Effect of Parental Migration on the Academic Performance of Left-behind Children in Northwestern China

Supplementary Materials 2. Heterogeneous effect of parental migration on academic performance

While we have found no significant negative impacts, mostly positive impacts, of parental migration on the academic performance of LBCs, all of these results have been for the average household (that is, for the typical migrant households). It is possible, however, that the impacts could vary for different subgroups, i.e., different types of migrant households, of our sample. In this section we use model (5) which is presented in Section 4 to test the heterogeneous effects of several variables. Specifically, we will look at the heterogeneous effects of parental migration on: students who are poor and higher performing (using *standardized English test score in the baseline*); students of different gender (*female*); students who are Han and non-Han (*ethnic minority*); students who are an only child or who have siblings (*only child*); students from poorer and richer families (*assets*), students with parents who have lower and higher levels of education (using either *father has junior high school or higher degrees*, or *mother has junior high school or higher degrees*). For brevity, we only report the results of the unrestricted and adjusted model, but the results are robust to this specification of the model.

The heterogeneous analysis shows that the positive impact of parental migration on LBCs is greater for poor performing students (Appendix Table 2, columns 4-6, row 1). These results mean that, everything else held constant, parental migration affects academic performance of LBCs with different starting academic

performance in a heterogeneous way. Although it is beyond the scope of this paper to isolate the exact reason why parental out-migration helps poorer performing students more than higher performing students, it may be the additional resources that are available to households from newly out-migrating parents are able to overcome one or more of the educational barriers that were limiting the performance of the students (making them poorer performing). For example, it has been shown in a number of papers that when students are better nourished, their academic performance rises (Luo et al., 2012). If the newly available remittances were used to improve nutrition in the households where parents had recently left, this might lead to better academic performance by students that originally were not being provided enough nutrition and, hence, performed at a sub-par level. Remittances might also be used for other performance-enhancing investments of households with poorer performing students, such as, remedial tutoring or additional books or learning software and associated computer hardware.

The results of the heterogeneous analysis also demonstrate that the positive impact of parental migration on LBCs maybe offset if the mother of an LBC has at least junior high school degree. The coefficient on the interaction term between that variable indicating Mother Migrated (unconditional) households and mother's education level – Mother has at least junior high school degree or not – is -0.10 SDs and is significant at the 5% level (Appendix Table 2, columns 5, row 6). Hence, if a student's mother does not have at least junior high school degree, the scores of LBCs would improve when mothers out-migrate or both parents migrate. In contrast, in the

case of mothers with higher levels of education, the positive effects of out-migration (that are found for the average student) could be offset. While (again) we do not know exactly why, the results are consistent with the interpretation that there is a parental care-household resources trade-off when the mother of the student has the ability (from her higher level of education) to provide academic performance-enhancing care (e.g., from time spent tutoring her child). However, when a student's mother is poorly educated, she may not have the ability to help her child with his/her studies and so when she leaves and begins to earn an income providing the household with additional resources there is a net positive gain. The results are similar to those found in previous studies which find that the impact of parental migration on academic performance of LBCs differs based on the background of parents, especially for the education levels of parents (e.g. Sawyer, 2014).

As is shown in Appendix Table 2, we find no significant evidence of heterogeneous effects for other student demographic and family characteristics, including gender, ethnic minority, only child, asset and father education level (Rows 2-5, 7). In other words, like the results for the average households reported in Tables 3 to 5, the results from DID analysis demonstrate that there are no significant effects of parental migration on the academic performance of LBCs and this is true in the case of either: boys or girls; Han or non-Han ethnic minorities; only children or children with siblings; as well as children from families in which the father has at least a junior high school degree or not.

Interestingly, although ethnicity does not matter when we aggregate all ethnic minorities into a single group, the impacts do differ when we differentiate minorities by sub-population. In other words, we do find heterogeneous impacts when students are Tibetan (versus the impacts when they are non-Tibetan) and when students are members of the Tu minority. Compared to the students in the *Never Migrant* households, Tibetan students in the *Any Parent Migrated* households (+0.11 SDs), *Father Migrated* households (+0.10 SDs), *Mother Migrated Only* households (+0.26 SDs) and *Mother Migrated* households (+0.13 SDs) improved more in their standardized English test scores than Han students (Columns 1, 3-5, row 3a). In contrast, Tu students in *Mother Migrated Only* households (-0.62 SDs) and *Mother Migrated* (-0.22 SDs) lagged behind in their standardized English test scores than Han students in those treatment subgroups, respectively (Columns 4-5, row 3b).

So what is happening? From our data, we find that Tibetan students perform worse than other students ($t=10.49$, $p<0.01$). This result is consistent with results from above that the positive impact on LBCs is greater for poor performing students. Our data also show that the education level of parents of Tu students is significantly higher than that of other non-Han ethnic minorities ($t=4.70$, $p<0.01$). As what we have discussed above, when mothers of LBCs have the ability (from their higher level of education) to provide academic performance-enhancing care, the positive impact of parental migration on LBCs may be offset.

Appendix Table 2. Heterogeneous effect.

Dependent variable: $\Delta Score_i = Score_{i,2014} - Score_{i,2013}$	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Any Parent Migrated	Father Migrated Only	Father Migrated	Mother Migrated Only	Mother Migrated	Both Parents Migrated
Characteristics of the students						
[1] MIG * Standardized pre English test score (standard deviation)	-0.02	0.02	-0.01	-0.08*	-0.07***	-0.06***
	(0.01)	(0.02)	(0.01)	(0.04)	(0.02)	(0.02)
[2] MIG * Female	-0.02	-0.04	-0.03	0.01	0.01	0.01
	(0.03)	(0.03)	(0.03)	(0.09)	(0.05)	(0.06)
[3] MIG * Ethnic Minority	0.03	0.02	0.02	0.08	0.03	0.01
	(0.03)	(0.04)	(0.03)	(0.09)	(0.05)	(0.05)
[3a] MIG * Tibetan	0.11**	0.08	0.10*	0.26**	0.13**	0.10
	(0.05)	(0.06)	(0.05)	(0.10)	(0.05)	(0.06)
[3b] MIG * Tu minority	-0.08	-0.02	-0.04	-0.62**	-0.22**	-0.09
	(0.07)	(0.08)	(0.08)	(0.24)	(0.09)	(0.10)
[4] MIG * Only child	-0.04	0.00	-0.04	-0.05	-0.08	-0.09
	(0.04)	(0.05)	(0.05)	(0.09)	(0.06)	(0.07)
[5] MIG * Asset	-0.01	-0.06	-0.02	0.02	0.02	0.02
	(0.04)	(0.07)	(0.05)	(0.02)	(0.02)	(0.03)
Characteristics of the parents and the households						
[6] MIG * Mother has at least junior high school degree	-0.02	0.04	-0.01	-0.10	-0.10**	-0.08
	(0.04)	(0.04)	(0.04)	(0.09)	(0.05)	(0.05)
[7] MIG * Father has at least junior high school degree	0.00	0.03	0.00	0.02	-0.03	-0.03
	(0.03)	(0.04)	(0.03)	(0.09)	(0.04)	(0.05)
[8] Standardized per English test score (standard deviation)	YES	YES	YES	YES	YES	YES
[9] Control variables	YES	YES	YES	YES	YES	YES
[10] School Fixed effects	YES	YES	YES	YES	YES	YES
[11] Number of Observations	6,724	5,783	6,547	4,696	5,460	5,283

* significant at 10%; ** significant at 5%; *** significant at 1%. Robust standard errors in parentheses clustered at school level. County dummies are controlled.