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Socio-Spatial Mobility and Inequalities in Adolescent Agency: A Longitudinal Study From Peru

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ABSTRACT

This study examines how socio-spatial mobility across middle childhood and early adolescence is associated with perceived agency, using five waves of Young Lives Peru panel data (ages 8–15; $N = 2,099$). A multidimensional measure of socio-spatial mobility is constructed to capture residential moves, rural-urban transitions, and poverty trajectories. Their combined associations with agency at age 15 are estimated using linear, lagged, and time-aligned models. Results reveal substantial heterogeneity across mobility pathways. Upward spatial mobility, particularly transitions from rural into urban, resource-rich environments, is associated with higher levels of agency, net of household characteristics, contextual conditions, and time-varying shocks. Children remaining in persistent rural poverty consistently report the lowest levels of agency, as do those exposed to repeated residential moves, pointing to a destabilising effect of chronic spatial disruption. These patterns are robust to alternative model specifications, including adjustments for prior levels of agency, and indicate that the implications of socio-spatial mobility depend on whether movement reflects access to opportunity or exposure to instability. Overall, the findings underscore how spatial inequalities become internalised during adolescence, with implications for the persistence of disadvantage over the life course.

1 | Introduction

Adolescence is a crucial period for the development of self-efficacy and a broader sense of personal agency. Pubertal and neurodevelopmental changes reshape how young people perceive themselves and their environments (Bandura 1986; Blakemore et al. 2010; Hansen and Jessop 2017). During these years, agency emerges as the capacity to formulate intentions and carry them out (Shanahan and Hood 2000), coinciding with the consolidation of identity and the integration of strategic thinking (Bühler and Massarik 1968; Clausen 1991; Erikson 1968; Larson et al. 2014). Yet many adolescents grow up in unstable environments with frequent moves and economic fluctuations, which can hinder their development. Such disruptions may limit young people's ability to anticipate, plan,

and pursue long-term goals, pushing them towards more reactive orientations. Although spatial transitions and residential instability are recognised as key mechanisms through which structural inequalities manifest over the life course (Gambaro et al. 2017; Gambaro et al. 2022), far less is known about how specific spatial and economic mobility pathways relate to the development of agency during early adolescence. While residential mobility in adulthood is often interpreted as an expression of individual agency, in childhood it primarily constitutes a formative context within which agency develops. Children may exercise forms of agency within mobility processes, but these are typically embedded in caregivers' decisions. This underscores the importance of examining how early-life mobility trajectories relate to the formation of perceived agency.

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Agency is a central but contested concept across the social sciences, with sociological approaches typically emphasising observable decision-making and the capacity to act upon and transform structural conditions, and psychological traditions focusing instead on subjective or perceived agency, understood as individuals' sense of control, autonomy, and efficacy. In this study, agency is conceptualised as a subjective orientation that captures the perceived ability to influence one's circumstances, rather than directly observed behaviour. From a bounded agency perspective, this subjective sense of control is shaped by material, social, and spatial contexts (Evans 2007). Children's capacity to act is therefore simultaneously influenced by cognitive resources and by the environments in which they grow up. To capture these dynamics, a new composite measure of socio-spatial mobility is introduced, tracing household trajectories across poverty status, urbanicity, and residential stability from ages 8 to 15 using data from *Young Lives* Peru ($N = 2,099$). This multidimensional approach captures the interplay between economic conditions, spatial setting, and residential moves, dimensions often examined separately in prior research.

Existing evidence suggests that frequent relocations can disrupt adolescents' social ties, educational continuity, and access to supportive networks that scaffold planning and goal setting (Anderson and Leventhal 2017). However, the consequences of mobility depend heavily on context: some moves provide access to higher-quality schools, safer neighbourhoods, and better services, while others reflect instability or economic stress (Elder 1998). The Peruvian case offers a unique opportunity to examine the spatial and developmental consequences of mobility. *Young Lives* data show that Peruvian children often experience shifting poverty conditions, rural-urban transitions, and constrained access to high-quality services (University of Oxford 2019). Age 15 represents a pivotal transition point when adolescents begin making decisions about schooling and identity, and when spatial and socio-economic inequalities tend to crystallise (Hitlin and Elder 2007; Shanahan 2000). Yet little is known about how distinct (but often simultaneous) forms of socio-spatial instability shape agency at this turning point. This study addresses this gap by integrating poverty trajectories, spatial settings, and residential mobility into a unified analytic framework. By situating adolescent development within broader spatial and socio-economic processes, it offers new insights into how place-based inequalities become embedded in young people's capacity to act with purpose, with implications for understanding stratification across the life course.

2 | Bounded Agency in Contexts of Social and Spatial Disruptions

Bounded agency theory highlights that while young people actively shape their life paths, their choices are constrained by the social, economic, and spatial environments in which they grow up (Shanahan and Hood 2000). From a life-course perspective, such constraints are especially consequential during periods of transition, when timing and place shape developmental opportunities and risks (Elder 1995; Heinz and Marshall 2003). Sen (1985) notion of "conversion factors" similarly emphasises that agency depends not only on the desire to act but on the environmental, social, and personal conditions

that enable resources to be transformed into meaningful opportunities. Exposure to disadvantaged and unstable settings can therefore restrict both the motivation to act and the perceived capacity to do so.

Within the bounded agency and life-course traditions, agency is often operationalised through subjective orientations, such as perceived control, aspirations, and self-efficacy, which mediate the relationship between structural conditions and individual trajectories (Macmillan 2007). These dimensions capture how individuals interpret their position within constrained environments and anticipate future possibilities, even when the enactment of agency through observable decision-making remains difficult to measure directly. A central insight is the developmental significance of disruption, or what Thomas and Thomas (1932) termed "crisis": moments when established routines lose their effectiveness. Spatial disruptions, such as frequent residential moves, neighbourhood changes, or rural-urban transitions, can sever social ties, interrupt schooling, and undermine psychological well-being, especially when compounded by poverty and limited institutional support (Anderson and Leventhal 2017; Haynie and South 2005; Simsek et al. 2021). Life-course scholarship consistently shows that such crises accumulate over time, producing durable inequalities in later life (Dannefer 2003; DiPrete and Eirich 2006). Timing is also crucial, especially during adolescence, a sensitive period where important changes in identity and education heighten the impact of instability (Crockett and Silbereisen 2000; Elder 1998). In this sense, early disruptions are both immediate experiences and temporal signals that shape how young people interpret their opportunities and constraints and envision their futures. Sociological accounts of modern uncertainty (Bauman 2007; Beck 1992) underscore how such disruptions reverberate beyond the present, constraining both current options and future horizons.

Still, transitions may also open adaptive pathways. Shanahan and Hood (2000) argue that change can prompt individuals to develop new behavioural strategies to regain control. Elder (1995) work similarly shows that the effects of residential mobility depend on biographies and material conditions: moves undertaken to access better schools, safer neighbourhoods, or stronger social networks can expand developmental opportunities (Bronfenbrenner 1979; Chetty and Hendren 2018). From a resilience perspective, agency grows through overcoming manageable challenges that reinforce a sense of competence and perceived control (Masten 2015, 2021). Moderate instability can therefore foster self-efficacy, whereas persistent or layered forms of disruption are more likely to overwhelm coping capacities.

Because theories of agency have largely been developed in Western contexts, their broader applicability requires careful attention to variation in structural conditions and cultural norms. Cross-national evidence suggests both contextual specificity and broad underlying regularities. Seiffge-Krenke et al. (2012) 18-country study shows that while coping styles and stress perceptions vary culturally, core constructs such as control beliefs remain meaningful across settings. Likewise, Deng et al. (2022) review of migrant children demonstrates that even under constraints such as poverty, legal precarity, and

displacement, young people routinely exercise goal-directed behaviour. Their findings position agency as inherently relational and spatially embedded, emerging from the opportunities and restrictions produced by families, institutions, and wider socio-economic environments.

3 | Case Study: Peru

The Peruvian context provides a compelling lens through which to examine the connections among poverty, mobility, and adolescent growth. While Peru has made notable progress in household welfare over the past twenty years (Central Bank of Peru 2016), structural inequalities persist, particularly between rural and urban areas. These gaps reflect differences in educational performance (Arteaga and Glewwe 2014), cognitive skills (Castro and Rolleston 2015), and disparities in child health and nutrition (Shin 2007). The legacies of poverty and instability in Peru are further accentuated by the consequences of two decades of internal armed conflict (1980–2000). Using maternal migration histories, Hidalgo-Aréstegui et al. (2025) showed that parental mobility during this conflict partially mitigated the negative impact of conflict exposure on children's socio-emotional development. Although the adjusted effects remained significant, their magnitude decreased when accounting for maternal migration. Importantly, exposure during early childhood (ages 0–5) and adolescence (ages 11–19) had the most detrimental effects, echoing broader developmental evidence on the sensitivity of these life stages.

One of the country's defining characteristics is its high level of internal residential mobility. This dynamic is reflected in the trajectories of the *Young Lives* sample itself. Although the study was initially drawn from a fixed set of sentinel sites, the subsequent dispersion of participants from 27 districts across 13 regions in 2002 to nearly 300 districts across all 24 regions by 2016 reflects households' residential mobility over time. Such mobility is often a household response to poverty, typically driven by the search for employment or improved access to services, as reported in Escobal and Flores (2009). Their study reveals that the developmental implications for children are frequently negative, especially when mobility occurs alongside chronic deprivation. Frequent moves are associated with school discontinuity, reduced access to healthcare, and weakened social support systems, all of which may undermine cognitive and socio-emotional development. The consequences of mobility were also geographically stratified. Urban children are more likely to benefit from residential moves, while moves between rural areas rarely result in advantages. Similarly, Espinoza-Revollo and Ogando-Portela (2019) find that adolescents living in urban areas report significantly higher levels of agency compared to their rural peers. They also observe a clear educational gradient: youth whose caregivers had completed postsecondary education exhibited stronger agency at age 15. These findings align with those of Favara and Sánchez (2017), who underscore the role of socioeconomic resources in shaping adolescents' psychosocial outcomes. In summary, these studies highlight that residential mobility in Peru is often a stratified form of instability, generating opportunities under certain conditions but more frequently compounding disadvantage when combined with poverty, rural marginality, and structural inequalities.

4 | Data and Measures

4.1 | Sample

The analysis presented in what follows draws on data from the *Young Lives* study in Peru. Sampling was conducted across 20 sentinel sites selected using the 2001 FONCODES poverty map. The wealthiest 5% of districts were excluded from the sampling frame, resulting in a deliberate over-representation of socio-economically disadvantaged areas. As a result, approximately 75% of the sampled children lived in impoverished areas, and 25% in non-poor areas. The sample is therefore not nationally representative of the Peruvian population but is designed to capture variation within and across contexts of disadvantage.

The dataset comprises two cohorts: an older cohort born in 1994/95 and a younger cohort born in 2001/02. The study spans five rounds and encompasses fifteen years of data collection (2002–2016). Attrition is remarkably low: 91% of the original younger cohort and 85% of the older cohort were re-interviewed in the final round (Sánchez and Escobal 2020). To maximise statistical power and temporal depth, I have harmonised data from both cohorts, aligning variables within a common age window of 8 to 15 years and constructing parallel exposure measures for key life domains (e.g., residential mobility, poverty trajectories, and family conditions) within this shared developmental period. The initial sample includes 2,766 observations. The analytical sample is restricted to cases with non-missing information on the outcome, the socio-spatial mobility measure, and all covariates included in the regression models. This results in a baseline analytical sample of $N = 2,099$. Missing data are handled through listwise deletion.

As shown in supplementary analyses (available upon request), missingness is not concentrated in a single variable but reflects cumulative non-response across several measures, including family structure, maternal characteristics, and the agency index. Missing data on the outcome variable accounts for approximately 10% of cases, while additional reductions arise from covariates such as family breakdown and maternal age. To assess potential selection bias due to missing data, logistic regression models were estimated predicting inclusion in the analytical sample. Results indicate that inclusion is not systematically associated with most demographic and contextual variables, including gender, ethnicity, and exposure to high-crime environments. Some differences are observed in socioeconomic characteristics, with children from less-educated households and those with younger mothers being slightly less likely to be included, reflecting higher levels of missingness in these groups. However, there is no evidence that inclusion is strongly patterned by the main socio-spatial exposure.

4.2 | Outcome: Agency Index at Age 15

The outcome variable of interest is perceived agency at age 15. The survey includes five Likert-style items, which were standardised (z-scored) and then summed to form a composite score, following previous operationalisation with *Young Lives* data (Espinoza-Revollo and Ogando-Portela 2019; Favara and Sánchez 2017; Yorke and Ogando-Portela 2018). The original items measure the extent to which adolescents agree with the

following statements: ‘*If I try hard, I can improve my situation in life*’; ‘*I like to make plans for my future studies and work*’; ‘*If I study hard at school, I will be rewarded by a better job in the future*’; as well as reverse-coded items indicating limited autonomy (e.g., ‘*Other people in my family make all the decisions*’, and ‘*I have no choice about the work I do – I must work*’). They capture three interrelated domains: future orientation, effort-outcome contingency, and perceived autonomy. These facets represent distinct but complementary expressions of young people’s capacity to act within structural constraints. This formulation is consistent with sociological and developmental definitions of instrumental and developmental agency, emphasising an individual’s perceived ability to pursue goals and impact social trajectories (Bandura 1977; Rotter 1966).

4.3 | Socio-Spatial Mobility in the Transition to Adolescence

This study introduces a categorical measure that captures the intersection of three dimensions—household poverty status, residential setting (urban or rural), and residential mobility—across two age intervals: middle childhood (8–12), and early adolescence (12–15). These specific intervals were selected because they represent the period during which all three dimensions are concurrently available for both the younger and older cohorts in the *Young Lives* study.

The construction of the *socio-spatial mobility* measure proceeded in three steps. First, at each observed round, children were classified as living in an urban or rural site. Using this information, I created a sequence of observed site types and classified children by their first and last observed locations. Children who were observed only in urban sites were classified as ‘always urban’, while those observed only in rural sites were classified as ‘always rural’. Children whose first observed site was rural and last observed site was urban were classified as ‘rural to urban’. Less common trajectories, including urban to rural and non-linear transitions such as rural-urban-rural or urban-rural-urban, were collapsed into an ‘other transitions’ category.

Second, I measured economic disadvantage using the household wealth index observed across the same period. The wealth index is the primary measure of socio-economic status in the *Young Lives* study (Briones 2017) and is constructed as the simple average of three equally weighted sub-components: housing quality, access to services, and ownership of consumer durables. Housing quality includes structural features such as wall, roof, and floor materials, as well as household crowding, measured by the number of rooms per capita. Access to services indicates whether households have electricity, safe drinking water, sanitation, and modern cooking fuel. The consumer durables component tracks ownership of assets like radios, TVs, refrigerators, and vehicles, with country-specific lists reflecting local standards. Each sub-component is normalised between 0 and 1 and combined with equal weights to form an overall index measuring living conditions.

Given the sampling design of the *Young Lives* study, which oversamples disadvantaged households, relative measures of deprivation based on the sample distribution may mask meaningful

variation at the lower end of the socio-economic spectrum. Across survey rounds, the wealth index is centred well above the lower bound of the scale, with means ranging from approximately 0.55 to 0.63 and medians from 0.56 to 0.66. Accordingly, I apply a fixed cutoff of 0.25 on the wealth index to capture households located in the lower tail of the distribution, reflecting comparatively severe economic disadvantage within the sample. At each survey round, households below this threshold are classified as low wealth. Children with no low-wealth observations were classified as never low wealth, those with one low-wealth observation as occasionally low wealth, and those with two or more low-wealth observations as persistently low wealth. For the main composite exposure, I collapsed this into a binary poverty indicator distinguishing ‘never poor’ from ‘ever poor’, where the latter combines occasional and persistent low-wealth exposure.

Third, I combined poverty exposure with urban-rural trajectory and residential mobility status to create the main socio-spatial mobility categories. Each child was classified based on: (1) whether they lived consistently in rural or urban areas; (2) whether they ever experienced poverty; and (3) whether they changed residence at least once during the observation period. This yielded categories such as ‘Never poor, always rural, no move’ or ‘Ever poor, always urban, any move’. This measure aims to move beyond additive models of risk by accounting for how compound forms of disadvantage (e.g., moving while poor in a rural area) may generate developmental pressures that differ from those of any single factor. At the same time, it allows for the identification of potentially protective or opportunity-enhancing pathways, such as residential mobility accompanied by economic stability or urban access. In supplementary models, I decomposed the composite measure into its constituent dimensions (i.e., poverty persistence, urban-rural trajectory, and movement timing) to assess whether the main associations were driven by economic disadvantage, spatial context, or residential mobility.

To complement the composite socio-spatial mobility measure, I include an additional indicator that identifies children who moved across more than one age interval (0–8, 8–12, and 12–15), thereby distinguishing between isolated moves and repeated residential disruptions. While the main socio-spatial typology is restricted to the harmonised age 8–15 window, where poverty, urban-rural context, and residential mobility can be jointly observed across cohorts, this indicator incorporates early-life moves derived from retrospective move histories. Because mobility before age 8 is not measured in a fully comparable way to the later observation window, it is not included in the composite exposure. Instead, this measure serves as a separate proxy for cumulative *residential instability*, capturing the extent to which children are exposed to repeated environmental disruptions throughout childhood.

4.4 | Confounders and Contextual Factors

To account for family background and conditions, model specification incorporates the following covariates: *parental education*, categorized into tiers (none, primary, secondary, as the reference category, and post-secondary) and measuring the highest level of schooling attained by either caregiver; *family structure disruptions*, such as parental separation or death;

maternal age at childbirth, which is standardized; child's *sex*, *age* (in months) and *ethnicity* (Mestizo vs. non-Mestizo). A cohort indicator is also included to account for differences between the younger and older cohorts in the *Young Lives* study. These controls ensure that the effects of mobility are not conflated with underlying family demographic characteristics known to influence adolescent development.

The models additionally adjust for *sustained exposure to high-crime environments* as a proxy for adolescents' exposure to local environmental conditions characterised by insecurity and social disorder. Since the *Young Lives* study collects data approximately every 3.5 years, these round-level observations provide repeated snapshots that approximate the socio-environmental contexts in which children and adolescents lived over time. This measure is derived from a community-level questionnaire administered to key informants (e.g., politically appointed leaders, health workers, teachers, school headmasters, religious leaders), who provide information on the social, economic, and environmental context of each community where cohort members and their families reside. Importantly, community-level data are collected for the locations where children are observed at each survey round, so that the set of observed communities expands over time as households move, rather than being restricted to the original sentinel sites. At each round, these informants reported whether daily life in the community was 'significantly affected' by specific forms of crime and disorder, including theft, violent crime, youth gangs, prostitution, drug selling, drug addiction or alcoholism. These responses were recoded so that 'yes' was coded as 1, 'no' as 0, and 'not mentioned' or 'don't know' as missing. A community-level crime score was then calculated as the mean of these items, ranging from 0 (no listed problems present) to 1 (all problems present), capturing the overall salience and co-occurrence of crime-related problems within each locality rather than the incidence of specific events.

To generate a single longitudinal measure, scores from all available rounds were aggregated at the community level and averaged over time, producing a composite value that reflects the persistent level of crime and social disorder in each locality over the study period. Average crime exposure was calculated for each child between the ages of 8 and 15. It was computed by taking the mean of the child's annual crime exposure scores in the three rounds conducted over this age span. Specifically, children whose average crime score fell within the top 25% of the distribution (i.e., above the 75th percentile) were classified as having lived in a high-crime area.

A description of the categorical variables used in multivariate models is provided in Table 1, while Table 2 summarises the means and standard deviations of the agency index by socio-spatial mobility categories.

5 | Analytical Approach

The empirical strategy combines a cumulative life-course perspective with supplementary longitudinal specifications to balance interpretability and temporal alignment. The main specification treats socio-spatial mobility as a bundled exposure measure, integrating poverty exposure, residential mobility, and urban-rural trajectories into a single categorical variable. By summarising

TABLE 1 | Descriptive statistics by analytical sample.

	<i>n</i> (%)
Socio-spatial mobility pattern	
Never poor Always Rural No Move	214 (10.2)
Never poor Always Rural Any Move	73 (3.5)
Never poor Always Urban No Move	785 (37.4)
Never poor Always Urban Any Move	650 (31.0)
Never poor Rural to Urban	45 (2.1)
Never poor Other transitions	52 (2.5)
Ever poor Always Rural No Move	130 (6.2)
Ever poor Always Rural Any Move	52 (2.5)
Ever poor Always Urban No Move	28 (1.3)
Ever poor Always Urban Any Move	29 (1.4)
Ever poor Rural to Urban	24 (1.1)
Ever poor Other transitions	17 (0.8)
Residential instability	
Moved over multiple periods	322 (15.3)
Didn't move or moved in one age-range only	1,777 (84.7)
Sustained exposure to high-crime environments	
Yes	525 (25.0)
No	1,574 (75.0)
Family breakdown	
Always with both parents	1,553 (74.0)
Otherwise	546 (26.0)
Parental higher education	
None	31 (1.5)
Primary	573 (27.3)
Secondary	973 (46.4)
Post-secondary	522 (24.9)
Sex	
Male	1,074 (51.2)
Female	1,025 (48.8)
Ethnic group	
Mestizo	1,934 (92.1)
Non-Mestizo	165 (7.9)
Cohort	
Young (born in 2001/02)	1,518 (72.3)
Old (born in 1994/95)	581 (27.7)
Total observations	2,099

exposure histories into discrete categories, this approach prioritises interpretability and enables comparison of theoretically meaningful combinations of economic and spatial conditions.

To assess whether these associations reflect pre-existing differences in agency, I estimate a lagged specification that additionally controls for agency at age 12. Agency at age 12 is the only prior measure available in a comparable form across both cohorts and thus provides the most suitable baseline for

TABLE 2 | Mean values and standard deviations of the agency index at age 15 by socio-spatial mobility categories.

	Mean (SD) agency at age 15
Sample mean (SD)	0.01 (0.54)
<i>Socio-spatial mobility pattern</i>	
Never poor Always Rural No Move	-0.09 (0.54)
Never poor Always Rural Any Move	-0.14 (0.45)
Never poor Always Urban No Move	0.07 (0.55)
Never poor Always Urban Any Move	0.09 (0.53)
Never poor Rural to Urban	0.08 (0.44)
Never poor Other transitions	-0.06 (0.44)
Ever poor Always Rural No Move	-0.25 (0.50)
Ever poor Always Rural Any Move	-0.16 (0.49)
Ever poor Always Urban No Move	-0.21 (0.40)
Ever poor Always Urban Any Move	-0.25 (0.55)
Ever poor Rural to Urban	-0.10 (0.43)
Ever poor Other transitions	0.04 (0.65)

harmonised adjustment. Given that prior agency may itself be shaped by earlier socio-spatial conditions, this specification is interpreted as a more conservative test of the main associations rather than as a causal adjustment. To more closely align exposure timing with outcome measurement, I further estimate a time-aligned person-period model. In this specification, observations at ages 12 and 15 are stacked, and agency at each age is linked to socio-spatial exposure in the immediately preceding interval (ages 8–12 and 12–15, respectively). This approach allows for analysing how socio-spatial exposure during a particular period affects agency by the *end of that period*. Each child contributes up to two observations, and a child-level random intercept accounts for repeated observations within individuals. This model leverages the longitudinal structure of the data to examine whether period-specific socio-spatial contexts are associated with agency at the end of the corresponding developmental stage. The resulting coefficients can be interpreted as differences in agency associated with exposure histories within each interval, averaged across the two age periods.

Additional analyses examine the sensitivity of the results to alternative modelling choices and measurement assumptions. First, the composite exposure is decomposed into its constituent dimensions to assess whether the observed associations are driven by specific components rather than their combined configuration. Second, the analysis is replicated using alternative poverty thresholds to evaluate the robustness of the findings to different definitions of low wealth. Finally, to address potential concerns related to sparse categories and estimation uncertainty, particularly for less common mobility trajectories, the baseline specification is re-estimated using Bayesian linear regression with weakly informative priors.

6 | Results

6.1 | Baseline Associations: Cumulative Socio-Spatial Mobility and Agency

Table 3 (Model 1) presents the baseline association between cumulative socio-spatial mobility and agency at age 15.

Compared with the reference group (i.e., never-poor youth who remained in rural areas and did not move), several relatively advantaged socio-spatial trajectories were associated with higher agency. Never-poor youth who consistently lived in urban settings without moving had higher agency scores ($b = 0.099$, $p = 0.023$), as did never-poor youth in urban settings who moved at least once ($b = 0.163$, $p < 0.001$). Never-poor youth who transitioned from rural to urban areas also reported higher agency ($b = 0.202$, $p = 0.021$). In contrast, agency is lowest among those exposed to both poverty and rural immobility ($b = -0.185$, $p = 0.002$).

Among covariates, being female was significantly associated with higher agency scores ($b = 0.149$, $p < 0.001$), as was having a parent with a post-secondary education ($b = 0.115$, $p < 0.001$), while parental primary education was associated with lower agency ($b = -0.083$, $p = 0.007$). Older maternal age at birth was positively associated with agency, though only marginally significant ($b = 0.020$, $p = 0.099$). No statistically significant differences were observed by ethnic identity. Living in high-crime neighbourhoods between ages 8 and 15 was associated with significantly lower agency ($b = -0.056$, $p = 0.045$). This result suggests that prolonged exposure to unsafe environments can dampen young people's sense of personal control, net of socioeconomic status and household disruption. Having experienced multiple moves across different developments is also negatively associated with the outcome ($b = -0.105$, $p = 0.005$).

6.2 | Temporal Robustness: Lagged and Time-Aligned Models

To assess whether these associations reflect pre-existing differences in agency, Model 2 introduces a lagged specification controlling for agency at age 12. Agency shows moderate persistence over time ($b = 0.17$, $p < 0.001$), yet the pattern of socio-spatial associations remains substantively unchanged. Never-poor youth in urban settings without moving ($b = 0.085$, $p = 0.049$), never-poor youth in urban settings who moved ($b = 0.146$, $p = 0.001$), and never-poor youth who moved from

TABLE 3 | Baseline and lagged specifications.

	Model 1. Baseline	Model 2. Lagged
Socio-spatial mobility pattern (ref.= Never poor Always rural No move)		
Never poor Always rural Any move	−0.04 (0.07)	−0.04 (0.07)
Never poor Always urban No move	0.10* (0.04)	0.08* (0.04)
Never poor Always urban Any move	0.16*** (0.05)	0.15** (0.05)
Never poor Rural to urban	0.20* (0.09)	0.21* (0.09)
Never poor Other transitions	0.06 (0.08)	0.05 (0.08)
Ever poor Always rural No move	−0.18** (0.06)	−0.18** (0.06)
Ever poor Always rural Any move	−0.03 (0.08)	−0.04 (0.08)
Ever poor Always urban No move	−0.12 (0.10)	−0.10 (0.11)
Ever poor Always urban Any move	−0.12 (0.10)	−0.10 (0.10)
Ever poor Rural to urban	−0.01 (0.11)	−0.01 (0.11)
Ever poor Other transitions	0.15 (0.13)	0.16 (0.13)
Residential instability (ref.= Didn't move or moved in one age-range only)		
Moved over multiple periods	−0.10** (0.03)	−0.11** (0.04)
Sustained exposure to high-crime environments (ref.= no)		
Yes	−0.05* (0.02)	−0.06* (0.02)
Family breakdown (ref.= Always with both parents)		
Otherwise	−0.01 (0.02)	−0.02 (0.03)
Parental higher education (ref.= Secondary)		
None	−0.05 (0.10)	−0.03 (0.10)
Primary	−0.08** (0.03)	−0.06* (0.03)
Post-secondary	0.11*** (0.02)	0.10*** (0.02)
Maternal age at childbirth (scaled)	0.02 (0.01)	0.02 (0.01)
YL child's age in month (scaled)	0.00 (0.00)	0.00 (0.00)
Sex (ref.= Male)		
Female	0.15*** (0.02)	0.13*** (0.02)
Ethnic group (ref.= Mestizo)		
Non-Mestizo	0.05 (0.04)	0.05 (0.04)
Cohort (ref.= Young, born in 2001/02)		
Old (born in 1994/95)	−0.03 (0.02)	−0.02 (0.02)
Prior levels of agency		
Agency index at age 12	—	0.17*** (0.02)
Sample size (N)	2,099	2,090
Adjusted R-squared	0.07	0.10
F-statistic	8.33***	10.44***

Note: Values are beta coefficients with standard errors in parentheses. Model 1 estimates the association between agency at age 15 and a composite measure of socio-spatial mobility, while Model 2 introduces a lagged dependent variable by controlling for agency at age 12.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

rural to urban areas ($b = 0.212$, $p = 0.015$) continued to report higher age-15 agency. Ever-poor youth who remained in rural areas without moving continued to report lower agency ($b = -0.175$, $p = 0.003$). Figure 1 compares the estimated coefficients for socio-spatial mobility categories from the baseline and lagged models, separately for children from never-poor and ever-poor backgrounds.

To more closely align exposure and outcome in time, Table 4 presents the results from a stacked person-period model. In this

specification, agency at age 12 is associated with socio-spatial exposure between ages 8 and 12, whereas agency at age 15 is associated with exposure between ages 12 and 15. Each child contributes up to two observations, and a child-level random intercept accounts for repeated measures. This design ensures that exposure precedes the outcome in each observation and allows the estimation of associations across early adolescence. The results confirm that time-specific socio-spatial exposure is significantly associated with agency ($F = 5.05$, $p < 0.001$). The same set of pathways identified in the baseline model remains

Baseline and lagged linear models

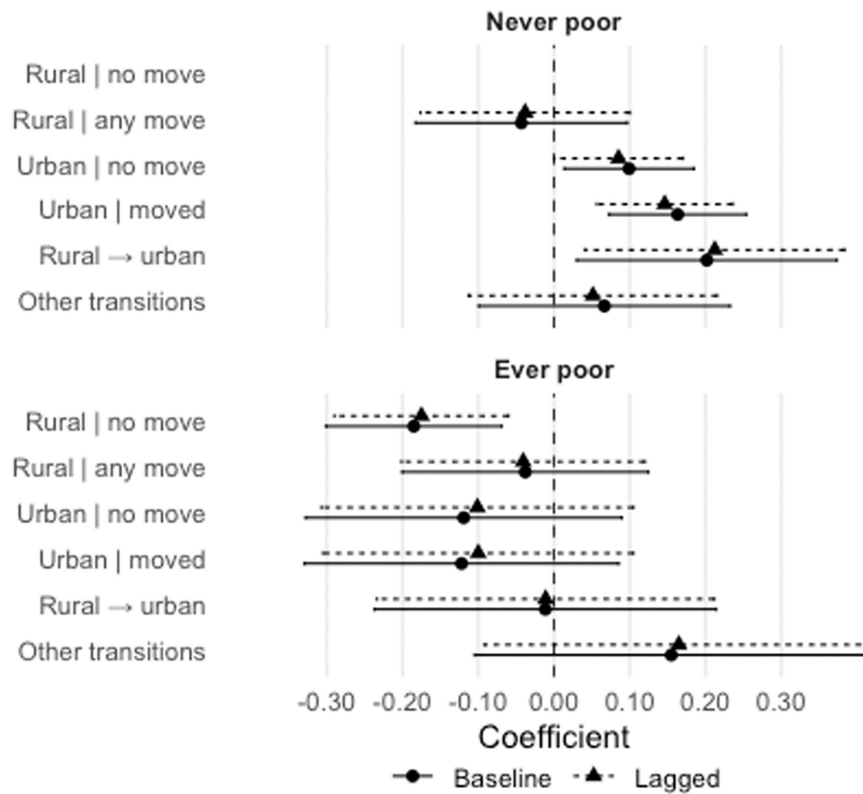


FIGURE 1 | Coefficient plot comparing baseline and lagged linear model.

TABLE 4 | Time-aligned stacked mixed-effects model.

	b (SE)
Socio-spatial mobility pattern (ref. = Never poor Always rural No move)	
Never poor Always urban No move	0.11*** (0.02)
Never poor Always urban Any move	0.12*** (0.04)
Never poor Rural to urban	0.12* (0.06)
Ever poor Always rural No move	-0.08* (0.04)
Observations (person-period)	4,079
Sample size (N)	2,059
F-test (socio-spatial exposure)	5.05***

Note: The table shows the coefficients of a linear mixed model with child-level random intercepts, with a narrowed focus on the socio-spatial pathways that were statistically significant in the baseline model. Estimates are adjusted for all covariates shown in the full model. Socio-spatial exposure is aligned to the preceding developmental period (ages 8–12 for agency at 12; ages 12–15 for agency at 15). The coefficients express the difference in agency associated with a given socio-spatial exposure relative to the reference category, averaged across ages 12 and 15, conditional on exposure being measured in the preceding period.

** $p < 0.01$; * $p < 0.05$; *** $p < 0.001$.

salient. Never-poor children in urban environments exhibit higher agency, whether they remained in urban areas without moving ($b = 0.11$, $p < 0.001$), moved within urban contexts ($b = 0.12$, $p < 0.001$), or transitioned from rural to urban settings ($b = 0.12$, $p = 0.042$). In contrast, children exposed to poverty who remained in rural areas without moving report lower agency ($b = -0.08$, $p = 0.026$).

6.3 | Supplementary Tests

Across alternative poverty thresholds, the results in Table 5 show a high degree of consistency in both magnitude and statistical significance. Children who remained urban without moving show positive and increasing coefficients across thresholds ($b = 0.10$, 0.11 , 0.13), while those who experienced urban mobility display even stronger associations ($b = 0.16$, 0.17 , 0.19). Similarly, rural-to-urban transitions are associated with higher agency ($b = 0.20$, 0.22 , 0.25), indicating that upward spatial mobility is consistently linked to more favourable outcomes. In contrast, children exposed to persistent rural poverty without moving exhibit significantly lower levels of agency ($b = -0.18$, -0.14 , -0.09), although the magnitude of this negative association attenuates slightly at higher poverty thresholds. Importantly, these patterns remain stable despite substantial variation in the proportion of children classified as poor (from 14.5% to 29.7%), suggesting that the findings are not driven by the specific operationalisation of poverty.

The decomposed specification reported in Table 6 separates the composite exposure into poverty persistence, urban trajectory, and timing of residential moves. Persistent low wealth was strongly negatively associated with agency ($b = -0.278$, $p < 0.001$), while occasional low wealth was also negative ($b = -0.095$, $p = 0.035$). By contrast, continuous residence in urban settings ($b = 0.110$, $p = 0.001$) and rural-to-urban trajectories ($b = 0.144$, $p = 0.043$) were positively associated with agency. Movement timing was less consistently associated with agency, although moving only between ages 12 and 15 was marginally positive ($b = 0.092$, $p = 0.064$).

TABLE 5 | Robustness to alternative poverty thresholds.

	Threshold = 0.25	Threshold = 0.30	Threshold = 0.35
Socio-spatial mobility pattern (ref. = Never poor Always rural No move)			
Never poor Always urban No move	0.10* (0.04)	0.11* (0.05)	0.13* (0.06)
Never poor Always urban Any move	0.16*** (0.05)	0.17*** (0.05)	0.19** (0.06)
Never poor Rural to urban	0.20* (0.09)	0.22* (0.10)	0.25* (0.12)
Ever poor Always rural No move	-0.18** (0.06)	-0.14* (0.06)	-0.09 (0.06)
% 'ever poor'	14.5	21.7	29.7
Sample size (N)	2,099	2,099	2,099
Adjusted R-squared	0.07	0.07	0.07

Note: All models include the full set of baseline controls. Given the high degree of stability across specifications, the table focuses on the subset of socio-spatial mobility categories consistently associated with agency in both the baseline and lagged models.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

TABLE 6 | Decomposed exposure model unpacking the relative effects of poverty, spatial trajectory, and mobility timing.

	b (SE)
Exposure to low wealth (ref. = Never)	
Occasionally low wealth	-0.10* (0.04)
Persistently low wealth	-0.27*** (0.06)
Spatial trajectories (ref. = Always rural)	
Always urban	0.11** (0.03)
Rural to urban	0.14* (0.07)
Other transitions	0.09 (0.07)
Residential trajectories (ref. = No moves)	
Moved only between age 0–8	0.04 (0.03)
Moved only between age 8–12	0.01 (0.05)
Moved only between age 12–15	0.09 (0.04)
Moved over multiple periods	-0.06 (0.04)
Sample size (N)	2,099
Adjusted R-squared	0.07
F-statistic	9.66***

Note: Estimates are adjusted for all covariates shown in the full model.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Finally, the Bayesian re-estimation using weakly informative priors to assess sensitivity to sparse categories. The posterior estimates closely matched the baseline lagged model in direction and magnitude (see Table 7). Never-poor youth in always-urban settings who moved had higher agency ($B = 0.15$, 95% CrI: 0.06 to 0.24), as did never-poor youth who moved from rural to urban areas ($B = 0.21$, 95% CrI: 0.04 to 0.38). Never-poor youth in always-urban settings without moving also showed a smaller positive association ($B = 0.09$, 95% CrI: 0.00 to 0.17). Ever-poor youth who remained in rural areas without moving had lower agency ($B = -0.17$, 95% CrI: -0.29 to -0.06).

7 | Conclusions

This study aimed to investigate how cumulative exposure to socio-spatial disruptions influences adolescents' perceived agency at age 15, using data from the *Young Lives* Peru cohort.

Drawing on a bounded agency framework (Evans 2007; Shanahan and Hood 2000), complemented by insights from life course theory (Elder 1998; Heinz and Marshall 2003), it proposed that young people's ability to act with purpose emerges in interaction with material, social, and environmental conditions. Across specifications, the results consistently converge on the same conclusion: socio-spatial mobility is associated with adolescent agency, but the benefits are concentrated among youth who are not exposed to poverty.

On average, adolescents who moved under stable and resource-rich conditions reported higher agency scores compared to the reference group (children who were never poor and have been stably living in rural areas during their childhood). Mobility within rural areas does not positively affect self-efficacy; instead, it shows a marginal reduction in the agency index. The strongest positive association is observed among children who moved from rural to urban settings: this group reported significantly higher levels of agency at age 15, underscoring the developmental benefits that may accompany spatial transitions out of structurally disadvantaged contexts. Such patterns of ascending social mobility constitute one facet of what Masten (2015) describes as exposure to manageable challenges that can promote adaptive behaviours.

On the contrary, growing up in sustained poverty clearly undermines the potentially positive effects of mobility in our sample, including in urban settings. Among children experiencing economic deprivation, moving within urban contexts is no longer associated with greater agency. For children in poorer households, even moves that bring them physically closer to services or infrastructure may not translate into meaningful improvements in their perceived ability to plan and act for the future. Finally, residential immobility in low-resource environments appears detrimental as well. Adolescents who experienced poverty in rural contexts and didn't move during childhood had significantly lower agency scores, which supports the idea that stasis under deprivation can hinder young people's belief in their ability to act intentionally.

These findings align with previous international research pointing to a strong correlation between socioeconomic position in childhood and later life outcomes in multiple domains

TABLE 7 | Bayesian estimation.

	Estimate (Est. Error)	1-95% CI	u-95% CI
Socio-spatial mobility pattern (ref. = Never poor Always rural No move)			
Never poor Always rural Any move	−0.03 (0.06)	−0.17	0.10
Never poor Always urban No move	0.08* (0.04)	0.00	0.17
Never poor Always urban Any move	0.15*** (0.05)	0.06	0.24
Never poor Rural to urban	0.21* (0.08)	0.04	0.38
Never poor Other transitions	0.05 (0.08)	−0.11	0.21
Ever poor Always rural No move	−0.17** (0.06)	−0.28	−0.06
Ever poor Always rural Any move	−0.04 (0.08)	−0.20	0.11
Ever poor Always urban No move	−0.10 (0.10)	−0.30	0.10
Ever poor Always urban Any move	−0.10 (0.10)	−0.30	0.11
Ever poor Rural to urban	−0.01 (0.11)	−0.23	0.21
Ever poor Other transitions	0.16 (0.12)	−0.09	0.41

Note: Estimates are adjusted for all covariates shown in the full model.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

(Bradley and Corwyn 2002; Chetty and Hendren 2018; Cohen et al. 2010; Erola et al. 2016; Grant et al. 2023; Kahn and Pearlin 2006; Zimmer et al. 2016). However, they also contribute new knowledge to the childhood mobility literature in general by deepening our understanding of the internal heterogeneity of movers' experiences, and to the case study in particular by revealing an additional layer of the rural-urban divide in Peru.

Several covariates included in the models also showed meaningful associations with adolescent agency. Higher parental education was consistently associated with a greater adolescents' perceived sense of agency. Similarly, family stability, as proxied by the absence of household breakdown, and higher maternal age at birth showed positive effects. Female adolescents reported higher agency scores on average, a finding that may reflect gendered socialisation patterns or differential exposure to constraints according to Espinoza-Revollo and Ogando-Portela (2019). Ethnic group differences were not observed. Independent of mobility status, sustained exposure to high-crime neighbourhoods during adolescence was associated with lower agency scores, echoing classic models on context-based effects on childhood development (Bronfenbrenner 1979). Adolescents who grew up in areas characterised by chronic violence and insecurity were significantly less likely to report feelings of control, planning, and goal-orientation. This result aligns with previous research indicating that exposure to unsafe environments can curtail adolescents' well-being (Leventhal and Brooks-Gunn 2000).

To test the robustness of the results, a series of additional specifications was estimated. First, lagged models controlling for prior levels of agency were used to assess whether the observed associations reflect developmental change rather than pre-existing differences. Second, a time-aligned person-period (stacked) model was estimated, linking agency at ages 12 and 15 to socio-spatial exposure in the immediately preceding intervals. Third, alternative model specifications, including decomposed measures of mobility, and sensitivity analyses using alternative poverty thresholds (e.g., fixed thresholds at 0.25,

0.30, and 0.35) were estimated to assess the stability of the findings across different operationalisations of the key constructs. Finally, Bayesian regression models incorporated priors to assess uncertainty and posterior credibility. All these alternative specifications reinforced the main conclusions: the benefits of upward social mobility and rural-to-urban moves, as well as the negative association between persistent poverty, immobility, and low agency, remained strong.

While the analysis provides valuable insights, it also has certain limitations. To begin with, I am aware that the multidimensional measure of socio-spatial mobility used in this study, while useful to capture the joint configuration of poverty, spatial context, and residential movement, necessarily aggregates heterogeneous trajectories into a finite set of categories. In particular, trajectories that appear similar in categorical terms may differ substantially in their underlying dynamics, for example, short-distance moves within similar environments versus long-distance relocations involving major changes in social and institutional context, potentially leading to heterogeneous effects that are not fully captured by the composite measure. Also, although lagged specifications are used to account for prior levels of agency and a time-aligned person-period model is estimated to better align exposure and outcome timing, the analysis ultimately focuses on agency at age 15 as a developmental endpoint. As such, the models cannot fully capture dynamic processes of adaptation, recovery, or cumulative change over time. The available data provide only a limited number of harmonised observations across cohorts, which constrains the ability to model within-individual trajectories or to examine how children adjust to mobility experiences over longer periods. As used here, the agency index reflects adolescents' self-reported perceptions of control and future orientation rather than enacted behaviour. While this aligns with life-course approaches that treat subjective agency as a key mediating mechanism, such measures may be sensitive to reporting biases and cultural differences in how control and aspiration are expressed. Finally, despite the inclusion of a rich set of controls and multiple robustness checks, the observational nature of the data means that unmeasured confounding cannot be entirely ruled out.

Future research could address these limitations by more fully exploiting the longitudinal structure of the data, incorporating finer-grained measures of mobility (e.g., timing, frequency, and distance), and more explicitly distinguishing between subjective and behavioural dimensions of agency. In addition, an important avenue for further work concerns forms of forced socio-spatial mobility, particularly in contexts shaped by conflict and displacement. In Peru, decades of internal conflict and associated displacement have produced mobility trajectories characterised by acute constraint and uncertainty, which may shape developmental processes in ways that differ fundamentally from more routine or opportunity-driven movement.

Despite these limitations, the findings of this study contribute to a more nuanced understanding of how adolescents' perceived agency emerges under conditions of duress. The combined effect of residential instability and geographical volatility underscores the importance of multidimensional analyses. Adolescents' belief in their ability to act purposefully is shaped not only by household resources but also by the broader social ecologies in which they live (or have lived). By integrating bounded agency theory with empirical data on socio-spatial mobility, this study highlights the fragile yet adaptive nature of adolescent self-efficacy. In contexts like Peru, where poverty and migration often intersect, examining the quality, timing, and context of change is key to anticipating mobility-related outcomes. Future research and policy efforts should attend to the layered nature of instability, recognising that resilience is most likely to emerge when young people are supported through manageable challenges within environments that provide both safety and opportunity.

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Conflicts of Interest

The author declares no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are openly available in UK Data Service at <https://datacatalogue.ukdataservice.ac.uk/series/series/2000060#abstract>, reference number 10.5255/UKDA-Series-2000060. The data for this study come from Young Lives, a 15-year study of the changing nature of childhood poverty in Ethiopia, India (Andhra Pradesh and Telangana), Peru and Vietnam (www.younglives.org.uk). They are publicly accessible to registered users through the UK Data Service (<https://ukdataservice.ac.uk/>). Access requires completing standard registration and adhering to the data usage conditions established by the data providers. Young Lives has been core-funded by UK aid from the Department for International Development (DFID). The views expressed here are those of the author(s). They are not necessarily those of, or endorsed by, Young Lives, the University of Oxford, DFID or other funders.

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