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Abstract

In this paper we study the interrelationship between determinants of migration, conceived as a family strategy, and the potential impact of having a migrant household member on people left behind. Labour migration is often related to poverty but given its lumpy-investment nature, poverty may constitute a motivation to migrate as well as a constraint to do it. We use cross-sectional household data from two rural regions of Bangladesh to test whether migration is a form of income diversification strategy that significantly influences the risk-taking behaviour of source farm households in agricultural activities. We account for heterogeneity of migration constraints differentiating between domestic (temporary and permanent) and international moving destinations. We find that richer and large-holder households are more likely to participate in costly high-return migration (i.e. international migration) and employ modern technologies, thereby achieving higher productivity. Poorer households, on the other hand, are not able to overcome entry costs of moving abroad and fall back on migration with low entry costs, and low returns (i.e. domestic migration), which does not help them to achieve production enhancements and may lock them into persistent poverty. We interpret our results as evidence that if migration is a profitable household activity, entry constraints may hinder the access to it and its effectiveness as income diversification strategy.

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1. Introduction

Migration from developing countries, and in particular from rural areas, has become a central issue of economic development, but whether this process should be promoted or discouraged is currently largely debated. This paper contributes to the debate shedding some light on the potential complementarity between overseas economic opportunities and productive activities in rural households at origin. It looks, in particular, at the economic impact of domestic and international migration on such productive investment in sending households as the adoption of a modern farming technology.

It is largely recognised that 'spatially-diversified' families represent an institution arising from or influenced by the risky nature of rural production and the difficulties of self-insurance in low-income, rural settings (Rosenzweig, 1988). The insurance motives for migration has been emphasised by the New Economics of Labour Migration (NELM), according to which greater income uncertainty may encourage out migration as a risk diversification strategy (see Stark, O. and Levhari, D., 1982; Daveri and Faini, 1994). In this sense, better "insured" source households - those with migrants working elsewhere - should be more able to undertake higher-risk profitable activities than households with no migrants. Furthermore, subsequent remittances from migrant members increase household liquidity and may contribute to alleviate binding credit constraints in productive activities (Katz, E. and Stark, O. 1986; Stark, 1991).

On the other hand, though, migration of people entails a loss of labour force and human capital resources in the place of origin; this is likely to influence production choices as well, especially in farm households in developing countries largely recognised to be highly dependent on family labour for their subsistence. Therefore, whether the overall economic effect of migration on rural households at origin will be positive or negative is difficult to be predicted *a priori*; empirical evidence is needed to better understand the linkages between migration and development in local communities.

This paper contributes in filling this gap by carrying out an empirical analysis on the potential effect of migration on productivity-enhancement choices in farm households at origin. We use cross-sectional household data from two rural regions of Bangladesh to test whether having a migrant member is a significant determinant of the decision of source household to employ a modern farming technology, that is high-yielding varieties (HYVs) of rice rather than traditional ones. Production of rice is central to Bangladeshi agricultural economy and

modern seeds are a relatively spread, divisible and profitable technology, but well-known as being more susceptible to yield variability than traditional varieties[1].

The bulk of empirical contributions on the impact of migration on sending households are mostly focused on the role of remittances in improving source household's consumption or income. Given the typical non-separable nature of consumption and production household decisions in rural settings with incomplete markets, relatively few empirical works have shown the potential impact of migration on household production choices at origin. Among these, Rozelle et al. (1999) and Lucas (1987) have shown the growth potential of migration in rural contexts of capital market imperfections, whereby remittances accumulated abroad allow households to improve their agricultural productivity and to accumulate productive assets.

Differently from this part of evidence on the NELM hypothesis, though, this paper is particularly concerned with the role of *entry constraints* in undertaking a remunerative and risk-reducing migration strategy. Indeed, moving from one place to another is not without costs for the whole household; namely, fixed initial financial costs, such as travel, recruiting agency and accommodation costs, and opportunity costs to migrate, in terms of forgone working capital, skills, yield, and income[2], ought to be sustained. In general, if access to profitable activities requires some initial cash outlay or start-up costs (to be paid in advance to investment returns), then multiple equilibria are likely to arise and poverty traps phenomena may be observed[3].

In this paper we look at heterogeneity of migration constraints in Bangladeshi farm households, differentiating between temporary, permanent and international moving. Information on alternative outside destinations included in our data-set show that the latter three typologies of migration have sharply different net-returns, in terms of initial costs and remittances sent back home. Therefore, although they all represent activity-diversification strategies improving farm household risk-management, not all migration forms may induce risk-taking behaviour in agricultural production in source households. Moreover, given the

[1] Causes of instability are identified mainly in genetic vulnerability and increased covariation across regions. In an earlier work of the author it has been shown that adoption of HYVs of rice has a positive impact on household wellbeing (see Mendola, 2003).

[2] At a macro level, Faini and Venturini (1994) have argued that the willingness to migrate is constrained by inadequate human and physical capital and, for a given wage differential, income per capita increases, in poor countries, release individual constraints to migrate and favour outflows. At a given "threshold", income per capita stops being a pushing facto and becomes a restraint factor, when people have achieved enough well-being to prefer to stay home rather than to leave. They test this hypothesis to explain the Italian migration hump of the beginning of the 90s obtaining very satisfying results.

[3] There are several theoretical and empirical contributions on the consequences of imperfect credit market and initial constraints in terms of risk-management capacity, low-risk investment by poorer farmers, ability to overcome entry barriers into high-return activities for better-resourced households, poverty traps (Eswaran and Kotwan , 1990, Banerjee and Newman 1993; Dercon 1996, 1998, Morduch, 1995)

costly nature of moving, poor farmers may well be excluded by the high-costs-high-returns opportunities of migration, whilst better-resourced farm households are more likely to take advantage of these strategies, which may represent an important route for enrichment through, for example, raising agricultural productivity. It follows that determinants of household choice (or chance) to have a migrant member will have simultaneous implications on the productive capacity of source households and, overall, on the economic effect of migration-strategy on people left behind.

By specifying a simultaneous framework of determinants and consequences of migration, this study offers some new empirical evidence on the impact of domestic (temporary and permanent) and overseas migration opportunities on the adoption of modern farming technologies (as a proxy for productivity-enhancement capacity) in sending rural households. We argue that the choice between temporary, permanent and international migration at household level can provide an interesting ground of analysis to assess the role of entry costs in shaping migration choices along with the potential non-monotonic economic impact of these strategies on household members at origin. We do so through a twofold empirical analysis: in first place we look at the determinants of household decision of having a migrant member, whereby migration choice is mapped into the three categories of moving. After showing the importance of heterogeneity of entry constraints – that take the form of wealth - in shaping household migration behaviour, we estimate a simultaneous equations model to assess the impact of the different typologies of migration on agricultural performance of sending farm households.

We find that richer and large-holder households are more likely to participate in costly high-return migration (i.e. international migration) and employ modern technologies, thereby achieving higher productivity. Poorer households, on the other hand, are not able to overcome entry costs of moving abroad and fall back on migration with low entry costs, and low returns (i.e. domestic migration), which does not help them to achieve production enhancements.

The remaining portion of the paper is organised as follows. Section II draws on NELM insights to briefly discuss migration as a costly household subsistence strategy that may lead to complementarities or else trade offs between economic opportunities elsewhere and productive activities at home. Section III discusses some specific feature of internal and overseas migration in Bangladesh whilst in section IV we present the data set and descriptive statistics of main variables used in the inferential analysis. Section V presents our estimation strategy and empirical results and section VI concludes.

2. Understanding migration: development-strategy or poverty-trap?

Migration is a global social phenomenon and, whatever the perspective taken on this issue, it is an ongoing process that surrounds and pervades all aspects of contemporary society. The world's great migrations out of rural areas are accelerating, making internal and international migration one of the most pervasive features of agricultural transformations and economic development both in developed and less-developed countries.

Yet, the economic literature on migration provides different explanations of the reasons why people move and offers few insights into the role migration plays in fostering (or hindering) economic development in sending communities[4].

Drawing on the seminal work of Stark (1978), the NELM theory has explained migration as an inter-temporal household strategy entailing interrelationships between determinants and impacts for the migrant and for the whole household left behind (Stark, 1991). Following this perspective, a wide array of contributions have emphasised the existence of complex motivations behind migration, such as risk-management strategy, alleviation of credit constrains and diversification of income portfolios[5]. This is opposed to the "expected income hypothesis" of Harris-Todaro (1970) that explains migration as an individual one-off adjustment to inter-sectorial wages differentials.

The perception of migration in the latter theory is focused on migrant *individual* decision motivated by imperfections in labour markets. The NELM perspective, on the other hand, has widened the way of thinking about migration in that it explains *family* motivations to send out a migrant arising from imperfections not necessarily in labour markets but rather in markets for credit and risk. However, "while constituting a motivation for migration, imperfections in capital and insurance markets may also constrain migration, resulting in the seeming paradox that increases in rural incomes (which enable households to self-finance migration costs and self-insure against migration risks) may promote, rather than impede, migration" (Taylor J.E. and Martin, P., 2001).

Following the existing literature on migration, there are three competing channels through which this process can affect household members left behind: namely, decreased domestic availability of family labour; increased cash-inflows (remittances); diversification of

[4] See Williamson (1998), Taylor and Martin (2001) for a review of theoretical foundations and empirical evidence on migration issue.

[5] Daveri and Faini (1998) formalise the argument that migration is a household decision driven by risk motivations. Using aggregate data, they also provide some evidence on the importance of risk in shaping domestic and international emigration behaviour in Southern Italian regions. The micro-economic literature on this issue also includes Katz, E. and Stark, O. 1986; Lucas and Stark, 1985,88; Rosenzweig M., 1988; Rosenzweig and Stark, 1989; Lucas, R.E.B., 1997.

resources (insurance provision). Yet, what is not clear from the literature is to what extent the beneficial effects of migration strategy in protecting household members left behind from economic pitfalls are able to improve the productive-investment capacity in sending rural households[6].

Few empirical studies have shown that earnings of international migrants have a positive impact on crop productivity and may also serve as a source of capital accumulation in rural households (Rozelle et al., 1999; and Lucas, 1987). Yet, little evidence exists, in a simultaneous framework, on the role migration costs (or the shadow value of remittances) play in shaping the potential impact of migration at origin.

A large body of migration literature has focused on remittances as the main way households are able to smooth their consumption and overcome liquidity or risk constraints for investment purposes. Indeed, the contribution of remittances – defined as the money and/or goods sent home by migrant workers – to the income level of sending households has been typically considered the key variable to assess the impact of migration on economic development. It is fairly well known that for many developing countries, remittances are an important source of income[7]. Moreover, remittances are now largely recognised as part of an informal familial arrangement that goes well beyond altruism and entails "exchange motives" (Lucas and Stark 1985, Cox et al. 1998)[8].

However, the linkage between the level of remittances and the development of sending households is not straightforward for three orders of reasons. Firstly, the sign and dimension of their economic effects depend on a host of intervening (and often conflicting) variables such as informational and financial costs of migration and the opportunity cost to move (in terms of forgone human and physical capital)[9]. In second place, a critical point in order to

[6] In other words it is not clear whether remittances sent back by migrants are able to compensate for the opportunity cost of allocating a marginal unit of family time to migration, that is the loss of net income from production. Household may not be able to simultaneously devote time to migrant labour and to investment activities in home areas. Moreover, it has been argued that human and physical capital embodied in ('certain types' of) migration is likely to complement other family resources in production, strengthening the negative effect from less family labour (i.e. "brain drain" argument. See Faini, R. 2003). Another argument in this direction provided by the literature is the one of moral hazard phenomena in sending households: if migrant work is lucrative enough household members remaining behind may entirely forgo productive activities and live primarily on remittances receipts. For evidence on this see Gubert, F 2000. On the other hand, though, people left behind may invest more so as to motivate the migrant to send more remittances (de Janvry et al., 1997).

[7] E.g. South Africa gold workers to neighbouring countries; Mexican migrants in the US; unskilled South Asia (e.g. India, Pakistan, Bangladesh) migrants in the Gulf.

[8] According to the "exchange hypothesis" remittances must be seen as repayments for services provided by parent household such as childcare, education, bequests and inheritance, coinsurance, social standing. The exchange motive can be further divided into insurance motives (to spread risk across a broader portfolio) and investment motives (to build up household assets to be inherited later, or to repay previous investments that allow the migrant to retain the right to inherit).

[9] Differently said, the same expected value of remittances may not have the same effect on the probability to migrate for households at different points in the wealth distribution.

assess the impact of migration on economic development is whether remittances are used to finance consumption or productive investments[10]; yet, the latter analysis is not an easy task either, because of fungibility issue, externalities and lack of reliable measures of (net) remittances[11]. Lastly, remittances are endogenous to the migration selection and typically vary directly with the cost, risk and social dislocation associated with the move (i.e. with the form of migration). Therefore, the economic effects of remittances are intimately tied to migration determinants and cannot be evaluated independently of them. Furthermore, the insurance provision provided by family members working in different labour markets may influence sending farm households (and their productive capacity) even without remittances (Stark 1980).

Thus, household behaviour towards migration is crucial in shaping the economic effect of this process, which may act as a shelter against income and production risks faced by people left behind. There is considerable evidence in the development literature on the widespread diversification of farm household income sources as a way to manage risk in developing countries (see, for example, Morduch, 1995) [12]. There is also growing evidence, though, that entry constraints may limit the usefulness of income diversification strategies. This is to say that risk-management strategies may imply an efficiency loss for the poor, which the rich – typically better protected via assets and institutional arrangements – do not have to endure (see Dercon 2002).

Thus, given incomplete insurance and segmented capital markets, structural characteristics and wealth of households typically shape liquidity and risk constraints, thereby influencing the incentive to move and the shadow value of remittances. Moreover, when a farm household decides to send out a migrant, this has simultaneous implications on its productive capacity and may modify productivity-enhancement choices, such as a change of agricultural technology. Farm household decides about its present labour and other inputs allocations, on

[10] One perspective is that remittances tend to be used for conspicuous consumption rather than investment: for house construction or the sponsoring or weddings and the like, rather than improvements that are likely to lead to increasing agricultural productivity. A common use of remittances, nevertheless, is also to pay for education of the next generation and that does appear to be a clear investment strategy. However, a clear distinction between investment and consumption may be difficult to maintain in the context of the use of remittances. There is an important indirect effect of remittances money in the villages (expenditure on house construction for example can stimulate local building enterprises etc.).

[11] Remittances are notoriously difficult to measure (money and goods) because of official and unofficial channels (through relatives or when they go back). Moreover, a typical assumption of much of the work on remittances is that migrants are all self-supporting, that is no economic support is given to migrants leaving household of origin. Lipton (1980) argues that *net* remittances are quite small relative to village income (they are much more concentrated on richer households in the village unlikely to suffer from capital constraints) and have a negative economic effects at home. Taylor (1992) and Adams (1991), on the other hand, show a more positive scenario.

[12] See Mendola (2004) for a literature review on this.

one hand, and on its investments in household's (human and physical) resources and saving management strategy on the other. Therefore, when farm household resources are scarce (i.e. credit and risk constraints are binding), not all households are able to send migrants to work in a different market and even when they do so, it is not straightforward whether migration will result in a virtuous strategy - able to help relatives left behind to overcome production constraints and improve agricultural productivity- or in a poverty-trap. The body of economic literature that generally tends to conclude that migration is a subsistence strategy enabling households to escape poverty, fails to consider people not able to migrate and those who experience a poverty-trap because of migration.

3. Migration flows in Bangladesh

In the past 25 years Bangladesh has experienced positive economic and social change. Nonetheless, it remains among the least developed countries.

Historically migration has been a common subsistence strategy of Bangladeshi people, strictly correlated with colonialism. Long term permanent migration takes place typically towards the UK or US, although over time rigid immigration policies in western countries have limited further emigration from Bangladesh. During the 1970s the labour markets in the Middle East offered new scope for Bangladeshi migrant labour, and later such migration also expanded to the newly industrialised countries of South East Asia.

Between 1976 and 2002 more than 3 million Bangladeshis have emigrated overseas for employment. Over the past 5 years, though, migration has declined due to substantial increases in the cost of migration and stiff competition from new sending countries.

Determinants of both short and long-term migration are complex, resulting of many factors representing economic, social and cultural realities. According to official figures, international migrants are predominately young male, and female accounts for only 1%. This is so because the Bangladeshi government has banned certain types of female labour from independent emigration but many choose to do so through unofficial channels.

The labour force of Bangladesh working in different parts of the world is primarily made up of unskilled and semi skilled workers. In 2001 the professionals constituted only the three percent of the migrant worker against the 58 percent of unskilled workers (ILO).

Over the last decades, also domestic migration has resumed greater importance as a component of people's subsistence strategies and in shaping the national economy. According to recent surveys by the United Nations, International Labour Organization and the Bangladesh Bureau of Statistics (BBS), rural to urban migration in Bangladesh accounts for

two-third of the overall migration flow (where the remaining 10 percent is represented by rural-rural migration and 24 percent by international migration) (see Afsar, 2000) . traditionally, most economic migrants to internal urban areas are young males, but this changed significantly with the recent increase in demand for female labour in the readymade garment factories of Dhaka Khulna and Chittagong metropolitan areas. Remittances to rural areas have represented a crucial source of income for consumption and to expand business in agricultural products and construction materials. Remittances also helped to generate savings, the major source of capital in Bangladesh, in the absence of institutional credit on easy terms. Little studies are available on the migration patters of rural households in Bangladesh. It is assumed that the extreme poor people are more likely to gradually migrate to other parts of the country, passing through a period of temporary migration (Siddiqui, T. 2003). Some rural people also migrate internationally[13] but little data are available on the proportion of international migrants from rural areas. It has been argued that international migration typically generates sharply higher levels of remittances with respect to rural-rural or rural-urban migration. Yet, in Bangladesh there are financial obligations to migrate abroad, which include the cost of purchasing a visa, the airfare, and commission costs to the recruiting agencies[14] (Afsar et al. 2000).

4. Data and descriptive statistics[15]

The empirical analysis is based on a survey of 5062 rural and urban households from 8 villages in Chandina and Madhupur *thanas* in Bangladesh, conducted by the Institute of Development Studies in 1994/95. The survey collected detailed information on household characteristics, assets endowment, food production and non-farm activities. In each household, information on migration of household's members was gathered, including

[13] Bangladesh exports contract labour mostly to Middle Eastern and Southeast Asian countries, Saudi Arabia, Kuwait, Malaysia, South Korea, Singapore, Hong Kong. The UK and US are the two main destination in the West. Australia, Canada, Germany, France are also preferred countries for migration.

[14] The recruitment process of migrant workers in Bangladesh is quite complex. A host of intermediaries, some of which are official and formal, while other are dubious, dominate the whole process. The latter is mostly privatised and, after the selection process, the recruitment agency organizes the visa, travel documentation , air ticket and placement of workers in the receiving country against relatively high fees. Recently the proliferation of recruitment agencies has lowered the agency costs.

[15] A more detailed description of the data set is in Mendola 2003. This holds for figures on HYVs characteristics and productivity differentials as well.

information on duration and destination of migration, moving costs and remittances sent home by migrants[16].

In the present study we restrict our sample to 3404 rural farm households only[17], among whom 30 percent have households members who left to work elsewhere. Yet, a crucial point of our study is to map three different types of migration: national *temporary*, national *permanent*, *international* permanent migration[18]. Moreover, the household, as the unit of analysis, is defined as the whole family, including migrant members, reflecting the NELM theoretical approach we adopt, which conceives migration as a family strategy.

Incidences of different forms of migration are summarised in Table 1. Participation to migration has been identified through questionnaires asking the respondent (the household head) about whether anybody in the household had migrated and which destination for, along with some characteristics of migrant members.

In 62 percent of the cases, only one of the household member was a migrant; in 27 percent of the cases there were two migrants; 9 percent of households had 3 migrants and in the remaining 1 percent four members migrated. When there is more than one migrant member in the same household, in the thirty percent of cases they do not belong to the same migration typology (i.e. migration types are not mutually exclusive in the same household but they are made so[19]).

TABLE 1

INCIDENCE OF MIGRATION AMONG HOUSEHOLDS

Types of migration	**Freq.**	**Percent**
No migration	2417	71
Temporary migration	411	12.07
Permanent migration	431	12.66
International migration	145	4.26
Tot.	3404	100

[16] Migration here, and throughout all the study, refers is to the so-called "free" population movements. Much migration is that of refugees, asylum seekers and the internally displaced (and they are often amongst the poorest), but this study does not address these forms of "forced" migration. Hence, the analysis and framework presented here is within the realm of generalisable variables rather than in circumstances of shock that involve an exogenous set of causal variables and dynamics.

[17] It should be noted that with more than 50 percent of sample households being small and medium-scale farmers, small holders are highly represented in our sample (with a higher concentration than at national level; BBS 1999).

[18] Economic literature has often avoided constructing typologies of migration arguing instead for the need to capture the overall dynamics of population movements. Yet, this approach may lead to rather simplistic view of migration flows and their implications at a micro-level. Indeed, domestic and international migrations in developing countries have been little researched in a simultaneous framework: the two kinds of migration have generally been treated as different processes. In reality, though, most developing countries experience both, often involving the same households or even individuals. Mapping out various types of movement can improve our understanding of the potential virtuous or adverse impacts of migration on poverty and development in local communities.

[19] This point will be discussed deeper further on (see section 5.1 below).

Overall, there are 1241 migrants in the sample distributed as follows with the following characteristics (Table 2):

TABLE 2

CHARACTERISTICS OF MIGRANTS

MIGRATION TYPE	TEMPORARY	PERMANENT	INTERNATIONAL
Number of migrants	521	562	158
(percentage)	(42%)	(45%)	(13%)
Average age of migrants	33.34	29.13	31.96
Average education of migrants (year of schooling)	1.24	5.42	6.15
Average migration spell (how many years before 1995 migrants left for the first time)	8.7	7.6	3.5
Percentage of male migrants	99.62	95.02	100
Percentage of married migrants	84.45	56.23	64.56
Percentage of single migrants	14.97	42.53	34.81

Across different categories of migration, sample migrants are predominately men, young (around 30 years old) moving primarily to earn more money or find a job. What differs across types of migration is the educational level of migrants, clearly higher in the case of permanent and international migration, and in the latter cases the percentage of single migrants is also higher than in case of temporary migration[20]. Eventually, international migration seems the most recent type of moving, as sample migrants left on average around 1991, while permanent migration started earlier and temporary migration more than eight years before 1995.

Figure 1 shows the sample average amounts of costs of moving and remittances sent back home, by different categories of migration. Migration costs as well as remittances are directly asked to the survey respondent, and they refer to initial costs sustained by the household to send out a migrant (i.e. costs of travel, visa, recruiting agency etc) and the amount of money they receive from her/him.

It is clearly evident the increase in net-returns across typologies of migration, with international migration yielding the highest level of costs and remittances. Moreover, Tables 3 shows the percentage of migrants remitting, which is very high in all categories, suggesting a high correspondence between migration and remittances sent back home.

[20] Since the age of migrants is not very different, the single status of migrants can be considered as a 'cost' of permanent and international migration.

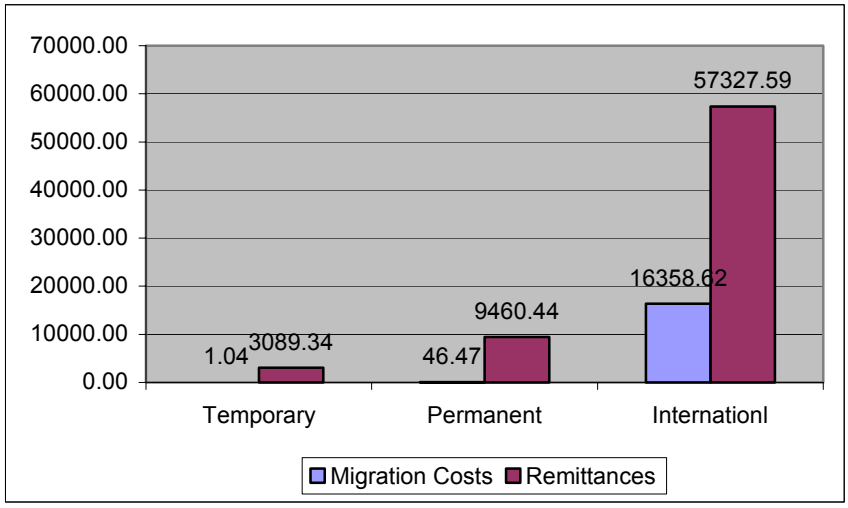

Figure 1: Migration costs and remittances across types of migration (averages, in Taka)

TABLE 3

Percentage of remitting migrants

Temporary	99.27
Permanent	94.43
International	97.24

Table 4 shows some farm household characteristics across types of migration.

In general, households with international migrants tend to be the largest[21] and wealthier, with the highest amount of land owned (also per adult equivalent - that is to say, controlling for households size does not change the strength of the correspondence), the highest amount of land operated, the lowest incidence of poverty and the highest total gross income[22]. The opposite can be said for households who have temporary migrants among their members, namely they seem to be the worst-off with respect to all indicators. Households with no-migrants, instead, appear more engaged than the others in such 'diversified' activities different from migration as cattle and off-farm activities. Though, they are poorer in terms of land and total income than households with international migrants.

[21] It should be noted that household size may be endogenous, in that affected by the (successful) migration process, but there is little literature on the impact of migration on fertility in source households.

[22] The correlation between gross household income and land owned is 52%, which is not surprisingly high.

TABLE 4

Characteristics of farm households by migration categories

Variable	NO MIGRATION			TEMPORARY			PERMANENT			INTERNATIONAL		
	Obs	Mean	St Dev.	Obs	Mean	St Dev.	Obs	Mean	St Dev.	Obs	Mean	St Dev.
Household characteristics and assets												
Household size (including migrants)	2417	5,37	2,25	411	5,93	2,30	431	7,05	2,71	145	8,81	3,68
Average education level of hh. members	2417	1,85	2,15	411	0,91	1,53	431	2,85	2,63	145	3,53	2,15
Land size (acre)	2417	0,77	1,37	411	0,47	1,16	431	0,84	1,08	145	1,81	1,92
Land size (p.a.e)	2417	0,18	0,29	411	0,09	0,19	431	0,15	0,20	145	0,25	0,24
Area of land operated (acre)	2417	1,97	2,20	411	1,38	2,78	431	1,6	1,77	145	2,8	3,06
Area of irrigated land (acre)	2417	0,89	1,36	411	0,31	0,93	431	0,39	0,82	145	0,62	0,73
Cattle owned (unit)	2417	1,19	1,74	411	0,57	1,13	431	0,75	1,19	145	1,15	1,45
Cattle owned (pae)	2417	0,27	0,39	411	0,11	0,20	431	0,13	0,23	145	0,15	0,18
Average number of migrants per household	2417	0	0,00	411	1,1	0,34	431	1,3	0,61	145	1,4	0 .64
Income flows												
Crop income (pae) (Taka)	2417	3212,41	4174,99	411	1259,79	6882,01	431	2125,13	3198,34	145	3865,26	6450,04
Crop income as % of tot.income	2417	38%	0,28	411	20%	0,19	431	26%	0,21	145	22%	0,20
Agricultural income [b] (pae)	2417	1175,25	1320,58	411	628,1	762,97	431	922,61	1317,74	145	1318,19	1680,07
Agricultural income as % of tot.income	2417	17%	0,17	411	13%	0,14	431	14%	0,15	145	9%	0,09
Off-farm income (excluding remittances) (pae)	2417	3135,85	4110,85	411	2456,27	4627,52	431	1202,28	1970,31	145	759,16	1479,74
Off-farm income as % of tot.income	2417	43,31%	0,32	411	50,13%	0,21	431	18,50%	0,24	145	6,17%	0,11
Income from pond (pae)	2417	130,27	440,80	411	104,7	182,31	431	273,11	552,61	145	431,4	683,70
Income from pond as % of tot.income	2417	2%	0,05	411	2%	0,04	431	4%	0,06	145	3%	0,04
Amount of 'temporary' remittances (pae)	2417	0	0,00	411	785,68	1342,54	431	67,66	334,45	145	22	105,20
Amount of ‘permanent’ remittances (pae)	2417	0	0,00	411	0	0,00	431	2619,19	3362,44	145	430,16	2488,83
Amount of ‘international’ remittances (pae)	2417	0	0,00	411	0	0,00	431	0	0,00	145	12842,9	34696,75
Tot. remittances as % of tot.income	2417	0	0,00	411	15%	0,14	431	39%	0,28		60%	0,24
Total gross income (pae)	2417	7626,96	6488,28	411	5194,17	11673,76	431	7185,19	5991,46	145	19665,2	37887,29
Amount of total loans from Ngos (pae)	2417	331,95	1058,65	411	121,47	456,05	431	46,89	291,73	145	23,68	174,66
% of hhs adopting HYVs of rice	2417	24,6%	0,47	411	15.5%	0,36	431	15,6%	0,36	145	18,6%	0,39
% of poor households[a]	2417	30,04%	0,46	411	51,34%	0,50	431	36,43%	0,48	145	4,83%	0,22

Pae = per adult equivalent (including migrant members)

a) The poverty line is based on the Food Adequacy Standard and has been set at 4200 Tk per (adult male equivalent) head per annum for 1994 (see Mendola 2003)

b) Agricultural income = homestead earnings, livestock, wood, straw.

As decomposed income flows are concerned, households with international migrant members have the highest level of crop and agricultural income, and the lowest amount of off-farm income (excluding remittances) with respect to all the other categories. As shares of total income, though, the latter income flows represent a smaller percentage of total household earnings than it is the case in the other groups; this is due to the significantly high amount of remittances they receive from international migrants, which account for 60 percent of total income. Moreover, as for farming investments, figures show that relatively few farmers with temporary migrants adopt high-yielding varieties (HYVs) of rice, whilst the highest shares of adopting households belong to the group with 'international' migrants and with 'no-migrants'. Thus, the crucial point here is to understand to what extent migration and remittances are complementary to other productive assets and activities but, given the endogenous nature of migration behaviour, descriptive statistics does not fully help in this regard.

Furthermore, it should be noted that also land ownership - which is a proxy for household wealth – might be thought as endogenous but, given missing Bangladeshi land market, it can be reasonably assumed exogenous. In order to focus on the relationship between land asset and migration, Table 5 shows the distribution of the three types of migration by the standard classification of land-size classes[23]:

TABLE 5

Categories of landowners	**Types of migration**				
	No mig	**Temporary**	**Permanent**	**International**	**Total**
Near landless	853	133	74	8	1,068
(%)	79.8%	12.5%	6.9%	0.8%	100%
Small farms	1,383	270	328	104	2,085
(%)	66.3%	13.0%	15.7%	5.0%	100%
Medium-Large farms	181	8	29	33	251
(%)	72.1%	3.2%	11.5%	13.15%	100%
Total	2,417	411	431	145	3,404
	71.0%	12.1%	12.7%	4.3%	100%

It is interesting to see that among families sending out migrants, near-landless do it mostly temporarily, small farmers have mainly temporary and permanent migrants, and medium-large farmers have a majority of permanent and international migrants. This is important in the selection process of migration at household level.

[23] Near-landless have less than 0.049 acres; small farms more than that and less than 2.49 acres; medium-large farmers have more than 2.5 acres. It is worth stressing that our dataset is skewed towards small and medium-farmers, as there are only 17 sample farm households being 'properly' large, i.e. owning more than 7.50 acres of land.

5. Estimation strategy and empirical results

The empirical analysis we carry out is twofold and aims at answering to the following questions: What determines the decision to participate in the migration process? Is it always a "profitable" - in that constraints-alleviating - household strategy as suggested by the NELM insights? In particular, given the income uncertainty farm households typically face, does migration have any importance in risk-taking behaviour in agricultural production?

The first step of our empirical strategy is estimating the determinants of household choice of having a migrant member in the household. Since there are different types of migration - which yield extremely different levels of (net) remittances as we saw above - we estimate household behaviour with respect to all types of moving, i.e. permanent, temporary and international migration, throughout binomial and multinomial logit models[24].

In the second step of our empirical analysis, we estimate the impact of the three different typologies of migration on the adoption of high-productive varieties of rice, technology relatively more risky but higher yielding than traditional seeds. We do so through three-stage least squares (3sls) estimation of linear probability models, in order to solve the problem of simultaneous determination of migration and adoption decisions at household level.

Understanding household migration behaviour in the first step is needed in order to estimate the economic effect of this endogenous process on the propensity to invest in agricultural activities in source farm households in the second step.

The estimation strategy of a simultaneous linear probability equations aims at sorting out problems of both endogeneity of migration choices and cross-correlation of household decisions towards technology and migration. Linear probability models have the advantages that are generally more tractable for assessing causation and applicable to data with limited-dependent outcome variable and dummy endogenous regressors (Angrist, 2001; see also below). Moreover, included explanatory variables shaping technology and migration actual investment decisions are often of greater analytical and policy interest than are latent index structural coefficients. Though, since the migration selection process is endogenous and shaped by many of the same characteristics that determine technology adoption in each regime, correct identification of the model depends on finding instrumental variables (IV) that affect technology adoption solely through their impact on migration choices.

[24] See below for further explanations on this. It should be noted that we estimated linear probability models as well and results from the latter are similar to marginal effects predicted by non-linear binary models.

5.1 The determinants of different typologies of migration

In the former section we saw that three existent types of migration, i.e. (domestic) temporary migration, (domestic) permanent migration, and international (permanent) migration, generate very different net-returns at household level.

Thus, why do people decide to migrate in general, and why do they do it for a low *vs* high remunerative migration type? Our hypothesis is that, in a context of missing or rationed credit and insurance markets, household characteristics and migration entry costs shape the expected future return differentials and the decision to participate in a specific type of migration.

Following the NELM theoretical framework, our unit of analysis is the household as a whole (including migrant members); this is to say that the spectrum of factors influencing the decision to migrate involves family characteristics and their endowment of human, physical and social capital.

In the first place, we estimate a logit model for the migration decision *overall,* that is the probability of having a migrant member in the household *i* as a function of a set of household characteristics (plus a regional dummy) X_i. Thus, the dependent variable is defined as follows:

$M_i = 0$, if household does not have any migrant member

$M_i = 1$, if household has at least one member migrated for work.

The logit migration model can be expressed as:

$$P = \text{Prob}(M_i = 1) = \frac{\exp(X_i'\beta)}{1+\exp(X_i'\beta)} \qquad i=1,...n$$

where β coefficients are the effect of a marginal change in X_i on the log odds ratio of migration occurring, that is:

$$\log\left(\frac{P}{1-P}\right) = X_i'\beta$$

The observable factors X_i determining the participation to the migration process are: household demographic characteristics (that are also tied with family labour endowment), human capital-related attributes (including experience and schooling), cultural and social ties (e.g. religion, family network), economic and institutional environment (e.g. region of living) and the wealth position of the household. With respect to the latter, we included three capital-related variables, i.e. landholdings, cattle owned[25] and agricultural capital (i.e farm equipment and owned tubewell for irrigation), in order to control for differences in physical capital across households. Yet, it is worth stressing the differences between assets, in particular the illiquid and liquid nature of land and cattle endowments. Land is the main inheritable form of

[25] Both variables are included per adult equivalent (pae).

wealth for Bangladeshis households and the main asset (beyond labour) that allow people to invest in widening opportunities[26]. Moreover, given that land market in Bangladesh is very thin or even missing, it is reasonable to treat land ownership as exogenous[27] [28]. Cattle owning, on the other hand, is a form of saving or liquid asset, whose role is to cope with risk[29].

Table 6 reports estimated coefficients and marginal effects for two logit model specifications of the migration decision rule.

Interestingly, the land asset variable appears significant and negative in the first specification, but significant and positive when squared (second specification). The same holds for cattle endowment. This is to say that the negative effect of land and cattle endowment on migration marginally increases as assets increases.

Being land a typical proxy for household wealth in Bangladesh, this result seems to suggest that at a lower level of wealth, a small increase in assets tends to discourage households to participate in the migration process, but the marginal propensity to migrate of better-off wealthy households increases in assets endowment. In other words, the non-linear U-shaped relationship between asset holding and migration seems to capture the role of fixed moving costs that present a barrier to migration for households liquidity or risk-constrained.

[26] Poor households typically own less land than the non-poor, and are highly represented among the near-landless (i.e. those owning less than 0.05 acres) (WB 2003). Moreover, financial assets in the form of micro credit have become more available to the rural poor in the recent decades, thanks to successful innovations adopted by various non-governmental organizations in Bangladesh. However, despite tremendous progress in this area, land is still considered the main form of collateral by micro credit financial institutions and formal-sector lenders. See note 13 above.

[27] Land is actually a great issue in Bangladesh because of its scarcity and because it is taken as a collateral in credit programmes. On the exogeneity of land ownership in Bangladesh see the debate between Morduch and Pitt (Pitt, 1988, Morduch, 1998, Pitt, 1999).

[28] The exogeneity of land ownership challenges the potential inverse relationship between (past) migration and (today's) wealth.

[29] It is commonly recognised that dependence on agriculture makes rural households more vulnerable to weather and price fluctuations and causes income fluctuations. Given the limited access to formal credit markets and social insurance, savings is an important tool for coping with income risk. Given the limited access to financial institutions, the most available form of savings for rural households in developing countries is livestock (the other forms of saving in kind are grain stock and land, but both are not easily realisable due to the tiny land market and to the lack of stocking utilities, especially for smallholder), which serve as the major form of wealth and as an insurance substitute, yielding a positive expected return and providing risk-diversification benefits (Dercon, 1996). The existing literature on the risk-coping role of livestock generally find that the latter perform a function as a liquid asset , which enables rural households to direct more inputs into high-return activities. Thus, assuming credit constraints under which few farmers have access to credit, livestock play the same role NELM attributes to the migration process, that is liquidity and risk alleviation at a household level, although livestock may be a relatively cheaper investment than migration. In this sense owing livestock and participating in the migration process might be viewed as substituted in their economic effect in enabling farm households to overcome production constraints.

TABLE 6

Determinants of migration decision (logit model)

	Specif. (1)	Marginal and fixed effects	Specif. (2)	Marginal and fixed effects
Number of males in the hh.	0.698	0.101	0.707	0.103
	(11.39)***		(11.44)***	
Number of females in the hh.	0.189	0.027	0.193	0.028
	(2.75)***		(2.80)***	
Number of children in the hh.	-0.115	-0.017	-0.113	-0.016
	(3.49)***		(3.41)***	
Most educated in the hh	-0.044	-0.006	-0.021	-0.003
	-0.58		-0.27	
Age of hh. head	0.004	0.001	0.003	0.000
	-0.18		-0.13	
(Age of hh.head)^2	0	0.000	0	0.000
	-0.6		-0.52	
Religion (whether it is Muslim)	1.058	0.114	1.077	0.117
	(6.53)***		(6.59)***	
Land owned (pae)	-1.112	-0.160	-1.622	-0.236
	(3.31)***		(4.73)***	
[Land owned (pae)]^2			0.385	0.056
			(3.67)***	
Cattle owned (pae)	-1.418	-0.204	-1.987	-0.289
	(5.69)***		(6.39)***	
[Cattle owned (pae)]^2			0.715	0.104
			(4.21)***	
Farm equipment owned	-0.061	-0.009	-0.039	-0.006
	-0.64		-0.42	
Whether own tubewells	0.282	0.044	0.199	0.031
	-0.77		-0.54	
N. of hhs. In the 'bari'	0.008	0.001	0.008	0.001
	-1.38		-1.42	
Self-poor assessment	-0.039	-0.006	-0.06	-0.009
	-0.37		-0.58	
% out-migrants in the village	4.401	0.634	4.42	0.644
	(5.32)***		(5.31)***	
Regional dummy	-1.076	-0.154	-1.106	-0.159
	(2.61)***		(2.68)***	
Constant	-3.887		-3.879	
	(5.49)***		(5.43)***	
Observations	3404		3404	
Pseudo R2 =	0.3352		0.3381	
			Chi2(2) = 22.45	
Joint Sign.Land[1]			P = 0.000	
			Chi2(2) = 42.72	
Joint Sign.Cattle[2]			P = 0.000	
% of correct predicted probabilities	80.35%		80.55%	

Robust - statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

[1] Joint significance of land owned and land owned squared.

[2] Joint significance of cattle owned and cattle owned squared.

Other household characteristics have the expected sign in shaping the propensity to migrate, although the educational variable included in the model (i.e. the education level of the most educated person in the household) does not appear significant. This result would contradict

the human capital theory of migration and the argument of selectivity effects of individual's skills and education on migration (Sjaastad, 1962). Yet, if education typically promotes rural out-migration, it does not do so with respect to all potential migrant destinations. Therefore, the effects of some human capital variables may differ across migrant destinations and this calls for a better mapping and estimation of different typologies of migration decision.

More in general, as we argued above, household variables (that influence individuals' income creation as migrants and/or non migrants) and migration costs significantly affect the decision to send a household member to work in a different market, so that heterogeneity of household strategies toward migration needs to be better disentangled. Thus, in the next tables we present migration probability models for different typologies of migration conceived as separated household alternatives.

Firstly, we carry out three logit models in order to separately predict the probability to migrate temporary, permanently or internationally (with respect to "all the other options" respectively, including non-migration). Secondly, we estimate a multinomial logit in order to estimate more specifically the relative probability of household participating in one of the three categories of migration with respect to the option of staying put. We do so because household migration decision has multiple outcomes, which are not close substitutes for each other, though. Thus, if on one hand three binary logit models include redundant information, on the other hand the multinomial logit has some potential weakness[30]. Still, the latter model provides more information about the simultaneous effects of independent variables across different migration outcomes, allowing for comparisons among all combinations of the categorical dependent variable.

Table 7 show three logit estimation results (for comparison purposes, Table A.1. in Appendix shows results from linear probability models). Migration types have been identified from the household survey in the following way:

$M^{T}_{i} = 1$, if household has at least one temporary migrant; $M^{T}_{i} = 0$ otherwise;

$M^{P}_{i} = 1$, if household has at least one permanent migrant; $M^{P}_{i} = 0$ otherwise;

$M^{I}_{i} = 1$, if household has at least one international migrant; $M^{I}_{i} = 0$ otherwise.

[30] By assumption, the odds ratios in the multinomial logit model are independent of the other alternatives. On models for nominal outcomes see Greene 1997, and J. Scott Long, 1997.

TABLE 7

Determinants of participation to different categories of migration (logit models)

	TEMPORARY		PERMANENT		INTERNATIONAL	
	Raw Coeff.	Marginal and fixed effects	Raw Coeff.	Marginal and fixed effects	Raw Coeff.	Marginal and fixed effects
Number of males in the hh.	0.264	0.013	0.258	0.014	0.453	0.003
	(3.49)***		(3.92)***		(4.87)***	
Number of females in the hh.	-0.054	-0.003	0.039	0.002	0.334	0.002
	-0.65		-0.51		(3.33)***	
Number of children in the hh.	-0.082	-0.004	-0.136	-0.007	0.076	0.000
	(2.04)**		(3.31)***		-1.36	
Most educated in the hh	-0.814	-0.040	0.512	0.028	0.521	0.003
	(7.44)***		(5.86)***		(3.61)***	
Age of hh. head	-0.014	-0.001	0.072	0.004	-0.011	0.000
	-0.44		(2.40)**		-0.25	
(Age of hh.head)^2	0	0.000	-0.001	0.000	0	0.000
	-0.04		(2.06)**		-0.02	
Religion (whether it is Muslim)	2.852	0.061	-0.075	-0.004	0.885	0.004
	(5.39)***		-0.42		(2.98)***	
Land owned (pae)	-2.674	-0.130	-1.392	-0.076	3.57	0.022
	(4.45)***		(3.13)***		(3.10)***	
[Land owned (pae)]^2	0.673	0.033	0.291	0.016	-2.388	-0.015
	(5.39)***		(2.78)***		(2.33)**	
Cattle owned (pae)	0.275	0.013	-1.45	-0.079	-2.351	-0.015
	-0.47		(3.90)***		(1.96)**	
[Cattle owned (pae)]^2	-0.75	-0.037	0.626	0.034	0.147	0.001
	-1.19		(3.57)***		-0.08	
Farm equipment owned	-0.128	-0.006	-0.148	-0.008	-0.012	0.000
	-0.59		-1.17		-0.1	
Whether own tubwells	-0.268	-0.012	0.537	0.036	0.645	0.005
	-0.45		-1.07		-1.04	
N. of hhs. in the 'bari'	0.001	0.000	0.01	0.001	-0.008	0.000
	-0.09		-1.47		-0.71	
Self-poor assessment	0.34	0.017	-0.115	-0.006	-1.143	-0.007
	(2.60)***		-0.91		(4.39)***	
% out-temp. migrants in the village	10.397	0.506	-1.636	-0.089	-0.041	0.000
	(4.27)***		-0.7		-0.01	
% out-perm. migrants in the village	-9.677	-0.471	11.811	0.641	1.91	0.012
	(2.36)**		(2.94)***		-0.25	
% out-intern. migrants in the village	-7.316	-0.356	3.916	0.213	15.936	0.098
	(2.58)***		-1.35		(3.24)***	
Network	-0.04	-0.002	1.2	0.106	0.552	0.004
	-0.16		(5.88)***		(1.87)*	
Regional dummy	-3.407	-0.206	0.068	0.004	-1.503	-0.010
	(4.07)***		-0.08		-1.04	
Constant	-1.462		-6.783		-7.292	
	-1.24		(6.15)***		(4.12)***	
Observations	3404		3404		3404	
Pseudo R2 =	0.248		0.257		0.351	
Joint Sign.Land[1]	Chi2(2)=29.04 P = 0.000		Chi2(2) =9.83 P = 0.007		Chi2(2)=11.78 P = 0.002	
Joint Sign.Cattle[2]	Chi2(2) = 2.89 P = 0.23		Chi2(2)=16.27 P=0.000		Chi2(2)=15.25 P=0.000	
% of correct predicted probabilities	87.93%		88.22%		96.09%	

Robust - statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

[1] Joint significance of land owned and land owned squared.

[2] Joint significance of cattle owned and cattle owned squared.

The most interesting figure is the relationship between migration and land asset endowment, which is downward sloping in cases of temporary and permanent migration, and inversely shaped for international migration[31]. This is to say that land owned (i.e. household wealth) has a negative, marginally increasing, effect on the household propensity to have a domestic migrant (in particular, either temporary or permanent), and a positive, marginally decreasing, effect on the probability to send a migrant abroad (Figure A.1 in Appendix illustrates the predicted probabilities for the three migration outcomes according to household land ownership). The relationship between migration and cattle endowment, instead, is mainly negative across the three typologies of migration, marginally increasing in case of permanent migration only: this seems to suggest that migration and cattle are substitute activities (or cattle is sold to finance migration) and the reason for this may lie in the theoretical argument that cattle is a liquid asset, playing the 'same' role as migration in the household risk management[32].

The education level of the most educated person in the household results now significant and with opposite signs across migration types, as expected, since temporary migration is mainly devoted to low-skill jobs, differently from the other two types of movements[33].

Given that migration is a function of networks and contacts as well (and given that our survey did not include much information on this), we use the presence of more than one migrant in the household left more than three years prior to the survey year, as a proxy for (familiar) social capital or chain migration (this is the 'network' variable).

Results show that the presence of another household member emigrated time ago is an important factor in fostering especially permanent migration, and it is not significant for temporary migration. This is consistent with the recent and scattered nature of international migration, and with the more cultural and policy-driven permanent domestic migration in Bangladesh.

Of course the migration history of the village (the proportion of the sample village labour force out-migrated either temporary, permanently and internationally)[34] is highly correlated

[31] We find evidence of the first part of a U-shaped and hump-shaped land-migration relationship in case of temporary/permanent and international migration respectively. We will discuss deeper these non-linear relationships further on.

[32] Nonetheless, if cattle and migration are similarly household saving-strategies to cope with risk and liquidity constraints, the 'scale' of the strategy is different in that migration has sharply higher entry costs and subsequent returns which can have a big impact on the long-run household welfare.

[33] *Ceteris paribus,* a small increase in the educational level of the most educated household member decreases the probability of having a temporary migrant by 3.9 percentage points, increases the probability of having a permanent migrant by 2.7 percentage points and the one of having a international migrant by 0.3 percentage points.

[34] This variable represent the 'emigration stock' at village level and it is different from the 'network' variable, which captures the 'chain effect' within the same household.

with the propensity to migrate. These are proxy variables for 'external' migration networks capturing the idea that members of the village who have already out-migrated may help drive down some of the up-front cots of migration, as they share information about jobs in other areas with their neighbours[35].

Eventually, it is worth noting the effect of a "behavioural" variable such as the self-assessment of the household poverty status on the propensity to migrate. *Ceteris paribus,* being "self-poor" increase the propensity to migrate temporary (by 1.7 percentage points), is not significant and negative for permanent migration, and significantly decrease the propensity to migrate internationally (by 0.7 percentage points). This is consistent with all argued above.

The former binary logit models estimated do not allow for all comparison among the relative probability to migrate either temporary, permanently and internationally with respect to the option of staying put. Therefore, a multinomial logit model is estimated.

Yet, as we already mentioned above, some households have more than one migrant belonging to different categories or, differently said, migration typologies are not necessarily mutually-exclusive within a same household. On the other hand, though, they are very different household strategies each of which entails highly different patterns in terms of both determinants and impacts on people left behind. Therefore - even if we are forced to overlook potential interactions between household migration strategies – we argue it is reasonable to kind of 'order' them in such a way that, if there is more than one migrant in the household, international migration category will be always captured, followed by permanent migration and then temporary migration[36]. This is to say that the dependent variable of the multinomial logit is defined as follows:

Mij = 0, if household *i* has no migrant members;

Mij = 1 if household *i* has at least one migrant belonging to the *j*th category

where *j* = temporary migration *without any* permanent or international migrant; permanent migration *without any* international migrant; international migration.

[35] The literature on migration has largely emphasised the important role migration networks play in driving the decision to move (Taylor et. al. 1996).

[36] This is because the three types of migration involve different levels of investment costs (not only financial), whereby international and temporary migration and the highest and the lowest tails respectively. In this sense, if a household can afford sending a household member abroad, for example – which entails much higher costs and returns than other migration types - it would be insignificant whether it has also a migrant moving temporarily.

The multinomial logit model is specified as follows: let Pij be the probability that household i is in category j so that $\sum_j P_{ij} = 1$. Differently from the logit model, the individual probabilities are given by:

$$P_{ij} = P(M_i = j) = \frac{\exp(X_i'\beta_j)}{\sum_j \exp(X_i'\beta_j)}$$

The parameters β_j measure the effect of *Xi* (the set of explanatory variables) on the *relative* probability of household i being in one of the j categories.

Results of the estimation of the multiple migration-options model, where the base category is "no migration", are shown in Table 8 [37].

Findings are close to estimates from the binary models, although interpretation of coefficients allow for all comparisons among migration outcomes. According to Wald tests, the hypothesis that all coefficients are simultaneously insignificant across categorical outcomes is rejected at 0.01 level for all regressors but 'farm equipment' and 'tubwell owned'. Wald test for combining outcomes is passed as well, meaning that the hypothesis that categories can be collapsed (namely, all coefficients except intercepts associated with given pair of outcomes are null) is rejected at 0.01 level.

Looking at raw coefficients (i.e. marginal effects on the log odds ratios in terms of the base category), household demographic characteristics significantly affect the decision to migrate, with the reasonable exceptions of female adult members that seem not to influence (be involved in) temporary migration, and children not influencing international migration.

As expected, the most educated household member has a significant positive effect in increasing the propensity to permanent and international migration with respect to non-migration, and is negatively correlated with temporary migration. Muslim households show a higher propensity to migrate, and household subjective perception of being poor ('self-poor assessment') significantly increases the probability to migrate only temporarily and decreases international migration.

[37] In our multinomial logit, though, the dependent variable is uneven in the sense that different migration categories have uneven number of observations. In particular small international migration likelihood has an influence on the calculated marginal effects for this group, which are bound to be smaller and less significant.

TABLE 8

Determinants of participation to different categories of migration at household level (multinomial logit model)

	Temporary mig			Permanent mig.			International mig.		
Migration-type	**Coef.**	**z-stat.**	**P-value**	**Coef.**	**z-stat.**	**P-value**	**Coef.**	**z-stat.**	**P-value**
Number of males in the hh.	0.60 ***	4.73	0.00	0.70 ***	12.49	0.00	0.90 ***	7.52	0.00
Number of females in the hh.	0.06	0.46	0.65	0.21 ***	2.28	0.02	0.44 ***	4.46	0.00
Number of children in the hh.	-0.12 ***	-2.94	0.00	-0.15 ***	-6.76	0.00	0.00	-0.05	0.96
Most educated in the hh	-0.68 ***	-3.66	0.00	0.35 ***	4.67	0.00	0.51 ***	2.11	0.03
Age of hh. head	-0.01	-0.45	0.66	0.05	1.49	0.14	-0.01	-0.09	0.93
(Age of hh.head)^2	0.00	-0.20	0.84	0.00	-1.47	0.14	0.00	-0.16	0.87
Religion (whether it is Muslim)	3.02 ***	4.09	0.00	0.53 ***	2.54	0.01	1.26 ***	6.50	0.00
Land owned (pae)	-3.01 ***	-6.80	0.00	-1.70 ***	-2.86	0.00	2.11 **	1.96	0.05
[Land owned (pae)]^2	0.73 ***	6.81	0.00	0.38 ***	2.30	0.02	-1.63 *	-1.74	0.08
Cattle owned (pae)	-0.59 ***	-2.23	0.03	-2.36 ***	-11.00	0.00	-3.56 ***	-4.16	0.00
[Cattle owned (pae)]^2	-0.22	-0.70	0.48	0.98 ***	7.68	0.00	0.85	0.68	0.50
Farm equipment owned	-0.14	-0.63	0.53	-0.11	-0.85	0.40	-0.05	-0.28	0.78
Whether own tubewells	-0.30	-0.50	0.62	0.50	1.28	0.20	0.78	1.47	0.14
N. of hhs. In the 'bari'	0.01	0.72	0.47	0.01 ***	2.83	0.01	0.00	0.05	0.96
Self-poor assessment	0.24 ***	3.02	0.00	-0.13	-1.34	0.18	-1.12 ***	-3.52	0.00
% out-temp. migrants in the village	10.97 ***	14.58	0.00	1.96 ***	4.16	0.00	2.15 ***	2.93	0.00
% out-perm. migrants in the village	-6.54 ***	-4.83	0.00	9.67 ***	5.72	0.00	5.45 ***	3.05	0.00
% out-intern. migrants in the village	-4.47 ***	-5.62	0.00	5.31 ***	3.99	0.00	17.58 ***	10.00	0.00
Regional dummy	-2.80 ***	-8.87	0.00	-0.48	-1.23	0.22	-1.40 ***	-2.60	0.01
Constant	-2.93 ***	-2.85	0.00	-6.96 ***	-7.12	0.00	-8.84 ***	-3.82	0.00

Pseudo R2 = 0.3144

Joint Sign.Land[1]: Chi2(6) = 448.96

Prob > chi2 = 0.000

Joint Sign.Cattle[2]: Chi2(6) = 4233.00

Prob > chi2 = 0.000

Robust - statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

[1] Joint significance of land owned and land owned squared.

[2] Joint significance of cattle owned and cattle owned squared.

Furthermore, results on wealth related assets (land, cattle and physical agricultural capital) are consistent with non-linear relations found in the separated binomial models above. In particular, on one hand a marginal increase in the size of land decreases (at an increasing rate) the probability to migrate either temporary or permanently; on the other hand it increases (at a declining rate) the probability of household to send a migrant member abroad with respect to the option of staying put.

Cattle ownership, instead, has a negative effect on the propensity to migrate (at a lowering rate in case of permanent migration), and agricultural capital endowment does not appear significant (but mainly with negative signs). This seems to suggest that liquid assets are substitute investments of migration, as discussed above.

Finally, the incidence of different typologies of migration at village-level, significantly affect the probability to migrate; interestingly, percentages of permanent or international migrants in the village negatively affect the probability to migrate only temporary, supporting the hypothesis of external behaviours influencing household decision to migrate.

In order to show how land ownership affects the probability to migrate either temporary, nationally or internationally, Figure 2 illustrates the three *summed* predicted probabilities for all migration outcomes against the option of staying put.

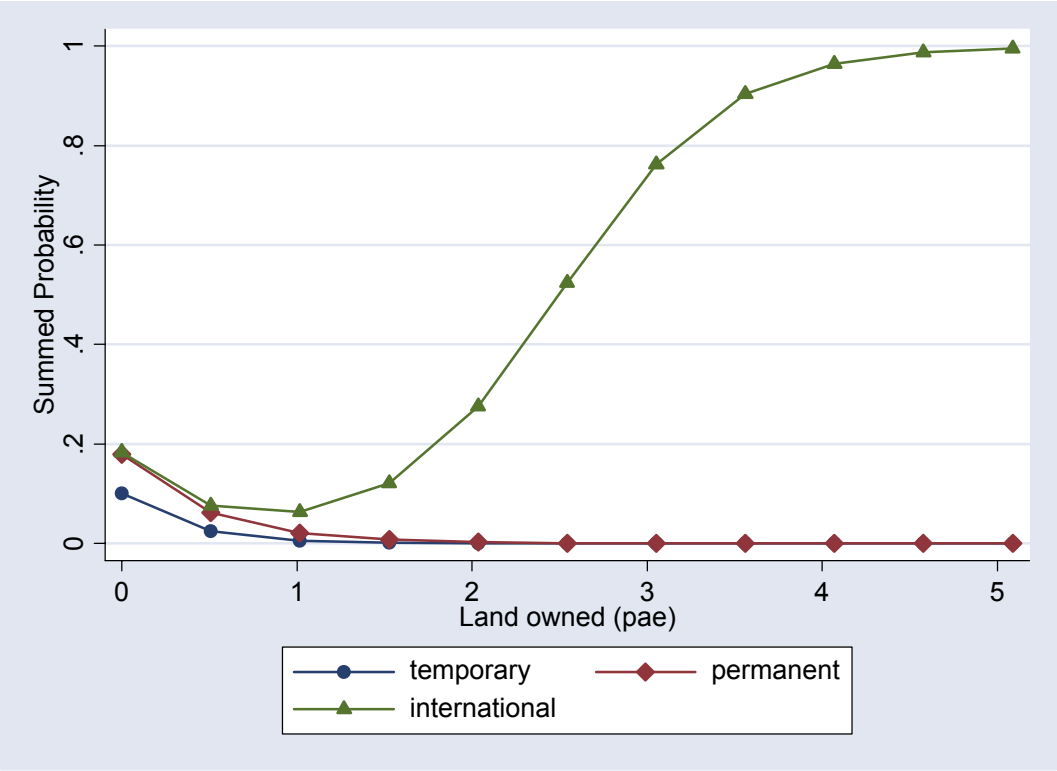

Figure 2: Summed predicted probabilities according to household land-ownership

The lowest line (temporary) plots the probability of having a temporary migrant for a given size of land owned. The upper line (permanent) plots the sum of the probability of having a temporary migrant or permanent migrant (i.e. the area between the two lines is the probability of having a permanent migrant only). And top line (international) plots the summed probability of migrating either temporary, permanently or internationally against the option of non-migrating (see also plotted probabilities in Figure A.2. in Appendix). The shape and areas of predicted probability clearly illustrate the non-linear relationship between land asset ownership and the household participation to the migration process.

The differently-shaped non-linear relations can be explained as follows. Overall, at low level of wealth a marginal increase of land-ownership decreases the propensity to migrate. In particular, in cases of temporary and permanent migration, at low levels of land owned a marginal increase of land decreases the propensity to migrate for these specific destinations (more rapidly in case of temporary migration than permanent migration). This is consistent with the idea that these migration typologies are low-cost and low remunerative in terms of remittances, thereby also little 'preferred' by households. In case of international migration instead, at low levels of wealth the propensity to migrate abroad is close to nil because of high entry barriers. After a threshold level, though, (around 1,2 acre of land), a marginal increase in household wealth increases the propensity to migrate, specifically to migrate abroad. In other words, land ownership becomes a pushing factor that releases household constraints to migrate and favour outflows overseas. This is consistent with other findings on historical migration (such as Italian hump-shaped migration in early last century; see Faini and Venturini, 1994) and with the fact that Bangladesh is a very poor country[38] (therefore, we capture the first part of a hump-shaped wealth-international migration relationship).

Along with reporting the model coefficients, we also show effects on log-odds ratios, which are useful to illuminate the dynamics among outcomes. They provide perhaps more illustrative information on the migration probabilities of household members with different characteristics than the marginal effects.

Table 9 shows the (marginal and unit) effect on the odds ratio of main determinants of migration decision.

[38] In addition, our dataset is even more skewed towards smallholder poor families, being large holders less represented than at national level (see note 17).

TABLE 9

Percentage Change in the Odds-ratio of typologies of migration at household level

Variable:	b	z	P>|z|	%	%StdX
Most educated in the hh					
permanen-temporar	1.03	7.94	0.00	179.40	118.90
permanen-internat	-0.16	-0.60	0.55	-14.70	-11.40
permanen-no_mig	0.35	4.67	0.00	42.10	30.80
internat-temporar	1.19	3.17	0.00	227.30	147.00
internat-no_mig	0.51	2.11	0.03	66.50	47.50
no_mig -temporary	0.68	3.66	0.00	96.60	67.40
Land owned (pae)					
permanen-temporar	1.31	2.08	0.04	269.20	42.50
permanen-internat	-3.80	-4.28	0.00	-97.80	-64.30
permanen-no_mig	-1.70	-2.86	0.00	-81.70	-36.90
internat-temporar	5.11	6.53	0.00	16481.00	299.40
internat-no_mig	2.11	1.96	0.05	720.80	76.90
no_mig -temporary	3.01	6.80	0.00	1920.20	125.80
Cattle owned (pae)					
permanen-temporar	-1.77	-6.31	0.00	-83.00	-46.60
permanen-internat	1.19	1.20	0.23	230.30	52.60
permanen-no_mig	-2.36	-11.00	0.00	-90.60	-56.60
internat-temporar	-2.97	-3.08	0.00	-94.90	-65.00
internat-no_mig	-3.56	-4.16	0.00	-97.20	-71.60
no_mig -temporary	0.59	2.23	0.03	80.80	23.30
Self_poor assess.					
permanen-temporar	-0.37	-6.46	0.00	-31.10	-17.00
permanen-internat	0.99	3.97	0.00	168.60	63.90
permanen-no_mig	-0.13	-1.34	0.18	-12.40	-6.40
internat-temporar	-1.36	-4.82	0.00	-74.30	-49.30
internat-no_mig	-1.12	-3.52	0.00	-67.40	-42.90
no_mig -temporary	-0.24	-3.02	0.00	-21.30	-11.30

b = raw coefficient
z = z-score for test of b=0
P>|z| = p-value for z-test
% = percent change in odds for unit increase in X
%StdX = percent change in odds for SD increase in X

For example, the effect of a unit change in education of the highest educated household member increases the odds of permanent moving relative to the non-migration and temporary migration categories (by 42.1 and 179.4 percent respectively), but it decreases the odds ratio with respect to international migration (by 16.5 percent), holding all the other variables constant. Moreover, a unit more of land (per adult equivalent) has the effect of decreasing the odds ratio between non-migration category and all the other categories, with the exception of international migration (whose odd ratio is on turn always increased by a unit positive change of land). Thus, household 'structural' variables (wealth and social status), as well as human

capital are highly important in shaping household decisions with respect to the subsistence strategy of migration.

Yet, according to the NELM approach, individual family members' labour time is *simultaneously* allocated between migration and non-migration work so as to maximise expected utility of the whole household. The interplay between the household decision to participate in different typologies of migration and the investment behaviour of household members left behind with respect to the adoption of risky farming technologies is the focus of the next section.

5.2 Migration effects on source households' agricultural productivity

Investing in high-productivity technology, such as HYVs of rice, is subject to financial and risk constraints, which are strictly binding for small farmers living in contexts of missing credit and insurance markets.

The NELM hypothesis that migration is a subsistence strategy enabling rural households to overcome investment constraints and achieve the transition to high-productivity agricultural techniques is tested through a system of equations, in order to address the issue of simultaneous household decisions towards investment in agricultural activities and alternative migration destinations. However, given the endogenous nature of the household migration, instrument variables are needed in order to identify migration equations.

Thus, we estimate the potential impact of different typologies of migration, i.e. temporary (T), permanent (P) and international (I) migration, on the farm household propensity to adopt high-productivity seeds (as a proxy for the household risk-management capacity) through a 3sls simultaneous equations linear probability model. For identification purpose, we use the sample proportions of households in the origin village participating to each separate migration typology as instrument variables. The latter are proxy variables for external and social migration networks (as explained above). Different village histories of migration – specifically for temporary, permanent and international migration - are likely to lower migration costs and increase the opportunities for village households to send out migrant members, but should not affect the propensity to adopt new farming technologies[39].

Based on the literature, we estimate a system of equations as follows:

$$Y_i = \gamma_0 + \gamma_1 X_{iT} + \gamma^J{}_2 M_i^J + \varepsilon_{iT}$$

$$M_i^J = \beta_0^J + \beta_1^J X_{iM} + \beta_2^J Z^J{}_{iM} + \varepsilon^J{}_{iM}; \qquad J=T;\ P;\ I, \tag{5.1}$$

[39] The same instrument is used in Rozell et al. 1999.

where Y_i is a binary variable equal to 1 if household *i* adopts the new technology; X_{iT} is a set of observed farm household variables influencing the choice of technology; and ε_{iT} is the random variable of the estimated equation.

M_i^J, are binary endogenous variables equal to 1 if the ith household participates in the Jth migration alternative, i.e. to temporary, permanent or international migration[40] (and zero if there is no migrant members); X_{iM} is a vector of household characteristics influencing the decision to migrate (different effects may result across the three typologies of migration) and Z^J_{iM} are exogenous variables to be used in the "first stage" of the system as instruments for the endogenous migration variables; ε^J_{iM} is the random variable of each migration equation.

Endogenous migration variables are correlated with the disturbance of the adoption equation, violating the assumption of ordinary least squares (Wu-Hausman F test rejects the null hypothesis that migration typologies are exogenous variables at 0.01 significance level)[41]; further, the simultaneous decision problem entails that the error terms among equations are (cross-) correlated as well. We use 3sls estimation in order to take account of both simultaneity and endogeneity biases.

Three-stage estimator uses an instrumental variables procedure to produce consistent estimates and generalised least squares to account for correlation structure in the disturbances across equations. Heckman and MaCurdy (1985) show that in case of simultaneous linear probability models, instrumental variable procedure produces consistent estimates.

This approach is the most tractable for our aim at estimating causal or *potential effect* of migration on the propensity to adopt risky technologies, rather than latent index coefficients (see Angrist, 2001)[42]. This is so because the two-stage and single-stage estimates are directly comparable. For robustness purpose, though, Table A.2 in appendix presents *structural* results of a probit adoption model estimated using instrumental-variable-probit (or Amemiya

[40] This is done in the same way as for the multinomial logit above, making categories mutually exclusive (i.e. household cannot belong to more than one category).

[41] For comparison purposes, the adoption equation has been estimated using simple OLS but results are not encouraging for migration typologies. However, the estimation procedure ignores the problem of endogeneity of migration decisions and the possible cross-equation correlation. As a raw check of endogeneity, we also included three interacted variables between typologies of migration and the size of land owned by household. Signs of interaction variables for permanent and international migration turn to be significant, suggesting that these types of migrations coupled with land ownership may have a potential effect on the propensity to adopt a superior agricultural technology.

[42] Limited dependent variable models with dummy endogenous regressors were first estimated using distributional assumptions and maximum likelihood (Heckman, 1978, Amemiya, 1978, Newey, 1985). Angrist (2001) argues that if the aim is to estimate causal or potential effect on the outcome of interest - rather than structural parameters of latent variables model - linear models are no less appropriate for binary dependent variables than non-linear models.

Generalized Least Squares (AGLS) estimator)[43]. We get structural coefficients on latent (utility) variable but, as expected, marginal effects on the probability of observing a one in the probit model is very similar to results of the former linear probability model (for comparison purpose, two and three-stage linear probability estimators and presented in the same table in Appendix).

In the first equation of the model (5.1), which explains the adoption of modern seeds, the dependent variable is equal to one if farm household has adopted the risky HYVs. As explanatory variables we include farm household characteristics such as household demographic variables, representative of family labour endowment; the average level of education of household members, which is not expected to be highly significant with respect to the relatively well known 'green revolution' technology package; the amount of cultivated land and land tenure, in order to take into account 'tenurial-insecurity' effects on risk management; farm equipment and means of ploughing owned; the quality of land (i.e. the percentage of irrigated land); pond[44] and cattle ownership, to take into account productive activities diversification; the ratio between land and family-labour endowment (whose negative sign suggests that HYVs are more labour-intensive crop than traditional ones); religion and self poor assessment of the household; regional dummy variable (equal to one whether household lives in Madhupur)[45].

Specification of migration equations is based on the first part of our empirical analysis conducted above about the determinants of temporary, permanent and international migration. Along with instruments, we include other (exogenous) variables as determinants of migration, such as demographic characteristics, the educational level of the most educated household member, the amount of land owned per consumption unit and the family migration 'network'. Table 10 reports econometric results of 3sls estimate of the system of equations, results that are robust to a number of alternative specifications.

[43] This method is closely related to the Heckman two-step procedure (Heckman 1978 p. 947) according to which if the purpose of the analysis is to estimate the final equation of interest (in our case technology adoption), it is possible to generate instrumental variables for endogenous regressors by estimating a linear probability model and with plug-in fitted results standard two-stage least squares procedure applies. Though, this procedure would yield incorrect standard errors and for this reason, Amemiya Generalized Least Squares is used to recover correct standard error estimates (see Maddala 1983, pp. 247-252 and Newey, 1987).

[44] Ponds are very important in rural Bangladesh life. They have multi-purpose usages. They are one of the water sources for the rural households, livestock and irrigation. Moreover, ponds are used for small-scale culture fisheries at a household level, thereby contributing to activity diversification.

[45] On the adoption of HYVs in Bangladesh see Mendola 2003.

TABLE 10**: 3sls estimate of the impact of different typologies of migration on HYVs adoption**

	DEPENDENT VARIABLES			
	ADOPTION OF HYVS	TEMPORARY MIG.	PERMANENT MIG.	INTERNATIONAL MIG.
Temporary migration	-0.23			
	(1.98)**			
Permanent migration	-0.269			
	(2.69)***			
International migration	0.577			
	(2.93)***			
Number of males in the hh.	0.015	0.016	0.032	0.019
	-1.56	(2.70)***	(5.34)***	(5.18)***
Number of females in the hh.	-0.005	-0.009	0.004	0.024
	-0.41	-1.22	-0.57	(5.14)***
Number of children in the hh.	0.012	-0.008	-0.011	0.006
	(2.29)**	(2.27)**	(3.26)***	(2.68)***
Average years of schooling in the hh.	-0.001			
	-0.11			
% of land owned	0.004			
	-0.59			
Amount of land operated	0.144			
	(6.08)***			
% of temple land	-0.026			
	(2.12)**			
% of cash-in land	0.003			
	-0.06			
% of mortgaged-out land	-0.056			
	(2.05)**			
Farm equipment owned	0.008			
	-0.78			
Power means of ploughing	0.038			
	(2.45)**			
Land-labor ratio	-0.059			
	(2.16)**			
Whether own pond	0.064			
	(3.27)***			
Self-poor assessment	-0.071	0.029	-0.009	-0.037
	(3.80)***	(2.60)***	-0.77	(5.20)***
Regional dummy	0.133	-0.081	0.052	0.031
	(3.69)***	(2.93)***	-1.32	(2.72)***
% of irrigated land	0.286			
	(12.13)***			
Religion (whether it is Muslim)		0.18	-0.031	0.042
		(9.26)***	-1.61	(3.55)***
Land owned (pae)		-0.133	-0.133	0.056
		(4.08)***	(4.13)***	(2.81)***
[Land owned (pae)]^2		0.043	0.029	-0.02
		(3.25)***	(2.18)**	(2.50)**
Cattle owned (pae)	0.117	-0.045	-0.11	-0.058
	(4.61)***	-1.49	(3.67)***	(3.17)***
[Cattle owned (pae)]^2		0.021	0.061	0.017
		-1.06	(3.14)***	-1.44
Family network		0.003	0.307	0.094
		-0.1	(12.06)***	(5.94)***
Most educated in the hh		-0.064	0.048	0.017
		(7.88)***	(5.97)***	(3.42)***
Constant	0.036	0.02	-0.095	-0.153
	-0.73	-0.5	(2.01)**	(8.13)***
Instruments:				
% temp.migrants in the village		0.799		
		(5.61)***		
% perm.migrants in the village			1.015	
			(5.63)***	
% intern.migrants in the village				1.029
				(8.77)***
Observations	3404	3404	3404	3404

Table 11 presents F-tests for the first stage of the 3sls procedure[46] and shows that our instruments are closely related to the variables they are instrumenting for, limiting the potential for weak instruments, especially in the specification with many controls.

TABLE 11

First-stage F-tests for the instruments

	Endogenous variable		
	Temp. Mig.	Perm. Mig.	Intern. Mig.
F-Stat.	10,97	9,93	24,31
P.Value	0,00	0,00	0,00

With respect to results shown in Table 10, all explanatory variables of the propensity to adopt modern seeds have the expected sign; in particular, the amount of land operated is positively correlated with the propensity to adopt, while tenure insecurity (the share of temple and mortgaged-out land) has a negative impact on that. The percentage of irrigated land and power means of ploughing have a significant positive sign, whilst the negative sign of the land-labour ratio variable suggests that HYVs are more labour-intensive crop than traditional ones[47].

The impact of migration on the propensity to adopt high-yielding varieties of seeds depends on which type of migration households participate in and, in turn, on the determinants of the migration decision. Our findings show that migration significantly affects agricultural technology upgrading; however, while having a household member migrated abroad has a *positive* effect in fostering household propensity to adopt modern and risky seeds, domestic temporary and permanent migration have a *negative* impact on the adoption propensity in source households. Therefore, if migration is a risk and credit-alleviating strategy, this seems not to be true for all types of migration in Bangladesh. Explanations for this may lie on both risk and credit arguments: indeed, overseas economic opportunities are likely to be less correlated with local earnings and provides much higher returns (remittances) than it is the case for domestic migration.

In this sense international migration acts as a shelter against local uncertain income prospects, as predicted by the NELM perspective and shown by our results. However, given that migration is an endogenously shaped process, this seems not to hold for all farm households.

[46] They test for the joint significant of the instruments in regression of the endogenous migration variables on all exogenous variables in the system.

[47] For a deeper discussion on determinants of HYVs adoption in Bangladesh see Mendola, 2003.

Indeed, all other estimated results are consistent with what we found above about determinants of different types of migration: a small increase in household wealth (land owned) and human capital endowment (highest level of education) lowers the propensity to participate in temporary and permanent migration and increases the household propensity to participate in international migration[48]. Therefore, wealthy households able to overcome 'entry barriers' to international migration will on turn be more likely to employ modern farming technology, thereby achieving higher productivity. Asset-poorer households, on the other hand, are unable to support migration costs and fall back on domestic migration, which does not help them to overcome financial or risk constraints locking them into poor productive performance. This, in turn, raises questions on the potential role of international migration in alleviating poverty (and inequality) at national and global level.

6. Conclusions

According to the NELM approach, the typical migrant is part of a rural extended family who dispatches members to other places of employment to generate capital and to obtain new investment opportunities (e.g. change of technology) for the family farm.

The main idea underlying this study is that if on the one hand imperfections in capital and insurance markets constitute a motivation to migrate – as stated by the NELM hypothesis, on the other hand they also may represent a constraint to do it; this is so because migration is a form of lumpy investment, especially onerous for such households as those living in poor rural areas of Bangladesh. Therefore, determinants of migration simultaneously shape the economic impact of having a migrant member on farm households left behind. This has important implications while seeking to understand the complex linkages between migration opportunities and economic development in local communities.

Assuming that higher initial asset holdings make it less likely that liquidity constraints bind, our empirical evidence shows that household's wealth-related capital (mainly in the form of land) is crucial in shaping heterogeneous migration behaviour towards different typologies of migration. Asset-poor farm households are more likely to enter into domestic migration with low entry costs, and low returns. Entry into high-return migration (i.e. international migration), in which most households would probably like to engage in a 'first-best' perspective, is restricted to richer and large-holder households. In particular, throughout a multinomial logit model estimation, we find that at low level of wealth, an increase in asset ownership reduces, at different rates, the propensity to migrate either temporarily,

[48] Also owing cattle has the same impact as found in the first part of inferential analysis? Here it might be not strictly exgenous, though, but the exclusion of it does not change much estimation results.

permanently or abroad. At higher level of household wealth, though, asset ownership stops being a constraint and becomes a pushing factor to outflows overseas only; this captures the effects of high entry costs to international moving and household liquidity constraints in *non-linearly* shaping migration behaviour. Indeed, higher asset holdings release household constraints to move abroad and favour high-return international migration.

These findings seem to challenge both conventional arguments that absolute poverty raises out-migration or that better-off households stay put. On the other hand, they highlight the importance of entry migration constraints, which act as pushing or restrain factors differently across household wealth distribution.

Furthermore, not all migration destinations may play the same role in mitigating household credit or risk constraints at origin. We estimated the economic impact of having a migrant member - either temporary, permanent or international - on the propensity to adopt new high-productivity farming technologies, such as modern seeds of rice, in source rural households. We found that international migration has a positive effect on the investment in a superior agricultural technology, whilst temporary and permanent migrations do not encourage such a risky agricultural investment. The estimation strategy we used is a simultaneous equations model, in order to take into account both the endogenous migration choice and the cross-correlation of household decisions with respect to its (human and physical) resources allocation.

We interpret our results as evidence that if migration is a profitable alternative household activity, entry constraints may limit the access to it and its usefulness as income diversification strategy. Lack of resources to bear the costs of migration faced by poor households may generate a poverty trap whereby only better-off households have access to the most 'profitable' type of migration and are able to exploit a virtuosos circle of complementarities between overseas economic opportunities and productive activities at origin. This intends to question the idea that migration is a straightforward strategy to escape poverty, and to emphasise the potential role of a better distribution of resources and information in 'connecting' poor people to development-enhancing processes at a global level.

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APPENDIX

Table A.1: Determinants of participation to different typologies of migration

	TEMPORARY		PERMANENT		INTERNATIONAL	
	Marginal and fixed effects of logit model	Linear probability model	Marginal and fixed effects of logit model	Linear probability model	Marginal and fixed effects of logit model	Linear probability model
Number of males in the hh.	0.013	0.023	0.014	0.029	0.003	0.003
		(3.80)***		(3.93)***		(4.58)***
Number of females in the hh.	-0.003	-0.006	0.002	0.005	0.002	0.025
		-0.84		-0.6		(4.16)***
Number of children in the hh.	-0.004	-0.008	-0.007	-0.012	0.000	0.007
		(2.33)**		(2.91)***		(2.51)**
Most educated in the hh	-0.040	-0.065	0.028	0.046	0.003	0.018
		(8.67)***		(5.51)***		(3.42)***
Age of hh. head	-0.001	-0.001	0.004	0.004	0.000	-0.003
		-0.3		(1.84)*		(2.48)**
(Age of hh.head)^2	0.000	0	0.000	0	0.000	0
		-0.32		-1.53		(1.86)*
Religion (whether it is Muslim)	0.061	0.086	-0.004	-0.043	0.004	0.044
		(12.08)***		-1.62		(2.78)***
Land owned (pae)	-0.130	-0.115	-0.076	-0.124	0.022	0.057
		(3.74)***		(4.22)***		(2.65)***
[Land owned (pae)]^2	0.033	0.038	0.016	0.027	-0.015	-0.019
		(1.94)*		(2.96)***		(2.35)**
Cattle owned (pae)	0.013	-0.034	-0.079	-0.095	-0.015	-0.072
		-1.43		(3.65)***		(4.75)***
[Cattle owned (pae)]^2	-0.037	0.011	0.034	0.05	0.001	0.03
		-0.92		(2.91)***		(3.87)***
Farm equipment owned	-0.006	-0.006	-0.008	-0.011	0.000	0.007
		-0.8		-1.41		-0.96
Whether own tubwells	-0.012	0.063	0.036	0.011	0.005	-0.006
		(4.52)***		-0.45		(1.87)*
N. of hhs. in the 'bari'	0.000	0	0.001	0.002	0.000	0
		-0.47		(1.65)*		-0.53
Self-poor assessment	0.017	0.033	-0.006	-0.01	-0.007	-0.036
		(2.82)***		-0.88		(5.09)***
% out-temp. migrants in the village	0.506	1.056	-0.089	-0.046	0.000	0.087
		(4.01)***		-0.17		-0.5
% out-perm. migrants in the village	-0.471	-0.794	0.641	1.359	0.012	-0.033
		-1.63		(2.76)***		-0.46
% out-intern. migrants in the village	-0.356	-0.632	0.213	0.391	0.098	0.928
		-1.51		-0.98		(3.36)***
Network	-0.002	0.005	0.106	0.312	0.004	0.087
		-0.16		(7.64)***		(2.86)***
Regional dummy	-0.206	-0.251	0.004	0.169	-0.010	0.006
		(2.37)**		-1.58		-0.08
Constant		0.213		-0.299		-0.056
		(1.80)*		(2.55)**		-0.72
Observations		3404		3404		3404

Robust - statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Figure A.1: Predicted probabilities from *logit* models according to household land-ownership

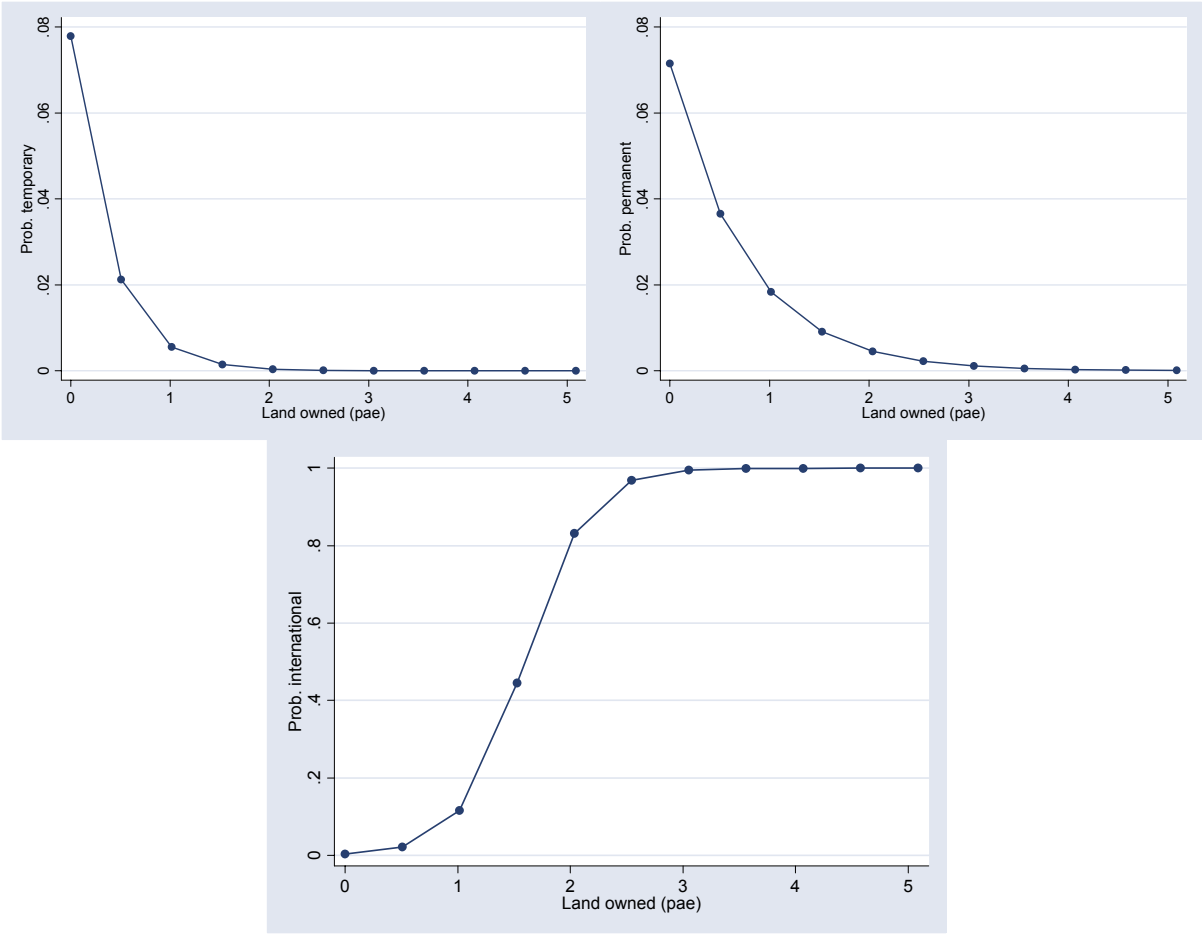

Figure A.2: Predicted probabilities from *multinomial logit* according to household land-ownership

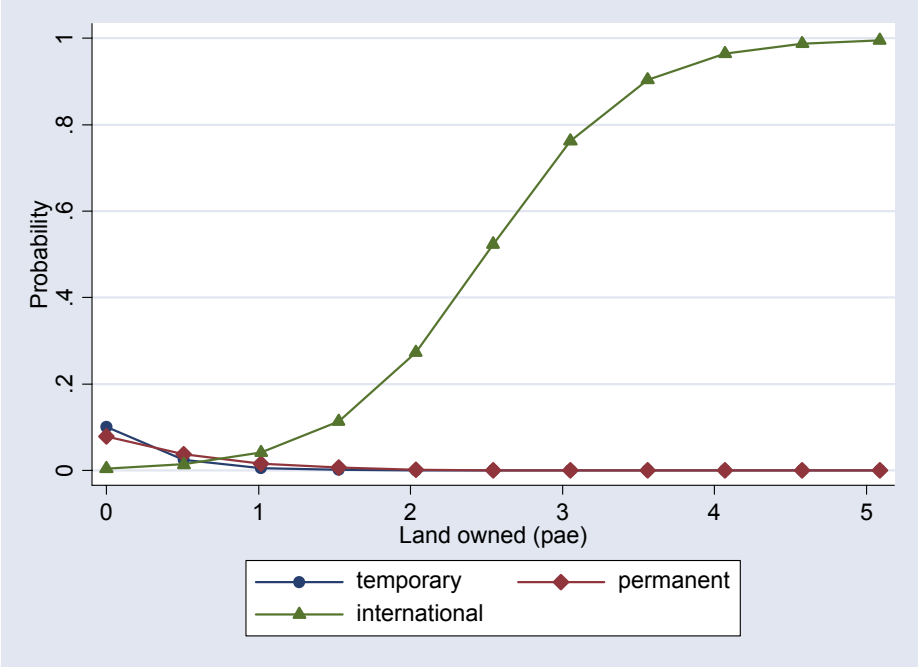

Table A.2: Impact of different typologies of migration on HYVs adoption

	(1)	(2)	(3)	(4)	(5)
Estimator:	***ivprob-coeff.***	***ivprob-marg. effects***	***3sls***	***2sls***	***2sls-robust s.e.***
Temporary migration	-0.963	-0.226	-0.23	-0.214	-0.214
	(2.05)**	(2.05)**	(1.98)**	(1.80)*	(1.76)*
Permanent migration	-1.509	-0.293	-0.269	-0.309	-0.309
	(3.65)***	(3.65)***	(2.69)***	(3.02)***	(2.85)***
International migration	2.68	0.554	0.577	0.509	0.509
	(3.32)***	(3.32)***	(2.93)***	(2.52)**	(2.32)**
Number of males in the hh.	0.07	0.022	0.015	0.019	0.019
	(1.82)*	(1.82)*	-1.56	(1.95)*	(1.77)*
Number of females in the hh.	-0.008	-0.003	-0.005	-0.001	-0.001
	-0.18	-0.18	-0.41	-0.07	-0.07
Number of children in the hh.	0.042	0.013	0.012	0.013	0.013
	(2.06)**	(2.06)**	(2.29)**	(2.54)**	(2.47)**
Average years of schooling in the hh.	0.005	0.002	-0.001	0.001	0.001
	-0.28	-0.28	-0.11	-0.2	-0.19
Percentage of land owned	0.03	0.009	0.004	0.016	0.016
	-0.6	-0.6	-0.59	(2.02)**	(2.60)***
Amount of land operated	0.47	0.15	0.144	0.156	0.156
	(4.66)***	(4.66)***	(6.08)***	(6.14)***	(4.82)***
Percentage of temple land	-0.079	-0.025	-0.026	-0.028	-0.028
	-1.57	-1.57	(2.12)**	(2.16)**	-1.21
Percentage of cash-in land	-0.046	-0.015	0.003	-0.015	-0.015
	-0.19	-0.19	-0.06	-0.23	-0.21
Percentage of mortgaged-out land	-0.616	-0.197	-0.056	-0.113	-0.113
	(4.36)***	(4.36)***	(2.05)**	(3.92)***	(3.60)***
Cattle owned (pae)	0.365	0.117	0.117	0.108	0.108
	(3.85)***	(3.85)***	(4.61)***	(4.22)***	(3.74)***
Farm equipment owned	-0.008	-0.002	0.008	0.004	0.004
	-0.19	-0.19	-0.78	-0.36	-0.27
Power means of ploughing	0.086	0.028	0.038	0.03	0.03
	-1.34	-1.34	(2.45)**	(1.80)*	(1.75)*
Land-labor ratio	-0.283	-0.09	-0.059	-0.071	-0.071
	(2.40)**	(2.40)**	(2.16)**	(2.53)**	(2.44)**
Whether own pond	0.224	0.072	0.064	0.054	0.054
	(2.60)***	(2.60)***	(3.27)***	(2.56)**	(2.71)***
Self-poor assessment	-0.211	-0.067	-0.071	-0.073	-0.073
	(2.90)***	(2.90)***	(3.80)***	(3.87)***	(3.84)***
Region dummy	0.345	0.111	0.133	0.121	0.121
	(2.37)**	(2.37)**	(3.69)***	(3.27)***	(3.20)***
Percentage of irrigated land	1.029	0.328	0.286	0.286	0.286
	(10.46)***	(10.46)***	(12.13)***	(11.20)***	(11.10)***
Constant	-1.442		0.036	0.038	0.038
	(7.34)***		-0.73	-0.77	-0.73
Observations	3404	3404	3404	3404	3404

Absolute value of z statistics in parentheses (robust in model (5) accounting for potential heteroscedasticity)
* significant at 10%; ** significant at 5%; *** significant at 1%