Human Capital Accumulation, Migration, and the Transition from Urban Poverty: Evidence from Nairobi Slums[1]

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Abstract

This paper examines determinants and consequences of migration from urban slums using panel data from two Nairobi slums. We analyze migration behavior of both adults and children. First, empirical analysis of labor market dynamics shows that schooling is complementary with experience (measured by duration in Nairobi) in slums jointly increasing the probability of migration to non-slum urban areas, and that labor-market returns to schooling and experience are low within slums. Though income generally increases with migration, schooling significantly explains an increase in income for migrants who headed to non-slum urban areas. Therefore, the accumulation of human capital critically determines the likelihood and outcomes of upward mobility. Second, our empirical analysis shows that children who lost their parent(s) tend to be trapped in slums, in contrast to the conventional view that orphans move back to rural origins for cares provided by their relatives (e.g., grandparents). Loss of parental human capital most likely due to AIDS-related prime-age mortality results in poverty trap among orphans in urban slums, which potentially causes long-term negative consequences in human capital formation in the next generation (i.e., intergenerational transmission of poverty).

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1. Introduction

It is increasingly recognized that the prevalence of poverty is not only widely spread in rural areas but quite serious in urban sectors of African countries where rapid urbanization, propelled by large scale migration from rural areas, created informal settlements in the cities and more recently reclassification and urban natural increase (favored by a young age-structure) contribute to urbanization and the development of informal settlements. Many rural-urban migrants seek better opportunities in urban areas - e.g., job, education, and marriage. Those who are able to assimilate to the urban destination experience upgrading of their jobs and better income prospects over time (e.g., Yamauchi, 2004).

Harris and Todaro (1969) argued that the higher expected returns to migration drive the expansion of urban informal sector. This proposition seems to hold since urban formal sectors offer high wages, despite the fact that the probability of directly moving to formal sectors is relatively small, though some studies report that such distinction between formal and informal sectors has been less important (Bocquier, 2005).[3] Some review studies document that in the context of developing countries, migrants' assimilation process is generally fast and educated migrants tend to find jobs in formal sectors (Williamson, 1988; Yap, 1977). The accumulation of human capital in urban areas seems very important to this transition process.

In the literature of urban-rural migration, however, the process of transition from informal to formal sectors (upward mobility) has not been investigated with micro panel data. This segment of migration is particularly important to understand what factors can facilitate the transition to more efficient sectors. The duration of stay in informal sectors substantially varies among informal settlers, which motivates our study. In this paper, we use data from two slums captured in the Demographic Surveillance System (DSS) in Nairobi, Kenya to analyze the pattern of migration among slum residents and their income dynamics.

The innovation of this research comes from our tracking survey in which we followed out-migrants from slums to non-slums. The population in slums is highly mobile, which creates potentially non-negligible selectivity that causes bias in our estimates for behavioral equations. For example, if human capital determines migration to urban formal sectors where returns to human capital are high, estimating returns to human capital using only slum residents misleads our conclusion. To solve the above problem, we attempted to track slum residents who moved out of the sample slums. Those who moved within the sample slums are also captured in the DSS system. Baseline sample of 2000 households was taken from the super-sample of DSS early 2007 to track out-migrants from those households in the period of summer 2007 to 2008.

We specifically examine potential roles of human capital that agents have carried from their rural origins and also acquire over time in urban areas. Most of the slum residents completed schooling in origins and then moved to Nairobi. They accumulate new experience in the urban destination. Our specific question is how these components: schooling and experience interactively affect the likelihood of transition from slum to non-slum urban areas. What are labor-market returns to human capital in urban labor markets - slum and non-slum areas, associated with out-migration from slums.

The second objective of this paper is to assess the impacts of the prime-age deaths of parent(s) likely due to AIDS epidemic on child mobility and changes in their welfare in urban slums. In this population, the loss of human capital is as important as the accumulation of human capital when we aim to explain the dynamics of population from urban slums. In particular, we focus on children's mobility (or immobility) associated with deaths of their parents(s).[4]

Let us summarize our findings. Our findings provide some unique insights into the way that urban labor market functions. First, we find that returns to schooling are relatively low or insignificant among slum residents. Returns to experience, measured by the length of stay in Nairobi, are positive, which indicates that agents accumulate destination experience over time, helping increase their income.

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3 The formal sector is also offering 'informal contracts' (unprotected jobs) as a result of the economic downturn. See Bocquier (2005) on the Nairobi labor markets,

4 Death of parents means loss of household human capital and phycological and material support provided to children. It is often argued that orphans can seek necessary cares by moving back to rural origins.

Second, however, schooling and experience are complementary in determining the transition probability of moving out of slums to non-slum urban areas. Though the educated agents initially have low probability to transit, they are more likely to exit slums than the uneducated agents as they accumulate destination experience. For example, after four years of Nairobi experience, agents who completed some schooling have higher probabilities of transition than those with no schooling. As a result, returns to experience are also higher among the educated than the uneducated.

Third, we also analyzed determinants of income increase associated with out-migration. It is found that schooling significantly increases income change among out-migrants who moved to non-slum Nairobi areas. Longer duration in slums however decreases the above education effect, implying a trade-off between the likelihood of upward mobility and labor-market returns (measured by income change). The accumulation of experience (augmented by schooling) increases the probability of migration to urban formal sector, but this also diminishes income change associated with migration In contrast, we did not find positive effects of schooling and experience on income change among migrants who moved to Nairobi slums and rural areas.

We also find that children who lost their parent(s) are likely to be trapped in slums. This is in a clear contrast to the conventional wisdom. Orphanhood significantly decreases the likelihood of moving to urban formal sector. Recent death of mother (father) significantly hinders mobility toward urban formal (rural) sector.

The above finding implies that though those who accumulate human capital in urban areas have higher probabilities of getting out of slum poverty, those who lose human capital (e.g., children who lose household human capital in their parents) are likely to be trapped in slum poverty.

2. Empirical Background

2.1 Tracking Survey

Field work for the first phase, which was the baseline survey, started on the 19th of June and ended on 6th August. This phase targeted 2000 households that were randomly selected from the migration theme in the APHRC's Urbanization Poverty and Health Dynamics (UPHD) program.

There was a delay in the start of the second phase owing to a slowdown in the photography exercise (for identification cards) which was being piloted on the out-migration study.[5]

The tracking of individuals who move out of the study area was initially set to be implemented in three distinct waves. The first wave was to identify the first batch of out-migrants from our baseline survey, then wave 2 was to update information collected in wave 1 while also recruiting new out-migrants identified from round 15 of the DSS (May – August 2007). The final wave was to update information for migrants interviewed in wave 1 and 2 and recruit the final batch of migrants identified in round 16 of the DSS (September- December 2007).

The field work was initially set to involve oral face to face interviews; however experiences from the field staff revealed that some of the out-migrants were difficult to find and therefore the team thought it necessary to develop a short version of the instrument to be administered by phone. This new development also meant that we could open up the destinations targeted by the project since it was easy to speak to out-migrants who went out of Nairobi and its surrounding areas. Thus we collected information from out-migrants in various destinations.

Wave 1 of data collection started on the 12th of September 2007 and ended at the close of the year, though those migrants with whom no contact was made at this time were still followed up in the subsequent waves. Field work ended in august 2008, having followed up a total of 144 main movers.

2.2 Destinations and Income Change

In this section, we briefly describe destination distribution and income changes. Table 1 reports destinations from our sample. Column 1 shows actual out-migration destinations including main

[5] Field interviewers were trained on the 28th & 29th of May 2007 and the pilot survey conducted from 2nd to 4th of June 2007. Revision of the questionnaire utilizing insights and the experiences from the pilot survey was done and a retraining session on the revised instrument as well as on the use of GPS equipment (which interviewers would use to record the geo-coordinates of individuals' destination) was done on June 15th.

movers, followers and others, and Column 2 shows only main movers in the tracked sample. Note that since Column 2 shows only main movers, and does not include those who followed main movers (spouse, children), the numbers in Column 1 are larger than those in Column 2. The difference between Columns 1 and 2 comes from two sources: follower sample and unidentified cases.

Table 1 to be inserted

Main destinations from this sample are non-slum Nairobi and rural areas. Some people moved within DSS slums and to other slums. We assume that this group does not experience substantial improvements of living conditions. For migrants to non-slum Nairobi and rural areas, reasons for migration must be different between the two cases. As we see in the empirical results later, determinants of migration are qualitatively different.

Figure 1 to be inserted

Figure 1 plots incomes before and after migration. We had 114 main movers observations with income information. It is shown that those who had relatively low incomes (including zero income) tend to experience positive change in income when migrating. For those who had relatively high income, change is proportionally small probably because many of them did not change jobs when migrating. Some people find new jobs while living in slums, which could be a reason for moving. Income growth rate is higher for those who had no income or low incomes before moving.

In our study, information on individual backgrounds comes from the DSS/UPHD survey. Especially the migration history module fielded in fall 2006 provides detailed information on migration history such as the first time he/she moved to Nairobi (from which we can compute duration of stay as a proxy for experience). In the analysis of child mobility, death module provides information on parental deaths. Cross-section information on income and asset holding is available from the fall 2006 round (but not in later rounds).

3. Empirical Results

3.1Migration and Labor Markets

We show estimation results using multinomial logit regression on migration destination choices. The baseline is no mobility and migration within the DSS slums or to other slums in Nairobi. Determinants of migration to non-slum Nairobi and rural areas are shown. Education 1 is defined as the indicator which takes the value of one if he/she attained some primary or completed, and education 2 if some secondary or completed or higher. Other urban cities (minor case) are included in rural areas since our focus is on transition to non-slum Nairobi.

Table 2 to be inserted

Column 1 shows baseline specification. We do not find any significant estimates for migration to urban sector. In the case of migration to rural areas, destination experience has a negative effect on migration, though age decreases the negative effect. Women tend to move to rural areas more than men.

In Column 2, we interact education indicators and duration of stay. Interestingly, though the direct effects of education levels are negative, we found significant complementarities between education and destination experience. The estimates mean that after four years of experience, the effects of education become positive.[6] With more experience in Nairobi slums, the educated are more likely to move to urban formal sector than the uneducated. The marginal effect is larger for the primary-school completed than the secondary-school completed. We do not find this effect in the case

6 In preliminary analysis, we also used years of schooling but the effect is not linear, and there seems to be a discontinuity from primary to secondary levels. We could not find significant differences between some attained and completed cases at each education cycle.

of out-migration heading to rural areas.

Column 3 includes interactions of duration with male and slum dummies. Complementarities between education and experience remain significant. In addition, we found that age reinforces the negative effect of duration in the case of mobility to urban formal sector.

Table 3 to be inserted

In order to understand the slum labor markets (including areas commutable from the sample slums), we estimate wage equations using the sample of slum residents.[7] Column 1 includes years of schooling and experience linearly. Interestingly, we do not find significant effect of schooling. Returns to experience are positive and significant marginally. In Column 2, we interact schooling and experience. Returns to schooling is positive and significant, but the estimate is relatively small (0.028). Interaction term of schooling and experience has a negative sign (not significant), which is in contrast to the findings from other countries (e.g., Thailand, see Yamauchi, 2004).

We conclude that in slums, returns to schooling and experience are insignificant or very low. Why? First, labor markets within slums or in the neighborhood do not have occupations that reward human capital. Second, it is possible that agents who had acquired human capital tend to move out of slums, which creates selectivity in the sample.[8] Returns to human capital may be realized only through migration, not in slums.

Table 4 to be inserted

To know relevance of the above conjecture, we estimate returns to human capital using information on income changes associated with out-migration.[9] Table 4 shows interesting differences in returns to human capital across destinations.[10] First, returns to schooling are significantly positive only in the non-slum Nairobi case. However, experience in slums decreases the positive effect of schooling. Second, returns to experience is significantly negative only in the rural area case. The longer they stay in slums, the lower income is after migration to rural areas. However, this effect is smaller among the educated. Third, strikingly, we do not find any evidence on the role of human capital in determining income change in the slum case.

Tables 5a and 5b to be inserted

We bootstrapped the estimation with a focus on the schooling effect, with replications being 200 times. In Table 5a, to simplify the estimation in the small sample, we only include years of schooling on the right hand side. The results are consistent with what we found in the previous table. First, the effect of schooling on income changes is the largest for out-migrants to non-slum Nairobi. Second, the effect is highly significant for out-migrants heading to rural areas but the magnitude is smaller than that found for non-slum Nairobi migrants.

In Table 5b we pool all observations by including destination indicators being interacted with years of schooling. The bootstrapped estimation results show, first, that returns to schooling are significantly higher among out-migrants to non-slum Nairobi and rural areas (than the benchmark returns estimated for slum movers), and this is particularly outstanding for out-migrants heading to the non-slum Nairobi areas. Second, we controlled for average income changes specific to those

7 We expect measurement errors in income data. Underreporting could be a common problem especially among those who earn more. That means we may underestimate returns to schooling in this sample.

8 There could be another kind of selectivity, driven by the entry to informal sectors. Those who enter informal sectors can be homogeneous in terms of schooling and labor-market experience. Observationally it is difficult to distinguish between entry-driven and exit-driven selectivity.

9 Ideally slum stayers and out-migrants should be pooled in the estimation if we have income panel data for the slum stayers. However, due to changes in the DSS study design, panel data on income for the stayers has not been captured. Therefore, our analysis pertains to the tracked out-migrants sample.

10 Due to the small sample, estimates could be sensitive to extreme values. However, as Figure 1 shows, income changes are rather in regularity.

destinations. Interestingly, without education, movers experience a decrease in income when migrating to non-slum Nairobi areas, and only if they complete primary school, they have a positive change in income. This is quite similar for migrants heading to rural areas. Third, for slum movers, we do not find positive returns to schooling, but in general their income increases when moving.

The above results imply potentially large bias in returns to human capital. Let $p(x)$ denote migration probability for moving to non-slum Nairobi (so, $1-p(x)$ is the probability of moving to slums or rural areas). The expected income for migrants is

$$E(y' \mid x) = y + E(dy \mid x)$$

$$= y + p(x)\, E(dy \mid x,1) + (1-p(x))\, E(dy \mid x, 2)$$

where y' is the next period income and dy is change in income. Destinations are denoted as 1 for non-slum Nairobi and 2 for others. Human capital is x, which changes the probability of migration as well as the expected income change conditional on a specific destination. Our results show that $p'(x)>0$ and $E(dy \mid x,1)> E(dy \mid x, 2)$.

3.2 Child Mobility

We analyze the determinants of child mobility with a focus on the impacts of parental death. Many children are defined as followers if they follow their parents in migration. In our tracking exercise, we could have a large number of follower children. However, if they lost parents and decide to move (e.g., join their grandparents' households), then they are defined to be main movers. Again we were not able to ensure enough sample size for the analysis of ex-ante and ex-post living conditions. Therefore, we examine migration behavior using our baseline sample.

Table 6 to be inserted

Column 1 in Table 6 includes individual characteristics only. The sample is children aged less than 12. First, age has an increasing and concave effect on both migration decisions. Second, starting date for being captured in the DSS surveys has a significant and positive effect on migration to rural areas. That is, recent in-migrants tend to move to rural areas.

Column 2 introduces indicators for deceased parent(s) and recent death(s). Interaction of deceased parent and their recent death is intended to capture the effect of shock associated with recent death of parent(s). In some cases, children migrated to the DSS slums without biological parent(s) alive but we cannot identify them from the data.

The results confirm that (i) loss of parent(s) significantly decreases the probability of migration to urban non-slum areas, and (ii) a recent death of mother also significantly decreases the probability further. Recent death of a father only decreases the probability of migration to rural areas. These findings are striking since it implies that the orphans tend to be trapped in urban poverty (slums) by having lost their parents under the circumstances where AIDS-related prime-age adult mortality is high in the sample slums (and therefore, the number of orphans increasing).

4. Conclusion

This paper showed significant roles of human capital - both carried from rural areas and accumulated in urban areas - in determining transition from urban slum poverty to formal sector. We found that schooling and destination experience are complementary in the transition process. That is, educated agents gain more from urban destination experience even in slums, increasing the probability of moving out of slums. Our estimates show that after four years of experience, those who have some schooling have a higher probability of transition than those without schooling.

We also found a clear contrast in returns to human capital between slum stayers and non-slum out-migrants. In slums, returns to human capital in income determination are relatively nil. This is partly because those who are educated are likely to move from slums to non-slum areas, causing selectivity bias in the cross-section estimation of income equations. In contrast, returns to schooling

are higher among non-slum out-migrants. Educated out-migrants experience a higher income change associated with migration.

Empirical results on child mobility after death of their parent(s) show evidence, which is far from optimistic given the fact that AIDS-related prime-age adult mortality is high in urban slums. Loss of parents means loss of human capital embodied in parents (e.g., due to AIDS). Orphans tend to lose their way moving out of slums. Recent death of mothers or not-having parent(s) significantly lowers the probability of their migration to non-slum urban areas. Recent death of father also lowers the likelihood of moving to rural areas. All in all, orphans tend to be trapped in urban slums, and are likely to experience worsened living conditions.

Human capital embodied in labor force (most likely carried from other areas) helps agents move out of urban poverty, increasing the probability of mobility to urban formal sector and realizing positive income change associated with such migration. However, the accumulation of experience in slum areas is a precondition for the positive role of schooling in promoting the pathway from slum poverty. Human capital embodied in parents is crucial in determining living conditions for children. Loss of such human capital significantly lowers the possibility of their upward mobility, creating long-term adverse impacts on their human capital and intergenerational poverty trap.

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Figure1 Income changes associated with migration

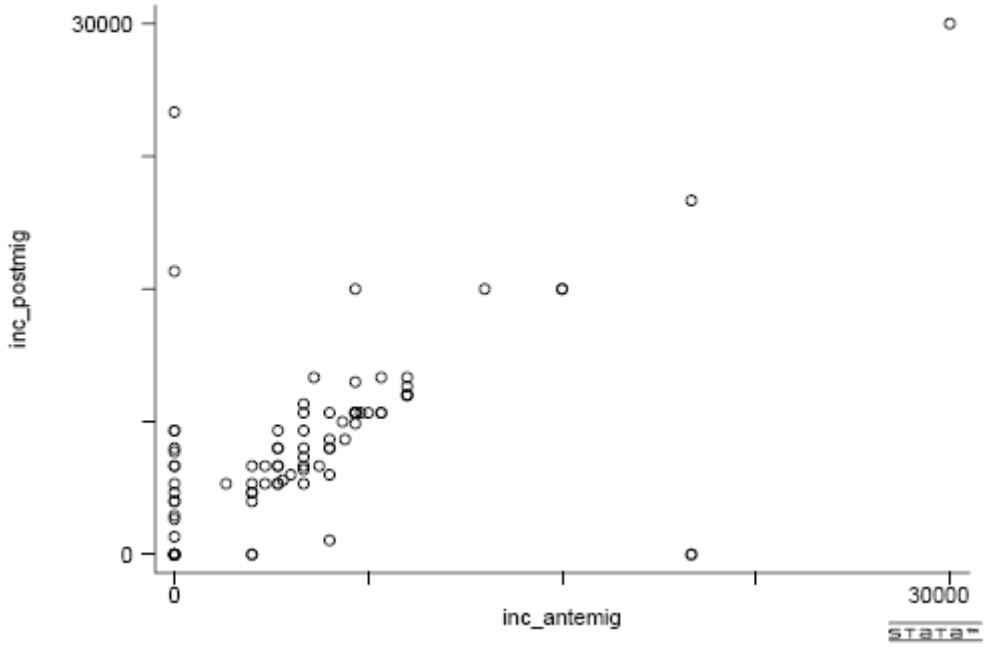

Table 1 Destination distribution

Destination	Baseline	Tracked
	All	Main movers only
Within same DSA slum	10	7
Non-DSA Nairobi slum	52	25
Non-slum Nairobi	101	39
Other urban Kenya	24	3
Rural Kenya	184	40

Numbers in the baseline (Column 1) covers out-migrants aged 12-60, including followers. The tracked sample (Column 2) only shows main movers.

Table 2 Destination choice

Non-slum Nairobi:			
Age	0.014 (0.56)	0.009 (0.39)	0.026 (1.19)
Male	-0.347 (1.19)	-0.356 (1.26)	-0.235 (0.48)
Duration	0.006 (0.05)	-0.886 (2.04) **	-0.741 (1.76)*
Education 1	1.155 (1.33)	-3.641 (1.69) *	-3.462 (1.65)
Education 2	0.961 (1.03)	-2.976 (1.28)	-3.160 (1.44)
Education 1 * Duration		0.918 (2.21)**	0.876 (2.16)**
Education 2 * Duration		0.812 (1.88) *	0.818 (1.98)*
Age * Duration	-0.002 (0.86)	-0.002 (0.91)	-0.004 (1.91)**
Male * Duration			-0.012 (0.37)
Vivandani slum	-1.654 (4.00) ***	-1.645 (3.87) ***	0.332 (0.48)
Vivandani slum * Duration			-0.361 (3.08)
Rural:			
Age	-0.015 (1.34)	-0.013 (1.13)	-0.009 (0.76)
Male	-0.450 (2.92)***	-0.480 (2.92)**	-0.804 (3.39)**
Duration	-0.104 (3.05)***	-0.094 (1.61)	-0.084 (1.40)
Education 1	-0.167 (0.34)	0.165 (0.21)	0.191 (0.25)
Education 2	-0.108 (0.20)	-0.142 (0.18)	-0.096 (0.12)
Education 1 * Duration		-0.025 (0.66)	-0.032 (0.88)
Education 2 * Duration		0.018 (0.42)	0.008 (0.20)
Age * Duration	0.001 (2.60)***	0.001 (1.84)*	0.001 (1.16)
Male * Duration			0.035 (0.25)
Vivandani slum	-0.414 (1.48)	-0.419 (1.52)	-0.301 (0.74)
Vivandani slum * Duration			-0.013 (0.38)
Number of observations	2573	2574	2574
Log of pseudo likelihood	-649.17	-644.90	-635.52
Pseudo R squared	0.0539	0.0602	0.0738

Numbers in parentheses are absolute z values, based on robust standard errors using enumeration-area clusters. *** 1%, ** 5% and * 10% significance. DSA slum as destination (i.e., staying slum) is baseline case. Education 1 is defined as some primary or completed (education 2, some or completed secondary).

Table 3 Income – Slum residents

Dependent: log income		
Years of schooling	0.0136	0.0275*
	(0.94)	(11.64)
Duration	0.0013*	0.0082
	(8.44)	(2.20)
Years of schooling * Duration		-0.0009
		(1.52)
Age	0.0171	0.0195
	(0.73)	(0.76)
Age squared	-0.0002	-0.0002
	(0.66)	(0.71)
Male	0.3166***	0.3198***
	(70.49)	(208.72)
Vivandani slum	0.1941	0.1928*
	(5.10)	(7.36)
Number of observations	1735	1735
R squared	0.0682	0.0694

Numbers in parentheses are absolute t values, based on robust standard errors using slum clusters. *** 1%, ** 5% and * 10% significance.

Table 4a Income change – Tracked out-migrants (main movers)

Dependent: Income change Sample:	Slum Nairobi	Non-Slum Nairobi	Rural
Years of schooling	-209.21	383.70**	-276.44
	(1.66)	(17.13)	(2.87)
Duration	-0.7984	75.016	-718.68**
	(0.01)	(1.52)	(22.65)
Years of schooling * duration	0.2829	-12.446**	66.487**
	(0.01)	(57.12)	(12.51)
Age	244.59	-46.480	176.79
	(1.64)	(57.12)	(0.95)
Age squared	-3.3849	0.4229	-1.0274
	(1.42)	(0.31)	(0.30)
Male	84.979	850.16	591.11
	(0.08)	(2.17)	(2.17)
Vivandani slum	832.76	1408.26**	-415.18**
	(22.19)**	(13.33)	(16.49)
Number of observations	32	37	34
R squared	0.0639	0.0827	0.2666

Numbers in parentheses are absolute t values, based on robust standard errors using slum clusters. *** 1%, ** 5% and * 10% significance.

Table 5a Returns to Schooling - Bootstrapped

Dependent: Income change Sample:	Slum Nairobi	Non-Slum Nairobi	Rural
Years of schooling	-63.787	337.91*	69.560***
	(1.13)	(1.90)	(4.50)

Bootstrapped robust standard errors are used with slum clusters. Replication is 200 times.

Table 5b Returns to Schooling - Bootstrapped

Dependent: Income change Sample: all	
Years of schooling	-63.787
	(1.20)
Years of schooling * Non-slum Nairobi	401.70***
	(2.67)
Years of schooling * Rural areas	133.35**
	(1.97)
Non-slum Nairobi	-2531.45***
	(2.56)
Rural areas	-1226.27***
	(3.64)
Constant	1597.15***
	(14.31)

Bootstrapped robust standard errors are used with slum clusters. Replication is 200 times.

Table 5 Parental death and child mobility

Non-slum Nairobi:		
Age	0.4721 (1.76)*	0.4323 (2.16)**
Age squared	-0.0390 (1.75)*	-0.0346 (1.81)*
Male	0.2238 (0.56)	0.1803 (0.58)
Vivandani	-1.8804 (3.45)***	-1.8806 (2.24)**
Start date	0.0008 (1.52)	0.0007 (0.92)
Mother deceased		-34.544 (84.16)***
Father deceased		-34.983 (95.80)***
Mother deceased * recent death		-35.223 (48.47)***
Father decreased * recent death		0.3892 (0.30)
Rural:		
Age	0.2353 (1.45)	0.2388 (1.65)*
Age squared	-0.0271 (1.92)*	-0.0274 (2.00)**
Male	-0.0452 (0.23)	-0.0883 (0.42)
Vivandani	0.0096 (0.05)	0.0179 (0.06)
Start date	0.0007 (3.23) ***	0.0007 (2.72)***
Mother deceased		0.0233 (0.03)
Father deceased		-0.1904 (0.27)
Mother deceased * recent death		1.4500 (1.04)
Father decreased * recent death		-35.793 (29.35)***
Number of observations	1422	1396
Log likelihood	-515.51	-502.23
Pseudo R sq	0.0420	0.0464

Numbers in parentheses are absolute z values, based on robust standard errors using enumeration-area clusters. *** 1%, ** 5% and * 10% significance. DSA slum as destination (i.e., staying slum) is baseline case. Sample is children aged below 12.