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Examining rural income and employment in Bangladesh: A case of structural changes in the rural nonfarm sector in a developing country

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Abstract

This study uncovers some important stylised facts about the structural changes in the rural nonfarm (RNF) economy in Bangladesh for the period 2000–2016 and identifies some broad determinants. Our work uses household-level, secondary sources such as Household Income and Expenditure Survey, Labour Force Survey and Bangladesh Integrated Household Survey. We find that the positive relationship between landownership and rural income has become weaker in recent years, indicating the increasing role of nonland inputs in generating rural income. The share of RNF income in total rural income has increased substantially over the years. The increase in nonfarm income is largely driven by the nonfarm wage income of the richer households, indicating adverse distributional consequences. There are also indications for specialisation in nonfarm activities—the share of income from the 'mixed' sources of farm and nonfarm has decreased, and the 'only nonfarm' source has increased. Households tend to move away from agriculture and specialise in RNF occupations as the education level increases. Our results offer important insights into rural development strategies and contribute to the broader questions of the development discourse on the structural changes in developing countries.

KEYWORDS

Bangladesh, rural nonfarm, rural transformation, specialisation

JEL CLASSIFICATION

O12, O14, Q12, R11

1 | INTRODUCTION

The perception that rural nonfarming (RNF) is a low-productivity transient sector that will eventually decay and vanish with economic development has long been proven wrong (Lanjouw & Lanjouw, 2001). It is argued that the high productivity of RNF employment has led to structural changes in the rural economy and, thus, in overall economic growth (McMillan & Rodrik, 2011). The growth of RNF not only shifts labour from agriculture but also generates additional employment for the rural workforce and thus helps reduce poverty. Christiaensen et al. (2013) found that the RNF development helped rural people escape poverty in Tanzania. In Vietnam, estimates show that the involvement of an additional household member in the RNF reduces the likelihood of being poor by 7–12 per cent (Hoang et al., 2014). In developing countries, farm workers are four times more likely to be poor than nonfarm workers (World Bank, 2017). Consequently, RNF development has become an integral part of rural poverty reduction strategies in developing countries.

Structural transformation of rural economies in developing countries is inevitable as the economy grows. The sectoral shares of output and employment in the rural economy undergo a substantial transformation, generally following the patterns of the overall economy: the share of agriculture declines, and the share of nonfarm sectors comprising manufacturing and services increases (Barrett et al., 2001; Haggblade et al., 2007; IFAD, 2016). However, the dynamics of the RNF sector are complex and nonlinear, with a wide range of determinants and consequences, depending on the local context and policies. Hence, it is imperative to consider the changes in the RNF sector that have significant policy implications.

Our study contributes to this discussion by documenting some broad patterns of change in RNF occupations and income and identifying some household-level characteristics that contributed to such changes in rural Bangladesh for the period 2000–2016, using several rounds of multiple sources of household data.[1] To highlight the changes in RNF activities, we focus on the evolution and determinants of (i) the distribution of farm and nonfarm income and employment and (ii) diversification versus specialisation with respect to RNF. To understand the household-level factors behind these broader changes, we studied the role of farmland ownership, education of the household head and remittances, both domestically and internationally.

In addition to the farm versus nonfarm dichotomy, we discuss how the distribution of wages and self-employment of RNF income and employment changes over time. This question is important because it has significant implications for rural income distribution. Reardon et al. (2000) noted that while the impact of RNF activities on poverty reduction was well established, the distributional impact was still ambiguous.

Our analysis is based on four rounds of the Household Income and Expenditure Survey (HIES), five rounds of the Labour Force Survey (LFS) and two rounds of the Bangladesh Integrated Household Survey (BIHS). The rationale for using several sources is that they have advantages over others in some specific aspects. For example, the HIES is an appropriate dataset for income and expenditure, while the focus of the LFS is employment. The BIHS offers a rare household-level panel in rural Bangladesh.

We find that the types of RNF occupations have not changed much over the years; low-productivity service sector jobs still dominate occupation profiles. The share of labour income from both farms and nonfarms in the total income of rural households increased.[2] This finding

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[1]Our approach is similar to Liu et al.'s (2020) study that provides a detailed description of rural transformation of Vietnam using multiple rounds of household and labour force data.

[2]Labour and nonlabour incomes comprise the total income. Nonlabour income includes remittances, transfer, rent and other income.

implies that rural households rely less on remittances and transfers now than before. The share of farm income has remained fairly constant over the years, but the share of nonfarm income has increased significantly in recent years. The increase in nonfarm income is largely driven by the nonfarm wage income of richer households, indicating adverse distributional consequences. We also studied the determinants of a higher share of RNF income and employment. We found that landlessness is still an important determinant of RNF activities, which may suggest that employment out of necessity persists extensively. More educated households tended to move away from farming. Neither international nor domestic remittances were found to be associated with a higher share of nonfarm income; rather, they tended to increase the share of farm employment and income.

The transition from diversification to specialisation is evident from the household data. Households with multiple working members are more likely to engage in either farm or nonfarm jobs. There are strong indications that income from 'mixed' sources of farm and nonfarm has declined, and 'only nonfarm' sources have increased over time. Household head's education was found to be a robust determinant of specialisation in nonfarm occupations.

This study contributes to the literature on the RNF sector in several ways. First, we systematically document broader changes in the RNF sector over a long period of 2000–2016. Second, we use multiple data sources to triangulate our main results, making them very robust. Third, our exposition of specialisation versus diversification sheds new light on how the rural economy has evolved. We find strong indication of specialisation in RNF activities, which suggests that the diversification of risk sharing in the rural economy has been reduced. Fourth, the education level of the household head has been identified as a major catalyst for rural structural changes. This is an important policy variable that can be leveraged to bring about direct change in rural economies.

This study contributes to the growing body of literature on the RNF sector in Bangladesh. Although RNF has long been an issue of particular interest in Bangladesh, detailed documentation of the broader structural changes in RNF is largely absent in the literature. The role of growth in agriculture (Shilpi & Emran, 2016), connectivity and rural towns (Deichmann et al., 2009) in RNF activities has been the mainstay of recent RNF literature in Bangladesh.

The rest of the article is organised as follows: Section 2 describes the data and provides some definitions; Section 3 describes the occupational profiles and broader structural changes regarding the share of the RNF economy; Section 4 offers a conceptual note that guides the empirical works; Section 5 analyses the determinants of the share of the RNF income and employment; Section 6 focuses on specialisation and diversification of the rural economy; Section 7 examines the determinants; and Section 8 concludes.

2 | DATA AND DEFINITIONS

2.1 | Sources

Our analysis is based on three sets of secondary data. We used four HIES (2000, 2005, 2010, 2016), five LFS (2005, 2010, 2013, 2015, 2017) and two rounds of the BIHS (2013, 2016). The HIES is a nationally representative household survey conducted by the Bangladesh Bureau of Statistics (BBS) that is used to estimate poverty lines. The LFS is also a nationally representative survey by the BBS on the labour market, and the BIHS is a panel data representative of rural Bangladesh collected by the International Food Policy Research Institute (IFPRI).[3] While our analysis primarily relies on the HIES, we used the LFS and the BIHS

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[3]These data sets are publicly available. Please see the web links of the respective data sets in references for details.

TABLE 1   Types of RNF occupations reported.

	2000		2005		2010		2016	
	Prim.	**Sec.**	**Prim.**	**Sec.**	**Prim.**	**Sec.**	**Prim.**	**Sec.**
No. of occupations reported	60	26	61	32	63	32	74	46
Share of occupations from								
Manufacturing (%)	35	27	34	34	35	31	30	35
Service (%)	65	73	66	66	65	69	70	65

Source: Several rounds of HIES; Prim., primary; Sec., secondary.

to triangulate our results. We used the respective sample weights of the datasets in our regression models.

2.2 | Definition of RNF and rural–urban

Following standard practice, we defined anything other than agriculture in rural areas as an RNF. Agriculture included farming, fisheries, livestock, poultry, forestry and hunting. This definition was followed across all data sources. We used the definition of 'rural' from the BBS. The BBS defines rural, municipal and city corporations. The latter two are located in urban areas. Since the HIES and the LFS are administered by the BBS, the definition of rural–urban is uniform across these sources. Moreover, the BIHS uses the BBS to define rural areas.

3 | CHANGES IN THE TYPES OF RNF OCCUPATIONS AND THEIR SHARES IN INCOME AND OCCUPATIONS

3.1 | Occupational profiles of RNF

Because the RNF sector is defined residually—anything but agriculture—it is by definition a heterogeneous sector. The HIES reports the primary and secondary occupations of all household members, allowing us to track how the types of occupations reported by households have changed over time. We documented both primary and secondary occupations because a large portion of nonfarm activities were secondary occupations undertaken in the slack period of agricultural cycles (Lanjouw & Lanjouw, 2001). Sixty types of primary RNF occupations were reported in 2000 (Table 1). In 2016, rural households reported 74 types of nonfarm primary occupations. Secondary RNF occupation also increased with primary RNF occupation. The number of secondary occupations reported by rural households increased from 26 in 2000 to 46 in 2016. The increase in both primary and secondary RNF occupations indicates that the RNF sector has become increasingly heterogeneous.[4]

We also categorised occupations into manufacturing, and service sector related occupations. About two-thirds of the occupations are in the service sector, and the rest are manufacturing jobs. This composition remained approximately the same over the years, except in 2016 (Table 1). The share of service sector occupations as primary occupations also increased. Reardon et al. (2001) noted similar trends with a higher share of income from services than from manufacturing in the 1990s in Latin America.

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[4]The increase in the number of RNF occupations is not due to changing or splitting occupation codes in the HIES. The total number of occupation codes has not increased much over the years. The number varied between 92 and 99 since 2000 HIES.
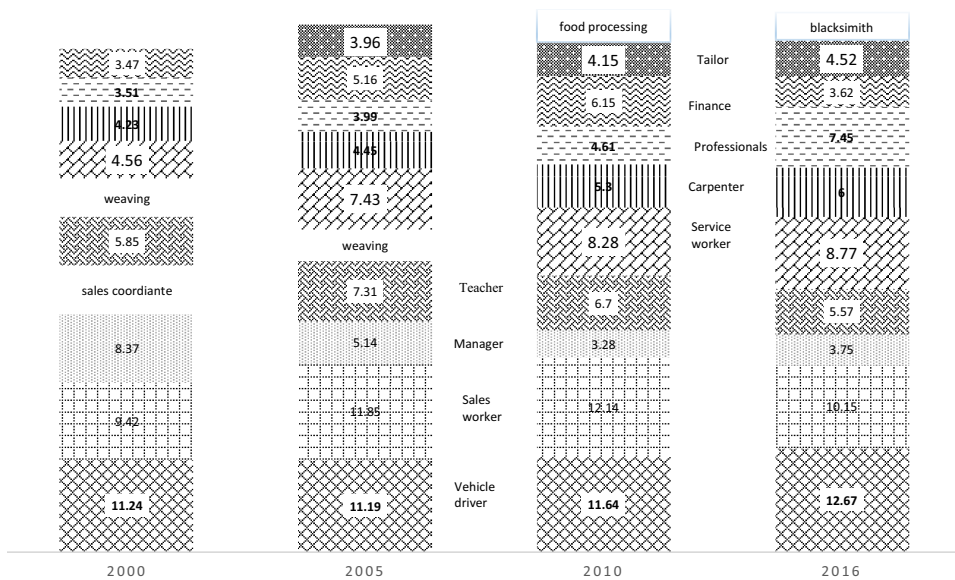
FIGURE 1 Distribution of top 10 rural nonfarm occupations: 2000–2016. [Colour figure can be viewed at wileyonlinelibrary.com]
Source: Several rounds of the HIES.

Now, the question is, what are these occupations? We documented the top 10 primary RNF occupations from each round of the HIES to learn how the structure of the RNF changed over time. Figure 1 shows that the top 10 occupations have not changed significantly since 2000. Only 13 different types of occupations constitute the top 10 in the four rounds of the HIES, and they make up approximately two-thirds of the total RNF occupations.

Occupations related to transportation, such as drivers, helpers and conductors of both motorised (bus, tempo, CNG, etc.) and nonmotorised vehicles (rickshaw, paddle van, etc.), have made up a large share of reported RNF occupations since 2000. Their share was approximately 11 per cent in 2000 and increased to approximately 13 per cent in 2016, indicating the dominance of the transportation sector in RNF activities. Nonclassified sales workers come next, which typically include occupations related to all kinds of shops (tea stalls, groceries, stationeries, hardware, etc.). Its share hovered at about 10–12 per cent during 2000–2016. Teaching is among the top 5 RNF occupations, although its share has decreased slightly since 2005. In 2016, approximately 5.57 per cent of the RNF occupations were teaching. The top 5 rural occupations were service related. In short, RNF is mostly a service-dominated sector, with a small proportion of manufacturing-related jobs (e.g. weavers and carpenters), and the dominance of service-related jobs has increased in recent years.[5]

3.2 | Changes in the sources of rural income and employment

We broadly categorised total household income into income from (i) agricultural wages, (ii) agricultural self-employment, (iii) nonagricultural wages, (iv) nonagricultural self-employment, (v) rent, (vi) remittances, (vii) transfers and (viii) other sources.[6] The first two

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[5]Five rounds of the LFS data also show similar patterns. The list of top 10 occupations of the LFS also reveals heavy concentration in service-related jobs such as shopkeepers and shop sales assistant, hand-and-pedal vehicle drivers, and car, taxi, van and motorcycle drivers.

[6]Note that the rental income from the equipment and the properties, and the interest income received make up the total rental income. Insurance claims, lottery, etc. are defined as other income.
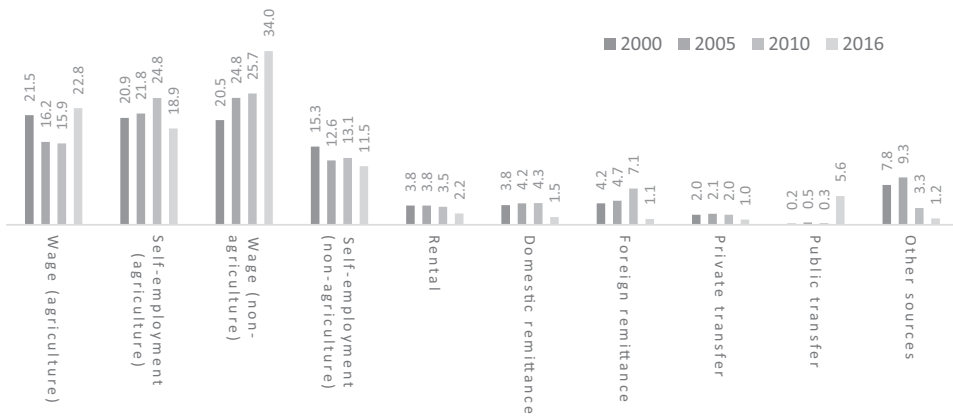
FIGURE 2 Shares of different sources of income of rural households (%).
Source: Several rounds of the HIES.

categories together comprised farm income, and the third and fourth comprised RNF income. We followed a conservative definition of RNF because we separated RNF income from rent, remittances and transfers (Hossain, 1984). Workers working abroad were also not part of the country's labour market; thus, international remittances were not included in the RNF. The case of domestic remittances was debatable, since it was not clear from the survey whether the activities that generate income are of RNF; we also consider them separately.

Figure 2 presents the share of rural household income from agricultural wages, declining from 21.5 per cent in 2000 to 15.9 per cent in 2010 but increasing to 22.8 per cent in 2016. The pattern of changes in the share of income from agricultural self-employment is the opposite: it increased from 20.9 per cent in 2000 to 24.8 per cent in 2010 but decreased in 2016. The income share from nonagricultural wages increased from 20.5 per cent in 2000 to 34 per cent in 2016, whereas that from nonagricultural self-employment declined from 15.3 per cent in 2000 to 11.5 per cent in 2016.[7]

The shares of rental income and domestic remittances remained at the same level—about 2 to 3 per cent. Foreign remittances contributed 4.2 per cent in 2000, increased to 7.1 in 2010 and sharply decreased to 1.0 in 2016. The share of private transfers decreases from 2 per cent to 1 per cent. However, the share of public transfer saw a jump from 0.2 per cent to 5.6 per cent, respectively, from 2000 to 2016.

When we compared farm with nonfarm income, we observed that between 2000 and 2016, the share of income from farm activities (wages and self-employment) did not fluctuate much and remained more or less constant at 38–42 per cent (Table 2). However, the income share from nonfarm sources (wages and self-employment) increased from 35.8 per cent in 2000 to 45.5 per cent in 2016.

We also observed the same trends in terms of employment distribution in rural areas. Overall, farm employment (i.e. wages and self-employment) decreased from 60.2 per cent in 2000 to 49 per cent in 2016. During the same period, nonfarm employment (wages and self-employment) increased from 39.8 to 51 per cent.

The higher share of nonfarm wage income (or employment) in total RNF income (or employment) has several implications. First, there is an argument that people start small businesses in developing countries as they cannot get paid jobs elsewhere, and this is more

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[7]According to LFS 2017, the share of salaried jobs in total nonfarm jobs is about 50.3 per cent up from 42.4 per cent in LFS 2005.

TABLE 2　Sources of income and employment of rural households: Farm and Nonfarm.

Sources	Income				Employment			
	HIES 2000	HIES 2005	HIES 2010	HIES 2016	HIES 2000	HIES 2005	HIES 2010	HIES 2016
Farm	42.4	38.0	40.7	41.7	60.2	51.7	49.8	49.0
Wage	21.5	16.2	15.9	22.8	24.3	21.3	20.1	25.4
Self-employment	20.9	21.8	24.8	18.9	35.9	30.5	29.7	23.5
Nonfarm	35.8	37.4	38.8	45.5	39.8	48.3	50.3	51.0
Wage	20.5	24.8	25.7	34.0	24.6	30.8	33.2	37.1
Self-employment	15.3	12.6	13.1	11.5	15.2	17.5	17.1	13.9
Total (Farm + Nonfarm)	78.2	75.4	79.5	87.2	100.0	100.0	100.0	100.0

Source: Several rounds of the HIES.

so in the rural economy. There is evidence of a strong preference for secured wage employment over self-employment (Calderon et al., 2016). The evidence that the share of salaried jobs has increased over time supports the idea that part of the RNF economy may have gone through a transformation from occupation by necessity to occupation by choice (Jayachandran, 2020).

Second, a higher share of wage employment in the RNF may deteriorate the income distribution if these occupations are concentrated in higher income groups. To investigate this, we plotted the sources of income against the income deciles of rural households (Figure 3).

Figure 3 shows that the share of income from nonagricultural wage employment has increased over the years, largely due to the higher-income decile. This share has been noticeably shrinking for the poorer deciles, particularly for the poorest three. This finding implies that an increase in the share of income from RNF wage employment benefits richer households. The share of income from self-employment, both farm and nonfarm, declined over time in the higher decile. Other sources of income that do not involve local economic activity, such as remittances and transfers, have declined in recent years for all groups.

Essentially, the share of labour income (farm and nonfarm) in the total income of rural households increased. While the share of farm income has remained fairly constant, the share of nonfarm income has increased significantly in recent years. The increase in nonfarm income is primarily due to an increase in nonfarm wage income. Labour supply follows the pattern of the income share. In recent years, wage income has become the dominant share of income in most income groups. Nonfarm income increases for richer income groups, particularly due to nonfarm wage income, indicating adverse distributional consequences.

4 | CONCEPTUAL FRAMEWORK AND RATIONALE FOR MODEL SPECIFICATIONS

The rural economy is characterised by duality in many dimensions—farm versus nonfarm, formal versus informal, skilled versus unskilled labour, etc.—and there are overlaps in these dimensions. In our study, we focused on the dynamics of first-farm versus nonfarm farms to understand structural changes in the rural economy. This conceptual framework guided our empirical work. We also relied on the literature to specify our empirical models, given the constraints of the datasets used.
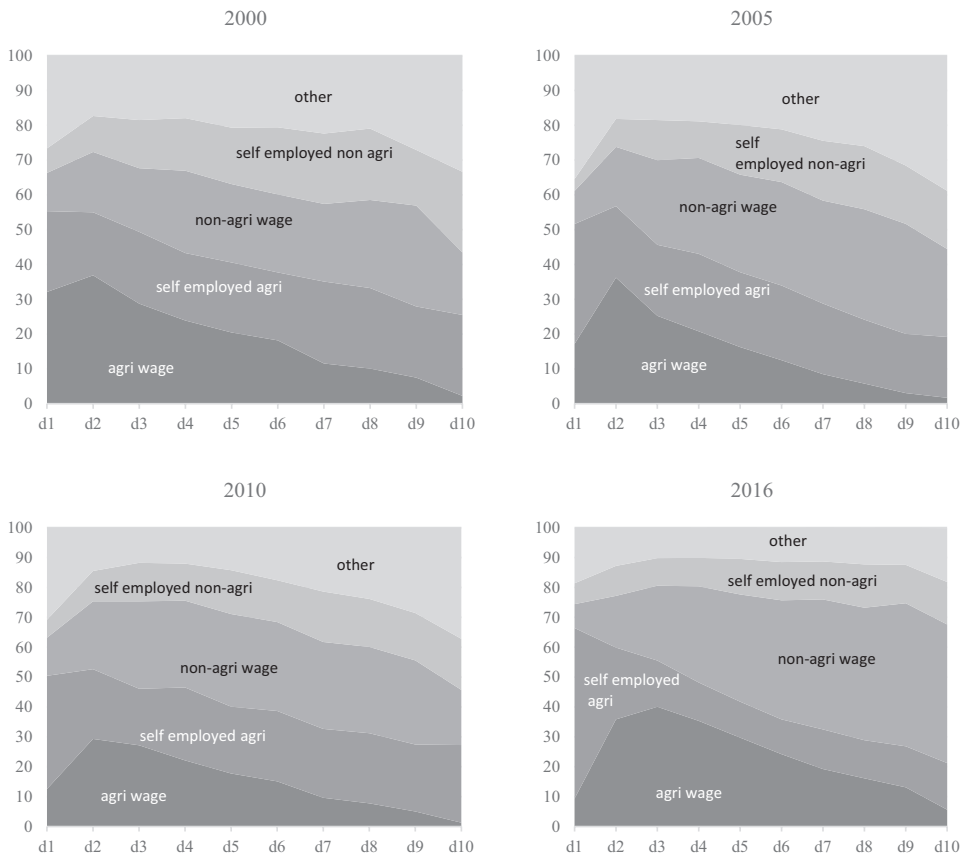
FIGURE 3 Sources of income-by-income decile.
Source: Several rounds of the HIES.

We began by conceptualising the production of farm and nonfarm outputs. Consider that the outputs of the farm and nonfarm sectors are produced by the following production function:

$$Y^F = f\left(K^F, L^F, A\right); \; Y^{NF} = F\left(K^{NF}, L^{NF}\right) \tag{1}$$

where farm output (Y^F)+nonfarm output (Y^{NF})=total rural GDP (Y); Farm capital (K^F)+nonfarm capital (K^{NF})=total rural capital (K); Farm labour (L^F)+nonfarm labour (L^{NF})=total rural labour force (L); A is agricultural land.

The problem of the representative rural household is to maximise Y by choosing the right combination of labour between farm and nonfarm work. To simplify the problem, we assumed that the choice of capital is made after labour is chosen. There are three possibilities:

4.1 | Interior solutions

$\frac{\partial Y^F}{\partial L^F} = \frac{\partial Y^{NF}}{\partial L^{NF}}$; In this case, the households are engaged in both farm and nonfarm activities. In the empirical analysis, we referred to these households as 'mixed households'. At the initial stage of diversification from farm to nonfarm, the share of mixed households tended to increase. Sen et al. (2021) observed a significant increase in the number of mixed households in Bangladesh in the early 2000s.

4.2 | Corner solutions

a. $\frac{\partial Y^F}{\partial L^F} > \frac{\partial Y^{NF}}{\partial L^{NF}}$; In this case, household labour is engaged in the farm sector only. These households are labelled as specialised in farming. Some households have a natural comparative advantage in farming.

b. $\frac{\partial Y^F}{\partial L^F} < \frac{\partial Y^{NF}}{\partial L^{NF}}$; In this case, household labour is engaged in the nonfarm sector only. These households are labelled specialised in nonfarms.

These corner solutions depend on rural labour productivity. As the productivity of labour in the RNF increases (e.g. due to education), labour tends to move away from agriculture and specialise in nonfarming only. Specialisation of RNF was observed in Latin America, well before being observed in South Asia (Berdegué et al., 2001). Recent evidence in Africa also suggests a higher share of nonfarm income and specialisation for richer households (Djido & Shiferaw, 2018).

Understanding the structural changes in Y critically depends on how Y^F and Y^{NF} change over time, particularly Y^F/Y^{NF} as well as the interior and corner solutions discussed above. Therefore, we focused on two major issues: (i) the evolution of farm and non-farm shares of rural households and (ii) the evolution of the mix between interior and corner solutions—how specialised versus mixed households have changed over time. We examined the latter analysis specialisation versus diversification in the rural economy.

We did not explicitly estimate production of the farm and nonfarm sectors; rather, we used factors that determine the choice of K and L between the farm and nonfarm sectors. Hence, we write:

$K = K$ (farm and nonfarm income, remittances, credit and transfers)

Apart from savings from farm and nonfarm income, remittances, credit and transfers are the three major sources of capital in rural areas (Syed & Miyazako, 2013; Yang, 2008).

$L = L$ (farm and nonfarm income, schooling, demographic characteristics and local opportunities)

The choice of labour between farm and nonfarm activity depends on household income, the education of household members and demographic characteristics such as household size, share of earners and whether the household is female (Estudillo et al., 2012; Sen, 2019).

Thus, the ratio of farm to nonfarm income is a function of the above factors and agricultural land.

Y^F/Y^{NF} = f (farm and nonfarm income, remittances, credit, transfers, schooling, demographic characteristics and local nonfarm opportunities)

Local nonfarm opportunities also depend on infrastructure, markets, distance to large cities and other factors. We captured the local characteristics that offer nonfarm opportunities using district fixed effects. Our choice of variables determining the evolution of farm versus nonfarm outputs or employment and the evolution of specialisation versus diversification was also guided by the literature. We tabulated nine studies in the online appendix (Table S4) that helped us choose the right-hand-side variables of our empirical models.

5 | DETERMINANTS OF THE SHARE OF RNF INCOME AND EMPLOYMENT

5.1 | Empirical strategy

While establishing causal inferences is beyond the scope of our study, we triangulated our cross-sectional results from the HIES and the LFS with household fixed effects from the BIHS,

offering some indication of causation. Because the value of the dependent variable lies between 0 and 1, we use the fractional probit to estimate the following regression using the HIES data.

$$
\textit{Share of nonfarm income}_i = \alpha_0 + \alpha_1.\,\textit{Edu of Head}_i + \alpha_2.\,\textit{Agricultural Land Owned}_i \\
+ \alpha_3 \textit{Domestic Remit}_i + \alpha_4 \textit{Foreign Remit}_i + \alpha_5 \textit{Control}_i + u_i
$$

(2)

where i denotes the household. The right-hand-side variables include the education of the household head, the amount of agricultural land owned and dummies if the household received domestic and foreign remittances. We controlled for household size, gender of the household head, share of earners in total earners, transfer income, credit outstanding, household income and district dummies. We estimated Equation (2) for the four rounds of the HIES (2000, 2005, 2010, 2016).

In the case of the LFS, we estimate the following model.

$$
\textit{Share of nonfarm employment}_i = \beta_0 + \beta_1.\,\textit{Education Dummy}_i + \beta_2.\,\textit{Land Dummy}_i + \beta_3 \textit{Control}_i + e_i
$$

(3)

where i denotes the household. As the LFS does not have information on remittances, we focused only on education and land ownership. Other control variables include the gender of the household head and household size. We estimated regression model (2) for the five rounds of the LFS (2017, 2015, 2013, 2010, 2005).

We ran fractional probit Equation (4) using the BIHS 2011 and BIHS 2015 separately. We then estimated the following model with household fixed effects:

$$
\textit{Share of nonfarm employment}_{it} = \gamma_0 + \gamma_1.\,\textit{Edu of Head}_{it} + \gamma_2.\,\textit{Agricultural Land Owned}_{it} + \\
\gamma_3 \textit{Domestic Remit}_{it} + \gamma_4 \textit{Foreign Remit}_{it} + \gamma_5 \textit{Control}_{it} + v_{it}
$$

(4)

The control variables include the share of earners to total earners, transfer income, outstanding loans, distance to main roads, distance to local shops and distance to weekly bazaars.

5.2 | Regression results and discussion

The marginal effects of the fractional probit results of Model 1 are reported in Table 3 for the four rounds of the HIES in Columns 1–4. The dependent variable is the share of nonfarm income in total income. The regression results showed that land-poor households had a higher share of nonfarm income in their total income. The marginal effects of agricultural land ownership were significant for all rounds of the HIES except 2016. In 2000–2010, a 1-acre increase in agricultural land was associated with a decrease in the share of nonfarm income by 4–7 percentage points. However, in 2016, the magnitude of the effects decreased to only 0.3 per cent, and the effects had lost statistical significance. That is, land ownership (or lack thereof) has become a weaker predictor of nonfarm income in recent years. Liu et al. (2020) found similar trends in Vietnam, where land endowment became less strongly associated with per capita consumption expenditure over time.

We further probed the association between agricultural land ownership and income and found that the role of land ownership in determining rural income diminished drastically (Figure 4). In 2000, there was a strong positive correlation between the amount of land owned and the income of rural households; households in the higher income decile owned higher amounts of cultivable agricultural land. This positive relationship was also observed for 2005, when the income level increased monotonically with the amount of land. However, this strong positive relationship broke down completely in 2010. In 2010, we observed no clear correlation

TABLE 3 Marginal effects of the fractional probit model with share of RNF income in total income as dependent variable.

Variables	HIES 2016 Y2	HIES 2010 Y2	HIES 2005 Y2	HIES 2000 Y2
Total land owned (agriculture)	−0.003	−0.070***	−0.047***	−0.045***
	(0.003)	(0.008)	(0.007)	(0.017)
Years of schooling of HH head	0.020***	0.021***	0.022***	0.021***
	(0.001)	(0.001)	(0.001)	(0.001)
Domestic remittance (dummy)	0.001	−0.058***	0.002	−0.103***
	(0.012)	(0.016)	(0.016)	(0.016)
Foreign remittance (dummy)	−0.082***	−0.128***	−0.082***	−0.172***
	(0.023)	(0.018)	(0.018)	(0.024)
Household size	0.035***	0.034***	0.027***	0.013***
	(0.002)	(0.002)	(0.002)	(0.004)
Share of earner	0.399***	0.476***	0.317***	–
	(0.025)	(0.028)	(0.032)	–
HH head female (dummy)	0.016	0.004	0.017	0.098***
	(0.013)	(0.017)	(0.020)	(0.024)
Transfer income	−0.006	0.001***	−0.003	0.003
	(0.003)	(0.0005)	(0.003)	(0.010)
Credit outstanding	−0.007**	0.007***	–	–
	(0.003)	(0.002)	–	–
Observations	26,132	6867	5772	4760
Design DF	1534	328	5771	4759

Note: Dependent variable is the share of nonfarm income in total farm and nonfarm income. Individual earning status (whether a household member earns or not) is not directly available for HIES 2000. Information on credit outstanding is not available for HIES 2000 and HIES 2005. We arrived at the regression sample after dropping urban households, households for which farm and nonfarm income together are zero, and outliers. The descriptive statistics of the regression sample are reported in the online appendix in Table S1. The original survey weights at the household level (the ones reported by the surveying agency) have been used in all regressions. Delta method standard errors are in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

between land ownership and income level. In 2016, we observed a weak relationship between these two variables. Land-poor households are no longer necessarily income-poor in rural areas. Observations of 'Hands not Land' on the rural production function in early 2000 (Toufique and Turton, 2002) have become more pertinent in recent years.

The regression results showed that the household head's years of schooling were positively associated with nonfarm income for all rounds of the HIES, and all marginal effects were statistically significant at the 1 per cent level. For instance, a 1-year increase in the household head's schooling was associated with a 2 percentage point increase in the nonfarm income of the household. The magnitude of this association remained constant over time.

Domestic remittances had a negative and statistically significant effect on RNF incomes in 2000 and 2010. Foreign remittances were also found to have a negative and statistically significant effect on RNF income for all years. The magnitude of these effects declines over time for both domestic and international remittances. In 2000, households receiving foreign remittances had approximately 17 percentage points lower nonfarm income shares than non-receiving households. The size of the effects declined to 8 percentage points in 2016. In short, although remittances are still associated with higher farm income, the degree of this association has declined.
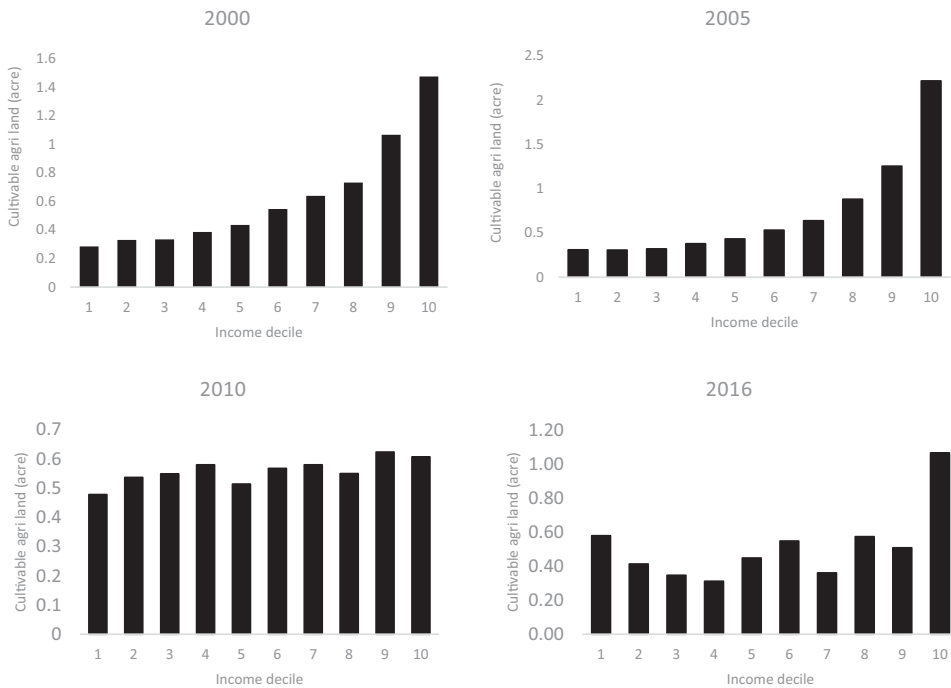
FIGURE 4 Land ownership and income.
Source: Several rounds of the HIES.

We then turned to the fractional probit results of Model 2 using the LFS data. In this case, the dependent variable was the share of nonfarm employment (i.e. the ratio of the number of persons employed in nonfarm work to the total number of employed persons in a household). The results are presented in Columns 1–5, Table 4. There were five landowner groups in the LFS. Our results show that compared with the landless (the reference group), a household with land had a smaller share of nonfarm employment than landless households (the reference group). As the amount of land increased, the share of nonfarm employment dropped significantly, and we observed a similar pattern across the years. Moreover, for larger landholdings, the share of nonfarm employment tended to decline over time.

The effects of education showed that the share of nonfarm employment increased with the education of household heads. The marginal effects were statistically significant at 1 per cent level for all years. Although not monotonic, the share of nonfarm employment tended to increase over time for households with higher levels of education. Households with larger size and female heads were found to have a higher share of nonfarm employment.

Next, using the BIHS data, we estimated Model (3), resulting in the marginal effects of the fractional probit results in Columns 1 and 2, and the fixed-effects results in Column 3 of Table 5. For all specifications, the dependent variable was the share of nonfarm employment in total employment. First, we considered the cross-sectional results in Columns 1 (2015) and 2 (2011). The amount of cultivable land was negatively related to the share of nonfarm employment in both years, and the coefficients were significant at the 1 per cent level. The education of the household head was positively correlated with the share of nonfarm employment, and this correlation slightly decreased over time. Households receiving domestic remittances engaged less in nonfarm employment than those who did not. We also found similar statistically significant negative relationships for foreign remittances in both years.

TABLE 4 Marginal effects of the fractional probit model with share of nonfarm employment as dependent variable.

Variables	(1) LFS 2017	(2) LFS 2015–16	(3) LFS 2013	(4) LFS 2010	(5) LFS 2005
Land (0.01–0.04 acres)	−0.022***	−0.030***	0.025	0.013	–
	(0.006)	(0.006)	(0.025)	(0.019)	
Land (0.05–2.49 acres)	−0.185***	−0.181***	−0.020	−0.161***	–
	(0.006)	(0.006)	(0.014)	(0.019)	
Land (2.50–7.49 acres)	−0.321***	−0.304***	−0.166***	−0.265***	–
	(0.010)	(0.010)	(0.012)	(0.021)	
Land (more or equal to 7.50 acres)	−0.346***	−0.279***	–	−0.279***	–
	(0.024)	(0.019)		(0.033)	
Education of HH head (Primary)	0.087***	0.089***	0.143***	0.068***	0.060***
	(0.004)	(0.004)	(0.010)	(0.007)	(0.007)
Education of HH head (Secondary)	0.151***	0.146***	0.234***	0.158***	0.106***
	(0.004)	(0.004)	(0.010)	(0.007)	(0.007)
Education of HH head (Higher Secondary)	0.342***	0.297***	0.351***	0.278***	0.283***
	(0.008)	(0.010)	(0.013)	(0.017)	(0.020)
Education of HH head (Tertiary)	0.570***	0.446***	0.510***	0.457***	0.409***
	(0.023)	(0.013)	(0.021)	(0.019)	(0.023)
Education of HH head (Others)	0.330***	0.294***	0.221***	0.291***	0.299***
	(0.034)	(0.047)	(0.044)	(0.071)	(0.099)
Sex of HH head (female)	0.034***	0.042***	0.147***	0.178***	0.116***
	(0.007)	(0.007)	(0.013)	(0.013)	(0.012)
HH size	0.013***	0.013***	0.010***	0.013***	−0.0009
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	55,081	54,795	17,948	31,106	22,555

Note: Share of nonfarm employment is the dependent variable, which is defined as the ratio of the number of persons employed in nonfarm to total employed persons in a household. Reference category for land dummy is no land. Reference category for education dummy is no education. Note that land and education variables are categorical in nature in the LFS. Coefficients of land are missing for the year 2005 because there is no information on land ownership in LFS 2005. Coefficient of land of a group (0.05–2.49 acres) for the year 2013 is missing because there is no household in this category. The descriptive statistics of the regression sample are reported in the online appendix in Table S2. The original survey weights at the household level (the ones reported by the surveying agency) have been used in all regressions. Delta method standard errors are in parentheses. ***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

We turned to the household FE results in Column 3. In this case, the cultivable land and education of the household head were no longer significant. In the case of land ownership, within-household variation was too small to produce any significant impact. This is also expected for education, as the household head mostly remains the same between the survey years, as does the level of education. However, the results for domestic and foreign remittances were statistically significant at the 1 and 5 per cent levels, respectively. This result robustly supported the notion that remittance-receiving households were likely to engage less in nonfarm employment over time.

Taking all the regression results together (HIES, LFS and IFPRI), several robust results stand out. Land-poor households are still largely involved in nonfarm occupations. However, the extent of the negative association between landholdings and the share of nonfarm income and employment weakened over time, indicating that landowners are also increasingly

TABLE 5 Marginal effects of the fractional probit model with the share of nonfarm employment in total employment as the dependent variable.

Variables	(1) BIHS 2011	(2) BIHS 2015	(3) Panel FE
Cultivable land owned/operated (acre)	−0.158***	−0.078***	−0.006
	(0.012)	(0.031)	(0.009)
Education of HH head	0.018***	0.016***	0.009
	(0.001)	(0.002)	(0.006)
Dummy: Domestic remittance	−0.131***	−0.152***	−0.073***
	(0.029)	(0.034)	(0.021)
Dummy: Foreign remittance	−0.109***	−0.111*	−0.074***
	(0.038)	(0.062)	(0.028)
Household size	0.011**	0.007	–
	(0.006)	(0.007)	
Share of earners	−0.139***	−0.232***	−0.458***
	(0.041)	(0.055)	(0.031)
Gender of HH head (Female)	0.133***	0.078***	–
	(0.029)	(0.032)	
Transfer income ('000)	0.00003	−0.0002*	−0.000
	(0.0001)	(0.0001)	(0.000)
Outstanding loan ('000)	0.0001*	0.00008	−0.000
	(0.0001)	(0.00005)	(0.000)
Distance to main road	−0.0047*	−0.008***	–
	(0.002)	(0.002)	
Distance to local shop	−0.021*	−0.032*	–
	(0.011)	(0.018)	
Distance to weekly bazaar	−0.015**	−0.017***	–
	(0.007)	(0.007)	
Observations	3168	3143	6286

Note: The dependent variable is the share of nonfarm employment, which is defined as the ratio of the number of persons employed in nonfarm to total employed persons in a household. The descriptive statistics of the regression sample are reported in the online appendix in Table S3. The original survey weights at the household level (the ones reported by the surveying agency) have been used. Delta method standard errors are in parentheses. ***$p<0.01$; **$p<0.05$; *$p<0.1$.

engaged in nonfarm activities. This tendency was observed more frequently in smaller land-holdings. Education is an important determinant of occupational choice between farm and nonfarm work: the more educated the household head, the more likely it is that the household will be engaged in nonfarm activities. The overall positive association between the education of the household head and the share of nonfarm income and employment is quite stable over the years. However, a higher education level is associated with more nonfarm employment over time. Remittance-receiving households engage more in farm employment and have higher farm income than nonrecipient households. However, there are indications that foreign remittances' role in promoting farm income has declined over time.

6 | SPECIALISATION VERSUS DIVERSIFICATION OF OCCUPATIONS

Following the conceptual framework in Section 4, we first categorised rural households based on the concentration of sources of income into three broad and mutually exclusive groups: farm-only, nonfarm-only and mixed. Mixed households had sources of income from both farm and nonfarm occupations. Because these three groups were mutually exclusive, our simple operational definition of specialisation in the RNF was a decrease in, 'mixed' and an increase in 'only nonfarm' income and employment over time.

Based on the HIES data, Table 6 presents the distribution of income and employment by income source from pure farm, pure nonfarm and mixed groups in the first three columns. In 2000, 44.4 per cent of households relied solely on agriculture for their income. This fraction of pure agriculture-based households declined slightly to 43 per cent in 2016, with little fluctuation between the years. By contrast, the share of nonagriculture-based households in the rural economy almost doubled from 16.93 per cent in 2010 to 30 per cent in 2016, although this share gradually decreased from 2000 to 2010. Mixed households accounted for approximately 42–43 per cent in 2005 and 2010. However, this share decreased drastically to 26 per cent in 2016. In short, pure agriculture-based households remained the same in 2000–2016, while mixed households have declined drastically since 2010, giving rise to a higher share of nonagricultural households. These descriptive statistics provide strong indications of specialisation in RNF occupations in the rural economy of Bangladesh.

Next, we focused on the distribution of occupations in rural households. Did we observe the same pattern of declining mixed groups in primary occupations? To answer this question, we defined pure farm, pure nonfarm and mixed households in terms of primary occupations. When all working members of a household reported agriculture as their primary occupation, we labelled the household as a pure farm household. Similarly, if the primary occupation of all household members was nonagricultural, we referred to this as a pure nonfarm household. Mixed households had agricultural and nonagricultural primary occupations. Columns 4–6 of Table 6 report the shares of the three groups. We observed a similar trend in employment for the period 2000–2016 (Table 6). Pure farm employment declined from 55 per cent in 2000 to 46 per cent in 2016, pure nonfarm employment increased from 33 per cent in 2000 to 46 per cent in 2016, and employment in the mixed category declined from 12 per cent in 2000 to 8 per cent in 2016.

While analysis at the household level indicated that households tended to specialise over time, we also examined this issue at the individual level. As individual-level income was difficult to estimate, we relied on individual employment. An individual was engaged in a pure farm (pure nonfarm) if he/she had only one primary occupation, which was a farm (nonfarm).

TABLE 6 Sources of rural household income and employment (both household and individual).

| | Sources of rural household income (%) | | | Sources of employment at household level (%) | | | Sources of employment at individual level (%) | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
Year	Pure farm	Pure nonfarm	Mixed	Pure farm	Pure nonfarm	Mixed	Pure farm	Pure nonfarm	Mixed
2000	44.40	18.61	37	54.64	32.9	12.46	58.4	27.3	14.3
2005	41.26	17.13	41.61	47.79	41.26	10.94	53.6	39	7.4
2010	40.41	16.93	42.66	46.97	42.05	10.97	51.7	40.7	7.6
2016	43.33	30.75	25.92	45.87	45.74	8.39	53.8	41.3	5

Source: Several sounds of HIES.

Individuals in 'mixed' groups had employment both in agricultural and in nonagricultural sectors. We observed the same trend in employment sources at the individual and household levels (Columns 7–9 of Table 6). Pure farm employment declined from 58 per cent in 2000 to 54 per cent in 2016, pure nonfarm employment gradually increased from 27 per cent in 2000 to 41 per cent in 2016 and employment in the mixed category declined drastically from 14 to 5 per cent.

In short, there were strong indications of specialisation at both the household and individual levels. While income from pure farms has remained constant over time, income from pure nonfarms has doubled in recent years, leading to a decline in income for the mixed group. Households with multiple working members are more likely to engage in either farm or nonfarm jobs. The share of individuals with multiple jobs has also declined and the share of pure nonfarming has increased, indicating specialisation at the individual level.

7 | DETERMINANTS OF SPECIALISATION/DIVERSIFICATION

7.1 | Empirical strategy

We ran multinomial logit models to identify the household-level characteristics responsible for such structural changes using all three datasets: HIES, LFS and BIHS. In the case of the HIES, we used the source of income to divide households into three mutually exclusive categories (i.e. pure farm, pure nonfarm and mixed). The same categorisation was made for the LFS and the BIHS using the source of employment. We considered a pure farm as the base category to identify the probability of engaging in other categories (i.e. pure nonfarm and mixed). The other covariates were the same as those used in Section 5.

7.2 | Regression results and discussion

The marginal effects of multinomial logit regression at the household level using four rounds of the HIES are presented in Table 7. Agricultural landholdings decreased the likelihood of engaging in pure nonfarming and increased the likelihood of being in the mixed group. This was true for all four rounds of the HIES. The number of years of schooling of the household head is an important factor in pushing households out of agriculture. An interesting pattern was observed: the probability of earnings from nonfarm households increased monotonically from 0.7 per cent in 2000 to 2 per cent in 2016 with one additional year of education for the household head, while the probability of earnings from mixed sources decreased monotonically over the years from 2 per cent in 2000 to 0.4 per cent in 2016. This indicates that education has played an increasingly prominent role in promoting specialisation in nonfarm occupations.

Interestingly, earnings from domestic and foreign remittances not only lowered the probability of earning from nonfarm sources alone but also reduced the possibility of earnings from mixed sources. The same pattern was true for domestic remittances, except in 2005 and 2016. The popular belief that agricultural households receiving remittances will diversify further into nonfarm activities, such as small businesses, did not necessarily hold. We repeated the same exercise with the five latest rounds of the LFS and two rounds of the BIHS at the household level; results are presented in Tables 8 and 9. In both cases, we restricted our sample to households with multiple-earning members.[8] At the household level with multiple earners,

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[8]Household-level specialisation only makes sense for the households with multiple earning members.

TABLE 7 Marginal effects of a multinomial logit regression on sources of income at the household level using HIES data.

Variables	HIES 2016		HIES 2010		HIES 2005		HIES 2000	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Nonfarm	Both	Nonfarm	Both	Nonfarm	Both	Nonfarm	Both
Total land owned (agriculture)	−0.083	0.029	−0.131***	0.008	−0.105***	0.017**	−0.134***	0.022**
	(0.081)	(0.028)	(0.007)	(0.009)	(0.010)	(0.007)	(0.009)	(0.009)
Years of schooling of HH head	0.021***	0.004***	0.010***	0.018***	0.011***	0.020***	0.007***	0.023***
	(0.003)	(0.001)	(0.001)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Domestic remittance (dummy)	−0.048***	0.070***	−0.019**	−0.027	−0.020*	0.041**	−0.025***	−0.120***
	(0.014)	(0.012)	(0.009)	(0.021)	(0.011)	(0.020)	(0.007)	(0.019)
Foreign remittance (dummy)	−0.012	−0.025	−0.039***	−0.065**	−0.039***	−0.037*	−0.021**	−0.156***
	(0.029)	(0.018)	(0.010)	(0.026)	(0.011)	(0.020)	(0.009)	(0.027)
Household size	0.023***	0.054***	0.002	0.076***	0.004*	0.053***	0.002	0.039***
	(0.005)	(0.004)	(0.002)	(0.005)	(0.002)	(0.004)	(0.001)	(0.004)
Share of earner (no. of earners/HH size)	0.223***	0.376***	0.093***	0.725***	0.078***	0.416***		
	(0.040)	(0.032)	(0.023)	(0.047)	(0.021)	(0.043)		
HH head female (dummy)	0.107***	−0.100***	0.046***	−0.059**	0.028*	−0.019	0.066***	−0.030
	(0.021)	(0.013)	(0.015)	(0.024)	(0.015)	(0.026)	(0.021)	(0.035)
Transfer income	−0.004	0.006	−0.000	0.001	−0.002	−0.002	0.027***	−0.090**
	(0.006)	(0.004)	(0.001)	(0.001)	(0.003)	(0.004)	(0.006)	(0.036)
Credit outstanding	−0.035***	0.017***	0.003*	0.016***				
	(0.012)	(0.006)	(0.002)	(0.006)				
Observations	26,132	26,132	6867	6867	5772	5772	4760	4760

Note: Base category is the farm only. Individual earning status (whether a household member earns or not) is not directly available for HIES 2000. The original survey weights at the household level (the ones reported by the surveying agency) have been used in all regressions. Information on credit outstanding is not available for HIES 2000 and HIES 2005. Robust standard errors are in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

TABLE 8 Marginal effects of a multinomial logit regression on sources of employment at the household level using LFS data.

Variables	LFS 2017		LFS 2015		LFS 2013		LFS 2010		LFS 2005	
	(1) Pure nonfarm	(2) Mixed	(3) Pure nonfarm	(4) Mixed	(5) Pure nonfarm	(6) Mixed	(7) Pure nonfarm	(8) Mixed	(9) Pure nonfarm	(10) Mixed
Land (0.01–0.04 acres)	−0.044***	0.082***	−0.047***	0.037***	−0.010	0.062*	0.027	0.044*		
	(0.008)	(0.012)	(0.008)	(0.011)	(0.028)	(0.037)	(0.017)	(0.023)		
Land (0.05–2.49 acres)	−0.171***	0.086***	−0.152***	0.033***	−0.043***	0.040*	−0.091***	−0.034		
	(0.008)	(0.012)	(0.008)	(0.011)	(0.016)	(0.022)	(0.016)	(0.024)		
Land (2.50–7.49 acres)	−0.170***	−0.042**	−0.182***	−0.055***	−0.160***	−0.013	−0.134***	−0.070***		
	(0.006)	(0.018)	(0.005)	(0.017)	(0.021)	(0.019)	(0.011)	(0.026)		
Land (≥7.50 acres)	−0.173***	−0.116***	−0.163***	−0.107***	0.001	−0.008	−0.143***	−0.055		
	(0.009)	(0.035)	(0.009)	(0.032)		(0.038)	(0.011)	(0.038)		
Education of HH head (primary)	0.054***	0.013*	0.055***	0.005	0.104***	−0.015	0.037***	0.022**	0.011	0.054***
	(0.007)	(0.008)	(0.007)	(0.008)	(0.016)	(0.015)	(0.008)	(0.010)	(0.010)	(0.012)
Education of HH head (secondary)	0.094***	0.023***	0.097***	0.010	0.191***	−0.017	0.073***	0.024**	0.039***	0.075***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.019)	(0.017)	(0.009)	(0.010)	(0.011)	(0.013)
Education of HH head (higher secondary)	0.241***	−0.017	0.243***	−0.051***	0.282***	−0.160***	0.148***	0.005	0.235***	0.046
	(0.016)	(0.016)	(0.020)	(0.018)	(0.026)	(0.023)	(0.026)	(0.026)	(0.036)	(0.036)
Education of HH head (tertiary)	0.487***	−0.173***	0.377***	−0.087***	0.464***	−0.086	0.302***	−0.065**	0.294***	0.044
	(0.032)	(0.032)	(0.022)	(0.021)	(0.040)	(0.064)	(0.030)	(0.029)	(0.038)	(0.037)
Education of HH head (others)	0.195***	0.020	0.239***	0.021	0.217***	0.026***	0.125	0.017	0.093	0.289
	(0.063)	(0.061)	(0.088)	(0.086)	(0.075)	(0.064)	(0.130)	(0.134)	(1.043)	(1.043)

(Continues)

TABLE 8 (Continued)

Variables	LFS 2017		LFS 2015		LFS 2013		LFS 2010		LFS 2005	
	Pure nonfarm	Mixed	Pure nonfarm	Mixed	Pure nonfarm	Mixed	Pure nonfarm	Mixed	Pure nonfarm	Mixed
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
HH size	0.013***	0.027***	0.015***	0.031***			0.011***	−0.001	0.007***	0.012***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)
Sex of HH head (female)	0.190***	−0.007	0.167***	−0.015	0.132***	0.036	0.174***	−0.155***	0.163***	−0.070***
	(0.010)	(0.016)	(0.010)	(0.016)	(0.017)	(0.025)	(0.017)	(0.029)	(0.015)	(0.024)
Observations	29,289	29,289	28,510	28,510	9930	9930	17,267	17,267	11,419	11,419

Note: Pure farm occupation is the base category. Reference category for land dummy is no land. Reference category for education dummy is no education. Marginal effects of land are missing for the year 2005 because there is no information on land ownership in LFS 2005. Marginal effect of land of a group (0.05–2.49 acres) for the year 2013 is missing because there was no household in this category. The original survey weights at the household level (the ones reported by the surveying agency) have been used in all regressions. Robust standard errors are in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

TABLE 9 Multinomial logit results (household level) using the BIHS data.

Variables	BIHS 2011		BIHS 2015		Panel FE	
	(1)	(2)	(3)	(4)	(5)	(6)
	Pure nonfarm occupation	Mixed occupation	Pure nonfarm occupation	Mixed occupation	Pure nonfarm occupation	Mixed occupation
Cultivable land owned/operated (acre)	−0.082***	−0.104***	−0.130***	−0.038	−2.126***	−0.732***
	(0.008)	(0.018)	(0.013)	(0.026)	(0.173)	(0.077)
Education of HH head	0.003***	0.022***	0.005**	0.021***	0.197***	0.160***
	(0.001)	(0.004)	(0.002)	(0.004)	(0.031)	(0.023)
Domestic remittance	0.003	−0.101**	−0.017	−0.120**	−0.886**	−0.832***
	(0.015)	(0.042)	(0.024)	(0.054)	(0.404)	(0.280)
Foreign remittance	−0.011	−0.166***	−0.086***	−0.150*	−2.031***	−1.103***
	(0.012)	(0.045)	(0.017)	(0.087)	(0.574)	(0.344)
HH size	0.002	0.111***	0.007	0.087***		
	(0.004)	(0.012)	(0.006)	(0.015)		
Share of earners	−0.038	0.594***	−0.102*	0.517***	−2.307***	−0.077
	(0.026)	(0.091)	(0.053)	(0.105)	(0.599)	(0.397)
Gender of HH head (female)	0.032***	0.099*	0.072***	0.077		
	(0.012)	(0.057)	(0.025)	(0.066)		
Transfer income ('000)	−0.000	−0.000	0.000	−0.000	0.000	−0.002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Outstanding loan ('000)	0.000	0.000	0.000***	0.000**	0.003**	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Observations	2252	2252	1644	1644	3896	3896

Note: Pure farm occupation is the base category. The coefficients of the last two columns (FEs) represent the coefficients of multinomial logit regressions. They are not the marginal effects as the marginal effects cannot be estimated for ML models with FEs. Share of earners is defined as the ratio of the number of earning members to the household size. The original survey weights at the household level (the ones reported by the surveying agency) have been used in the individual rounds; weights are not used in the panel fixed effect model. Robust standard errors are in parenthesis.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

pure farm, nonfarm and mixed households were defined in relation to the primary occupation. We labelled a household as a pure farm (reference category) and a pure nonfarm if the primary occupations of all household earners were farm and nonfarm activities, respectively. Similarly, households with both farm and nonfarm primary occupations were considered mixed households.

Considering Table 8, it is evident that the ownership of a smaller amount of land increased the probability of belonging to the mixed group and decreased the probability of being in the pure nonfarm group, compared to the landless group. However, the likelihood of mixing farm and nonfarm work decreased for larger landholdings. One possible explanation for this is that the land-poor farmers having 0.01–0.04 acres of land were largely involved in low-paid nonfarm activities.[9] As the size of the land owned increases, these farmers mix nonfarm with more farm work; therefore, the share of mixed group increases. But the larger farms which tend to specialise in farming tend to mix less farming with nonfarming work.

The LFS reports education variables as categorical variables. A lower level of education was associated with a higher likelihood of being engaged in both farm and nonfarm activities, whereas a higher level of education reduced this likelihood. This indicates that farming households with a lower level of education first diversify into nonfarm activities, and as the level of education increases to the tertiary level, all household members tend to abandon agriculture. The likelihood of moving away from agriculture at the tertiary education level increases over time.

Table 9 presents the results of multinomial logit regressions using the BIHS data. The first four columns show the year-specific OLS results, and the last two columns show the FE results. The results showed that higher amounts of owned agricultural land reduced the probability of all household members being involved in nonfarm activities alone and in both farm and nonfarm occupations. These results also held true for within-household variations (FEs). In terms of education, the FE results were positive and significant. The coefficients of both domestic and foreign remittances were negative and significant for FEs. This implies that households with multiple earning members who receive remittances are less likely to engage in nonfarm activities alone and in mixed occupations.

Taking all the results together using multiple years and sources, several robust results emerged. The ownership of agricultural land promotes specialisation in farming. However, there is heterogeneity; the impact of land ownership depends on the size of landholdings. In general, education promotes specialisation in nonfarm activities. Education tends to increase the chances of doing both farm and nonfarm work, mostly at lower levels of education. Remittance-recipient households, in contrast, are more involved in farming and less likely to mix farms with nonfarm occupations.[10]

8 | CONCLUSION

The objective of this study is to document broad structural changes in the RNF sector from 2000 to 2016 in Bangladesh. Several rounds of data collection helped us track the changes over time, while multiple sources triangulated our results. We examine the role of several socioeconomic characteristics of the household, such as agricultural land ownership, education of the household head, and domestic and foreign remittances, in influencing structural changes in

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[9]About 74 per cent of the households having 0.01–0.04 acres of land are involved in the RNF sector.

[10]We also conducted similar exercises at the individual level to examine the determinants of specialisation. The results are very similar to that of household-level analysis. These results are available upon request.

the RNF sector. We focus on two broad structural changes: the evolution and determinants of (i) the distribution of farm and nonfarm income and employment and (ii) diversification versus specialisation with respect to RNF.

We find that the role of agricultural land in the production of RNF income has diminished, implying that nonland inputs have become the dominant factors of production in rural areas. The growth of the RNF has led to a structural change in the production function of rural income. The share of RNF income and employment increased over time. The increase in nonfarm income is primarily due to an increase in wage income, particularly in the wage income of more educated workers. Hence, the benefit of the increase in RNF income has not been distributed evenly across income groups; the share of wage income has increased disproportionately for higher income groups. That is, the structural change in the RNF was not been found to be pro-poor. In line with the study by Haggblade et al. (2010), we argue that endogenous growth of the RNF sector does not guarantee that this will be a pro-poor growth, and therefore, intervention from the government is a must by providing greater access to the factors that promote RNF opportunities more equally such as education and skill training.

Households with multiple working members are now more likely to engage in either farm or nonfarm jobs, and this trend also holds at the individual level. That is, the incidence of mixing farm and nonfarm jobs, both at the household and individual levels, has decreased. This transition from diversification to specialisation indicates the maturity of the rural economy. This specialisation may increase labour productivity and output in rural economies. Any public intervention or policy-promoting RNF activity must consider this structural change. There is a tendency for rural development strategies in developing countries to encourage entrepreneurs by promoting secondary occupations through credit and training. This issue should be revisited in the context of growing specialisation on farms and nonfarms.

Education has been found to be a critical force in rural transformation, promoting higher RNF employment and specialisation. Based on our results, we hypothesise that at the initial stage of development, there will be an education-induced transformation from farm to non-farm work. As the level of education increases for all, due for example to policy, arbitrage opportunities in the RNF will decrease, and more educated individuals will be engaged in agriculture, giving rise to higher productivity and commercialisation of agriculture in the long run. However, this requires further exploration.

We acknowledge that our results cannot be interpreted as causal. Drawing causal inference is beyond the scope of this study, as our focus is not to answer any specific and narrowly defined question. Rather, we attempt to document the broader changes in the rural economy and their covariates, particularly the RNF sector, in the last two decades using several rounds of household data from different sources. We believe this type of documentation is important for two major reasons: first, broader picture is important for policy directions and for fixing the right 'development narrative' of a country, be it for the whole economy or a particular sector; second, the documentation of the association of the covariates can help find the right research agenda and generate more robust studies on causal paths in future.

The limitations of the causal interpretation of the results can be overcome in future research on the two major results. First, one of our headline results is that education plays an important role in promoting RNF employment and specialisation. Exogenous variations in school expansion (due to policies) can be used to study their impact on local RNF outcomes. Second, one can exploit a government-run lottery programme (e.g. Bangladesh–Malaysia visa lottery) to study the impact of international migration on the RNF activities of recipient households.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study were derived from the following resources available in the public domain: BIHS (2013, 2016), HIES (2000, 2005, 2010, 2016) and LFS (2005, 2010, 2013, 2015, 2017).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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