International and Domestic Economic Migration and Children's Growth Outcomes in Guatemala

Abstract
Historically, Guatemalans have suffered high rates of poverty and malnutrition while nearly ten percent of their population resides abroad. This investigation quantifies associations among Guatemalan fathers' and mothers' international and domestic migration, remittances and left-behind child growth. Based on year 2000 national-level data, preliminary findings include: for every month a father was abroad the previous year, a left-behind child aged <3 was 26.3 and 26.6 percent more likely to be stunted or severely stunted, respectively. Additionally, a left-behind child aged <5 was 16.2 percent more likely to be underweight. In contrast, no significant findings were shown among remittances, mothers' migration or fathers' domestic migration and measures of child growth. Many parents use migration as a means to improve the livelihoods of their children. However, as the preliminary results from this study show, these altruistic actions may have an ultimate and permanent negative impact on their children's well-being.

Introduction
Poverty and malnutrition, two diabolical conditions that often go hand in hand, remain rampant throughout much of the developing world. Historically, one of the worst performers in reducing poverty and malnutrition in the Western Hemisphere was Guatemala. In 1989, 55.6% of its population lived in poverty (Bierbaum and Fay, 2010), while the World Health Organization (WHO) reports that 62.1 % of all Guatemalan children under the age of five were stunted and 27.8% were underweight (WHO, 2012). However, in recent years Guatemala has witnessed a sharp reduction in its poverty rate (26.3% in 2006) (WorldBank, 2010), while stunting and underweight conditions in children under five have dropped to 48% and 13%, respectively, by 2009 (WHO, 2012). What are the factors that explain this decline in poverty and malnutrition in Guatemala over the last decade? Adams (2006) argues that economic migration, principally the remittances that were generated, was the single most important factor for reducing poverty at the beginning of the century.

Economic migration and the concomitant remittances that are generated can be an integral part of a household's livelihood strategy for alleviating poverty in places such as Guatemala. To put economic migration and the magnitude of remittance flows to Guatemala into perspective, the International Organization for Migration (IOM, 2009; Lozano, 2003) estimates that about 10% of Guatemala's population lived abroad in the first decade of the 21st century. The World Bank (2011) reported a six-fold jump in remittance inflows to Guatemala from 596 million in 2000 to over 4 billion U.S. dollars by 2009—representing 10.8% of Guatemala's GDP for that year. Adams (2006) discusses the importance of remittances in effecting poverty reduction in Guatemala at the beginning of this century. While his study did not find remittances to have an overwhelming ameliorative effect on poverty in Guatemala in 2000—only 1.6% of poor households were moved out of poverty due to remittances—the severity of poverty in Guatemala was reduced by 12.6%. This was due to the fact that remittances received by the 'poorest of the poor' households in Guatemala account for a disproportionate amount of their overall incomes (60%).

Prima facie, one can envision that the flow of remittance income to migrant-sending households would lead to improvements in left-behind children's well-being. For instance, remittance-receiving households can invest these payments in prenatal and general health care

and/or improvements in basic household infrastructure (electricity, clean water and sewage systems). Furthermore, remittances might be used to decrease the risk of malnutrition should a household face a negative income shock such as a meager harvest or severe climatic event. Unfortunately, studies have shown that the disruptive consequences of parental absences, especially in the first few years of migration, can neutralize the positive benefits of remittances to human capital formation. The very act of migration can lead to short-term losses in income, including the need to repay debt incurred to fund a migration trip. Additionally, migration can fracture the nuclear family through infidelity and/or the migrant's abandonment of his/her family (Frank and Wildsmith, 2005) leading to the long-term loss of household income. The temporary or long-term loss of a household breadwinner has contributed to poor children's health outcomes, including higher rates of infant mortality (Hamilton et al., 2009; Kanaiaupuni and Donato, 1999) and childhood illnesses (Schmeer, 2009) in migrant-sending households. This investigation quantifies the overall influence of economic migration—teasing out the beneficial income effects of remittances from the disruptive effects of father's absences—on left-behind children's well-being as measured by international growth standards

Research Question

How do fathers' and mothers' migration and the resultant remittances influence "left-behind" child growth in Guatemalan migrant-sending households? It is hypothesized that incidences of stunting, severe stunting, wasting, severe wasting, underweight, or severely underweight in left-behind children will be positively associated (more likely) with increasing father's and mother's migration length but negatively associated (less likely) with rising remittances received by the household.

Preliminary Statistical Analysis

Preliminary statistical analyses of stunting and severe stunting were performed with children aged <3 to address the fact that stunting is unlikely to occur after a child has reached the age of 3 (Beaton et al., 1990; Martorell et al., 1995). Additionally, measures of wasting, severe wasting, underweight, and severe underweight were analyzed with children aged <5, conforming to the WHO's international growth standards (Onis et al., 2007; WHO, 2006). A two-level logistic model was used for these preliminary analyses with 'child' at the first level and 'household' at the second level.

Preliminary Results

This investigation tests whether there are associations among increasing length of father's and mother's domestic and international migration in addition to the receipt of remittances over the last year with changes in left-behind children's growth outcomes. For children aged <3, increases in father's absences due to international migration were significantly correlated with both stunting and severe stunting but not with measures of father's domestic migration length (Table 1). For children aged <5, increases in father's absences due to international migration was significantly correlated with a "left-behind" child being underweight. In contrast, no relationships were found among any of the growth measures and remittances, mother's migration or father's domestic migration.

Next Steps

Preliminary analyses are based on multilevel models that control for spatial correlation of migration and remittances at the household and community level. However, they do not control for the endogeneity of decisions to migrate or to send remittances and children's health prior to a migration or remittance-sending event. To address this modeling challenge, a three-stage simultaneous equation model will be employed that addresses: (1) potential endogeneity of decisions to migrate and children's growth outcomes in the first stage; (2) potential endogeneity of decisions to remit income and children's growth outcomes in the second stage; and (3) a hierarchical model with time and individual level differences. The most promising instrumental variables (IVs) that will be explored include locally differential economic and labor conditions, wage rate differences, historic weather shocks (Munshi, 2003), distance, and infrastructure differences (Hildebrandt et al., 2005). Potential remittance IVs will include the percentage of households within communities that receive remittances and average amount of remittances transferred per household by community (suggested by Taylor *et al.* (2003), Damon (2010) and Beaudouin (2005)).

Discussion

Key preliminary findings in this investigation are the moderate to strongly positive correlations among short-term fathers' absences due to international migration and their left-behind children suffering from stunting, severe stunting and being underweight. The long-term importance of stunting and severe stunting, in particular, cannot be overstated. In comparison to wasting and being underweight, children who are chronically malnourished before the age of 3 express negative health and social development outcomes in later life related to stature, human capital formation and productivity. The development of stunting during infancy leads to permanent reductions in stature which can cause lower body functional limitations (LBFL) with concomitant reductions in physical strength in adulthood (Dewey and Begum, 2011; Huang et al., 2011). Furthermore, studies have shown strong associations between stunting and impaired intellectual development, school achievement and decreased economic productivity in adulthood (Milman et al., 2005). Stunting that develops in early childhood can pose a host of risks for childbearing in adult women. Pregnancies in stunted women are more likely to result in perinatal death (stillbirth) or children born with lower birth weight than children born to non-stunted women (Dewey and Begum, 2011). Ozaltin *et al.* (2010) also found that children born to stunted mothers were at higher risk of death compared with children born to mothers of normal weight.

TABLE 1
Two-Level Random Intercept, Logistic, Odds of Experiencing Malnutrition for Guatemalan Children, ENCOVI 2000.

| | Children Aged <3 | | | | Children Aged <5 | | | | | | | |
| | Stunting | | Severe Stunting | | Wasting | | Severe Wasting | | Underweight | | Severe Underweight | |
Odds Ratios = exp(β)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)	OR	(SE)
Independent variables												
Household remittances (100 U.S. dollars)	0.976	(0.025)	1.011	(0.026)	0.987	(0.044)	1.045	0.044	0.964	(0.027)	0.871[+]	(0.064)
Father's domestic migration length (months)	1.049	(0.063)	1.033	(0.061)	1.002	(0.107)	0.942	0.138	1.019	(0.055)	0.920	(0.089)
Father's international migration length (months)	1.263*	(0.129)	1.266**	(0115)	0.789	(0.199)	0.629	0.300	1.162*	(0.083)	1.029	(0.116)
Mother's domestic migration length (months)	0.939	(0.078)	0.905	(0.082)	0.885	(0.171)	--	--	0.934	(0.080)	1.101	(0.136)
Mother's international migration length (months)	0.960	(0.239)	1.102	(0.286)	1.413	(0.329)	1.115	0.371	0.855	(0.232)	1.071	(0.298)
Individual controls												
Age (days)	1.007***	(0.001)	1.007***	(0.001)	0.998**	(0.001)	0.998	0.001	1.002***	(0.000)	1.002**	(0.001)
Age^2	1.000***	(0.000)	1.000***	(0.000)	1.000	(0.000)	1.000	0.000	1.000***	(0.000)	1.000**	(0.000)
Female	0.921	(0.097)	0.855	(0.097)	0.783	(0.152)	0.920	0.260	1.120	(0.109)	1.027	(0.160)
Ladino	0.616***	(0.086)	0.900	(0.129)	1.252	(0.316)	1.247	0.449	1.239[+]	(0.159)	0.919	(0.190)
Father's age	0.999	(0.010)	0.981[+]	(0.010)	0.978	(0.019)	0.975	0.028	1.005	(0.010)	0.991	(0.016)
Father's level of education	0.809[+]	(0.090)	0.900	(0.106)	0.958	(0.192)	0.699	0.204	1.061	(0.111)	0.831	(0.136)
Father's height	0.949***	(0.009)	0.956***	(0.009)	1.008	(0.016)	0.989	0.022	0.955***	(0.008)	0.968*	(0.013)
Father's BMI	1.008	(0.018)	0.973	(0.018)	1.015	(0.031)	1.021	0.043	0.953**	(0.016)	0.952[+]	(0.026)
Mother's age	0.994	(0.013)	1.009	(0.014)	1.028	(0.024)	1.007	0.034	1.002	(0.012)	1.007	(0.019)
Mother's level of education	0.839[+]	(0.090)	0.666***	(0.080)	0.728	(0.146)	0.617[+]	0.179	0.839[+]	(0.089)	0.783	(0.136)
Mother's height	0.946***	(0.009)	0.940***	(0.010)	1.002	(0.017)	1.008	0.025	0.942***	(0.008)	0.952***	(0.014)
Mother's BMI	0.948***	(0.013)	0.942***	(0.014)	0.938*	(0.025)	0.943	0.037	0.925***	(0.012)	0.882***	(0.022)
Household controls												
Household size	1.053*	(0.026)	1.079**	(0.028)	1.105*	(0.047)	1.046	0.062	1.085***	(0.025)	1.131***	(0.037)
Household wealth index	0.907*	(0.044)	0.919	(0.053)	1.087	(0.058)	1.135	0.084	0.877*	(0.053)	0.928	(0.091)
Rural	1.168	(0.163)	1.308[+]	(0.202)	1.298	(0.343)	1.811	0.741	1.515**	(0.213)	1.651*	(0.398)
Geographic controls												
Metropolitan	1[R]		1[R]		1[R]		1[R]		1[R]		1[R]	
North	0.513*	(0.145)	0.503*	(0.164)	1.772	(0.928)	0.670	0.533	1.334	(0.444)	1.519	(1.014)
Northeast	0.871	(0.272)	0.577	(0.219)	2.045	(1.130)	2.073	1.530	1.322	(0.497)	2.199	(1.561)
Southeast	1.493	(0.417)	1.017	(0.323)	1.357	(0.719)	0.478	0.409	1.069	(0.364)	1.471	(1.002)
Central	1.118	(0.281)	1.061	(0.308)	0.970	(0.484)	0.483	0.361	1.471	(0.464)	1.250	(0.820)
Southwest	1.563[+]	(0.423)	1.486	(0.452)	2.202	(1.082)	2.260	1.509	2.453**	(0.779)	2.760	(1.784)
Northwest	1.455	(0.384)	1.263	(0.376)	1.183	(0.605)	0.753	0.549	1.822[+]	(0.581)	1.832	(1.192)
Peten	0.778	(0.215)	0.514*	(0.169)	1.012	(0.560)	1.350	0.985	0.669	(0.236)	0.550	(0.404)
Ψ(2)	0.794	(0.419)	0.661	(0.479)	1.492	(0.799)	0.881	1.114	0.761	(0.240)	0.514	(0.386)
Log likelihood	-1406.302		-1223.283		-561.320		-268.362		-1671.562		-710.818	
Number of Children (Level 1)	2539		2539		4071		4073		4131		4131	
Number of Households (Level 2)	2072		2072		2602		2603		2624		2624	

[+]significant at p<0.10, *significant at p<0.05, **significant at p<0.01, ***significant at p<0.001
1[R] designates the reference group that results for categorical and ordinal independent variables that are compared against. The reference has a value of 1.

References

Adams, R.H., Jr., 2006. International remittances and the household: Analysis and review of global evidence. Journal of African Economies 15, 396-425.

Beaton, G., Kelly, A., Kevany, J., Martorell, R., Mason, J., 1990. Appropriate uses of anthropometric indices in children. Nutrition policy discussion paper.

Beaudouin, P., 2005. Economic impact of migration on a rural area in Bangladesh. Centre d'Economie de la Sorbonne Working Paper, Universite Paris 1.

Bierbaum, R., Fay, M., 2010. World development report 2010: development and climate change, in: Bank, W. (Ed.).

Damon, A.L., 2010. Agricultural land use and asset accumulation in migrant households: The case of El Salvador. Journal of Development Studies 46, 162-189.

Dewey, K.G., Begum, K., 2011. Long-term consequences of stunting in early life. Maternal and Child Nutrition 7, 5-18.

Frank, R., Wildsmith, E., 2005. The grass widows of Mexico: Migration and union dissolution in a binational context. Social Forces 83, 919-947.

Hamilton, E.R., Villarreal, A., Hummer, R.A., 2009. Mother's, household, and community US migration experience and infant mortality in rural and urban Mexico. Population Research and Policy Review 28, 123-142.

Hildebrandt, N., McKenzie, D.J., Esquivel, G., Schargrodsky, E., 2005. The effects of migration on child health in Mexico [with comments]. Economia, 257-289.

Huang, C., Soldo, B.J., Elo, I.T., 2011. Do early-life conditions predict functional health status in adulthood? The case of Mexico. Social Science & Medicine 72, 100-107.

IOM, 2009. Encuesta sobre remesas 2009 ninez y adolescencia. International Organization for Migration, Geneva.

Kanaiaupuni, S.M., Donato, K.M., 1999. Migradollars and mortality: The effects of migration on infant survival in Mexico. Demography 36, 339-353.

Lozano, V., 2003. Encuesta nacional sobre emigración internacional de guatemaltecos. Guatemala: OIM, 509.

Martorell, R., Schroeder, D.G., Rivera, J.A., Kaplowitz, H.J., 1995. Patterns of linear growth in rural Guatemalan adolescents and children. Journal of Nutrition 125, S1060-S1067.

Milman, A., Frongillo, E.A., de Onis, M., Hwang, J.Y., 2005. Differential improvement among countries in child stunting is associated with long-term development and specific interventions. Journal of Nutrition 135, 1415-1422.

Mohapatra, S., Ratha, D., Silwal, A., 2011. Outlook for Remittance Flows 2011-13: Remittance Flows Recover to pre-Crisis Levels. The World Bank.

Munshi, K., 2003. Networks in the modern economy: Mexican migrants in the US labor market. The Quarterly Journal of Economics 118, 549-599.

Onis, M., Onyango, A.W., Borghi, E., Siyam, A., Nishida, C., Siekmann, J., 2007. Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World Health Organization 85, 660-667.

Ozaltin, E., Hill, K., Subramanian, S.V., 2010. Association of maternal stature with offspring mortality, underweight, and stunting in low- to middle-income countries. Jama-Journal of the American Medical Association 303, 1507-1516.

Schmeer, K., 2009. Father absence due to migration and child illness in rural Mexico. Social Science & Medicine 69, 1281-1286.

Taylor, J.E., Rozelle, S., de Brauw, A., 2003. Migration and incomes in source communities: A new economics of migration perspective from China. Economic Development and Cultural Change 52, 75-101.

WHO, 2006. The WHO child growth standards: Macros SPSS.

WHO, 2012. Global health observatory data repository: country statistics: Guatemala. , in: Organization, W.H. (Ed.).

WorldBank, 2010. Migration and Remittances Factbook 2011. World Bank Publications.