (Wooldridge 2002). Anyhow, suggested by one anonymous referee, we also tried to include regional-year average unemployment rate as an additional instrument, but no change of the results is found.

Table 4 The IV estimates of homeownership and mobility effects on adolescents' education outcome—whole and sub-samples

	All	Non-movers	Movers	High-income	Low-income
<i>2SLS linear regression estimation (z statistics in brackets)</i>					
% Homeownership, age 12–18	0.149*** (6.42)	0.118*** (4.00)	0.183*** (4.41)	0.077* (1.71)	0.173*** (6.22)
% Years moved, age 12–18	−0.398*** (5.66)	/	/	−0.500*** (4.50)	−0.325*** (3.58)
(Uncentred) R-square	0.7146	0.7189	0.7028	0.7536	0.6867
<i>Endogeneity test of homeownership</i>					
Wu–Hausman F test	8.88***	2.53	2.26	1.61	6.54***
Durbin–Wu–Hausman χ^2 test	8.89***	2.54	2.28	1.62	6.56***
<i>Relevance of instrument</i>					
Anderson canonical correlations LR test (Identification test)	2,925.6***	1,800.5***	974.2***	804.3***	2,091.1***
R ² of first-stage equation	0.3176	0.2940	0.3922	0.1985	0.4058
Observation	9,498	7,074	2,424	4,015	5,483

* significant at 10%; ** significant at 5%; *** significant at 1%. The control variables are same as column (6) in Table 2. The way to compute marginal effects is also same as in Table 2

running the first-stage homeownership regression, where the individual's homeownership status is regressed against region-year average homeownership ratio: for the whole sample, the estimated instrument coefficient is 1.045 (SD = 0.015, t value = 66.48); for regression, the adjusted R -square is 0.3176, and the statistical significance value of F value is well below 0.01.

The upper half of the Table 4 presents the IV estimator results. They are calculated using linear 2SLS procedure, and the standard errors are robust to the presence of arbitrary heteroskedasticity (through IVREG2 package in STATA 11). It can be found that the control of endogeneity does not reduce the impacts of homeownership but rather strengthens it. For example, for the full sample, the IV estimate of homeownership impact is 14.9%, almost double of non-IV estimate shown in the last column of Table 2. A similar finding is reported for the low-income sub-sample.

This finding suggests the standard estimators that without accounting for the endogeneity issue may produce downward biases in the estimates of homeownership impact, especially among low-income households. Interestingly, [Harkness and Newman \(2002\)](#) also find the IV estimators of homeownership impact are larger than non-IV ones in most cases. Of course, further research is called to give more robust investigations. Even so, considering all existing findings in this paper, it is safe to conclude that a causal effect of homeownership on adolescent's high-school graduation performance exists within the Swedish sample.

6 Concluding remarks

Homeownership is highly favoured over rental tenure in most countries, and there are long-running attempts by most western governments to raise the level of homeownership rate (Dietz and Haurin 2003). This is often implemented through favourable tax treatments and interest subsidies. A wide array of positive externalities is believed to be associated with homeownership (Aaronson 2000). For example, homeownership boosts civil virtue and citizen's responsibility (DiPasquale and Glaeser 1999). Further, there is evidence that homeownership is used as a form of security in countries that experience greater income inequality (Watson 2009). But, there are also widespread oppositions against homeownership-favoured tax treatment, which underscore that such policy consumes too many public resources (Kemeny 1980; Oswald 1999). Nonetheless, if homeownership really impacts the next generation's well-being, it will be a new strong support to the homeownership-favourite policy. Similarly, the relationship between residential mobility and children/adolescents' academic performance has attracted significant attention in recent decades. Accordingly, there are consistent debates whether the government should try to reduce residential mobility across regions through region-equalizing programs, etc (Strassmann 1991).

Using Swedish longitudinal data, we find both housing tenure and residential mobility are closely associated with adolescents' high-school graduation rates in Sweden. With rich controls of individual, family and community characteristics, our econometric regressions suggest that homeownership exerts beneficial impact, and residential instability has detrimental effect on Swedish adolescent's high-school graduation probability. As our findings are obtained after controlling for the potential endogeneity between housing tenure choice and educational outcome, they are robust results. Therefore, this paper provides a new piece of empirical evidence on the merits of homeownership and residential stability. Accordingly, we argue that the policy making of education should take into account the possible impacts from housing and urban development. Similarly, the policy of housing and urban development may need to consider possible effects on children and young people's human capital.

However, it is still too early to draw conclusions on the complete relationship between housing situations and adolescents' well-being. First, the causal mechanisms are still not well understood. Second, the impacts of building type, housing quality, construction space, dwelling's surrounding environment, school quality and neighbourhood characteristics are not thoroughly controlled. Although these deficiencies may not change the causal relationship, they affect the estimated magnitudes of the effects. Third, the educational outcome at age 19 is still too premature to judge whether the effects are sustainable and give conclusions on the long-run impacts of homeownership and mobility. For example, the failure to complete high school by age 19 does not necessarily imply unsuccessful experience of university or post-secondary education (Holmlund et al. 2008). Unfortunately, limited by data availability, we are not able to examine the long-run effects yet. Fourth, this paper studies only teenagers. As they begin to conduct socialization and formal individual identity during these years (Humke and Schaefer 1995; Caspi et al. 1998), it is reasonable to expect their

housing experience matters. However, such story may not valid for younger children.¹¹

On the other hand, it should be kept in mind that even though causal relationship between homeownership/mobility and teenage students' educational attainments can be established, we should still remain cautious when proposing policy recommendations. Public investment in homeownership tends to be very costly and may divert funding that could have more direct beneficial effects on children and adolescents' education. For example, as [Aaronson \(2000\)](#) and [Harkness and Newman \(2003\)](#) have argued, too much emphasis on earning down-payment and financing monthly mortgages payment may absorb disproportionate parts of parents' energy and consequently crowd out their time and money on their children's educational development. This critique also applies to policy recommendations to limit residential mobility. Restricted mobility may reduce one's chance to get a better-paid job or find a higher-quality school.

Thus, until now, the research in this field only offers partial-equilibrium analysis of the impacts of residential factors on adolescents' educational development. However, externalities of homeownership/mobility on other respects of adolescents' human development are not well understood yet. For example, [Oswald \(1999\)](#) suggests that high levels of homeownership may produce social costs by reducing job mobility and raising natural rate of unemployment. Further, [Kemeny \(1978a, 1980\)](#) proposes an influential hypothesis that high rates of home ownership would tend to be correlated with underdeveloped welfare states. As the recent global financial crisis has suggested, in homeowner-dominating societies even a small fluctuation of the home prices would have substantial impacts on household welfare as well as the operation of aggregate economy. The literature has also suggested that in many situations, there are inherent conflicts between homeownership promotion and affordability improvement ([Fischel 2001](#); [Ortalo-magné and Prat 2010](#)).

Thus, it is still too early to judge the overall trade-offs between reduced residential mobility and labour market flexibility. Similarly, homeownership-promoting policy should be carried with great care. Future studies covering a full-range and long-run perspectives of how housing experiences affect adolescents' human development is strongly warranted. Particularly, a longitudinal study that designed specifically to study the relationship between adolescents' academic high-school performance (and maybe even subsequent academic performance) and his or her homeownership and residential mobility would be warmly welcomed.¹²

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¹¹ Thanks for an anonymous referee for pointing out this.

¹² Thanks for an anonymous referee for suggesting this.

References

- Aaronson D (2000) A note on the benefits of homeownership. *J Urban Econ* 47(3):356–369
- Andersson E (2004) From valley of sadness to hill of happiness—the significance of surroundings for socio-economic career. *Urban Stud* 41(3):641–659
- Andersson E, Subramanian SV (2006) Explorations of neighborhood and educational outcomes for young Swedes. *Urban Stud* 43(11):2013–2025
- Åsberg P (1999) Housing decisions of young Swedish adults. *J Hous Econ* 8(2):116–143
- Astone NM, McLanahan SS (1994) Family-structure, residential-mobility, and school dropout—a research note. *Demography* 31(4):575–584
- Brännström L (2008) Making their mark: the effects of neighbourhood and upper secondary school on educational achievement. *Eur Sociol Rev* 24(1):463–478
- Boehm TP, Schlottmann AM (1999) Does home ownership by parents have an economic impact on their children? *J Hous Econ* 8(3):217–232
- Borjas GJ (1995) Ethnicity, neighborhoods, and human capital externalities. *Am Econ Rev* 85(3):365–390
- Caspi A, Wright BRE, Moffitt TE, Silva PA (1998) Early failure in the labor market: childhood and adolescent predictors of unemployment in the transition to adulthood. *Am Sociol Rev* 63(3):424–451
- Crane J (1991) The epidemic theory of ghettos and neighborhood effects on dropping out and teenage childbearing. *Am J Sociol* 96:1126–1159
- Davidson R, MacKinnon JG (1993) Estimation and inference in econometrics. Oxford University Press, New York
- Dearden L, Ferri J, Meghir C (2002) The effect of school quality on educational attainment and wages. *Rev Econ Stat* 84(1):1–20
- Dietz RD, Haurin DR (2003) The social and private micro-level consequences of homeownership. *J Urban Econ* 54(3):401–450
- DiPasquale D, Glaeser EL (1999) Incentives and social capital: are homeowners better citizens? *J Urban Econ* 45(2):354–384
- Durbin J (1954) Errors in variables. *Rev Int Stat Inst* 22(2):23–32
- Edin P-A, Fredriksson P (2000) LINDA-longitudinal individual data for Sweden. Working paper No. 19. Department of Economics, Uppsala University
- Erikson R, Jonsson JO (eds) (1996) Can education be equalized?: the Swedish case in comparative perspective. Westview Press, Oxford
- Fischel WA (2001) The homevoter hypothesis: how home values influence local government taxation, school finance, and land-use policies politics. Harvard University Press, Cambridge MA
- Galster G (1983) Empirical evidence on cross-tenure differences in home maintenance and conditions. *Land Econ* 59:107–113
- Galster G, Andersson R, Musterd S, Kauppinen T (2008) Does neighborhood income mix affect earnings of adults? New evidence from Sweden. *J Urban Econ* 63(3):858–870
- Galster G, Marcotte DE, Mandell MB, Wolman H, Augustine N (2007) The impact of parental homeownership on children's outcomes during early adulthood. *Hous Policy Debate* 18(4):785–827
- Gaspar J, DeLuca S, Estacion A (2009) Coming and going: the effects of residential and school mobility on delinquency. *Soc Sci Res* 39(3):459–476
- Goux D, Maurin E (2005) The effect of overcrowded housing on children's performance at school. *J Public Econ* 89(5–6):797–819
- Green RK, White MJ (1997) Measuring the benefits of homeownership: effects on children. *J Urban Econ* 41(3):441–461
- Harding DJ (2003) Counterfactual models of neighborhood effects: the effect of neighborhood poverty on high school dropout and teenage pregnancy. *Am J Sociol* 109(3):676–719
- Haurin DR, Parcel T, Haurin RJ (2002) Does homeownership affect child outcomes? *Real Estate Econ* 30(4):635–666
- Hausman J (1978) Specification tests in econometrics. *Econometrica* 46(6):1251–1271
- Haveman R, Wolfe B, Spaulding J (1991) Childhood events and circumstances influencing high school completion. *Demography* 28(1):133–157
- Harkness JM, Newman SJ (2002) Differential effects of homeownership on children from higher- and lower-income families. *J Hous Res* 14(1):1–19

- Harkness JM, Newman SJ (2003) Effects of homeownership on children: the role of neighborhood characteristics and family income. *Economic Policy Review*, Federal Reserve Bank of New York, pp 87–107
- Holmlund B, Liu Q, Nordström Skans O (2008) Mind the gap? Estimating the effects of postponing higher education. *Oxf Econ Pap* 60(4):683–710
- Humke C, Schaefer C (1995) Relocation: a review of the effects of residential mobility on children and adolescents. *Psychol J Hum Behav* 32(1):16–24
- Ioannides YM (1987) Residential mobility and housing tenure choice. *Reg Sci Urban Econ* 17(2):265–287
- Jackson MI, Mare RD (2007) Cross-sectional and longitudinal measurements of neighborhood experience and their effects on children. *Soc Sci Res* 36(2):590–610
- Kane TJ (1994) College entry by blacks since 1970: the role of college costs, family background, and the returns to education. *J Polit Econ* 102(5):878–907
- Kauppinen TM (2008) Schools as mediators of neighbourhood effects on choice between vocational and academic tracks of secondary education in Helsinki. *Eur Sociol Rev* 24(1):379–391
- Kemeny J (1978a) Forms of tenure and social structure. *Br J Sociol* 29(1):41–56
- Kemeny J (1978b) Urban home-ownership in Sweden. *Urban Stud* 15(3):313–320
- Kemeny J (1980) Home ownership and privatisation. *Int J Urban Reg Res* 4(3):372–388
- King MA (1980) An econometric model of tenure choice and demand for housing as a joint decision. *J Public Econ* 14(2):137–159
- Lien H-M, Wu W-C, Lin C-C (2008) New evidence on the link between housing environment and children's educational attainments. *J Urban Econ* 64(2):408–421
- Lundborg P, Skedinger P (1998) Capital gains taxation and residential mobility in Sweden. *J Public Econ* 67(3):399–419
- Maurin E (2002) The impact of parental income on early schooling transitions: a re-examination using data over three generations. *J Public Econ* 85(3):301–332
- Musterd S, Andersson R (2006) Employment, social mobility and neighbourhood effects: the case of Sweden. *Int J Urban Reg Res* 30(1):120–140
- Ortalo-magné F, Prat A (2010) On the political economy of Urban growth : homeownership against affordability. London
- Oswald AJ (1999) The housing market and Europe's unemployment: a non-technical paper. Unpublished paper, University of Warwick, Department of Economics
- Pettit B, McLanahan S (2003) Residential mobility and children's social capital: evidence from an experiment. *Soc Sci Q* 84(3):632–649
- Pribesh S, Downey DB (1999) Why are residential and school moves associated with poor school performance?. *Demography* 36(4):521–534
- Rohe W, Stewart L (1996) Homeownership and neighborhood stability. *Hous Policy Debate* 7(1):37–81
- Strassmann WP (1991) Housing market interventions and mobility: an international comparison. *Urban Stud* 28(5):759–771
- Sykes B, Musterd S (2010) Examining neighbourhood and school effects simultaneously: what does the Dutch evidence show?. *Urban Stud* 48(7):1307–1331
- Temple JA, Reynolds AJ (1999) School mobility and achievement: longitudinal findings from an urban cohort. *J Sch Psychol* 37(4):355–377
- Turner B (1997) Housing cooperatives in Sweden: the effects of financial deregulation. *J Real Estate Finance Econ* 15(2):193–217
- Van Ommeren Jos, Van Leuvensteijn M (2005) New evidence of the effect of transaction costs on residential mobility. *J Reg Sci* 45(4):681–702
- Watson D (2009) Do Europeans view their homes as castles? Homeownership and poverty perception throughout Europe. *Urban Stud* 46(9):1787–1805
- Wooldridge J (2002) *Introductory econometrics: a modern approach*, 2nd edn. South-Western College Publishing, New York
- Wu D-M (1973) Alternative tests of independence between stochastic regressors and disturbances. *Econometrica* 41(4):733–750