Key Determinants Influencing Income Diversification Among Rural Households in North Macedonia

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Abstract

Traditional rural development strategies have historically focused on agricultural activities as the primary source of income. However, contemporary approaches increasingly recognize Non-Farm Rural Employment (NFRE) initiatives as essential drivers of economic resilience and livelihood sustainability of rural households. This study examines income diversification among 140 rural households in North Macedonia, using 2018 survey data, categorizing income from agricultural production, non-agricultural rural activities, off-farm employment, transfers and others. The Shannon Index equitability, which captures income diversification through two dimensions: the number and equity of income sources, is employed in this analysis. Using linear regression, the study assesses the influence of specific determinants on diversification index, revealing positive bivariate associations with motivation (r=0.82, p<0.001), agricultural land size (r=0.27, p=0.001), market access (r=0.25, p=0.002), education (r=0.19, p=0.014) and financial access (r=0.21, p=0.006). Multivariate analysis identifies motivation (β=0.75*, p<0.001), market access (β=0.16*, p<0.001), *age (β=0.13*, p=0.01) and education (β=0.11*, p=0.02)* as the sole significant drivers. To effectively diversify rural economies, enhance resilience, and reduce vulnerability, policies should integrate household-level capacity building, such as vocational training, with broader structural interventions, including improved infrastructure and access to financial services. Promoting NFRE through such a dual approach is essential for fostering sustainable rural livelihoods in North Macedonia.

Introduction

Rural economies around the world are increasingly confronted with challenges arising from climate variability, market volatility and demographic changes. These pressures have prompted a necessary shift away from traditional agrarian livelihoods toward more diversified income strategies. While rural development policies have historically emphasized agricultural intensification as the primary route to poverty alleviation, mounting evidence from sub-Saharan Africa (Barrett et al., 2001), South Asia (Haggblade et al., 2010), and Latin America (Reardon et al., 2001) underscores the growing importance of non-farm rural employment (NFRE) in enhancing income stability, reducing vulnerability and building economic resilience. Dharmawan and Manig (2000) demonstrate that diversification-based strategies significantly affect rural household welfare, both socioeconomically and environmentally. On the other hand, as urban life becomes unhealthier and more stressful, there is a growing interest among city dwellers in seeking rural services for relaxation, recreation and a healthier lifestyle (Kovachevikj, 2021). Existing research identifies key drivers of diversification, including access to education (Escobal, 2001), financial services (World Bank, 2008), and market linkages (Ellis & Freeman, 2004).

However, in North Macedonia, rural opportunities are significantly shaped by institutional legacies and patterns of uneven development. While agricultural land ownership is frequently associated with a greater capacity for income diversification (Jayne et al., 2003), its relevance and impact within European post-socialist contexts remain insufficiently examined. Likewise, household motivation and cultural attitudes toward non-farm rural employment (NFRE), though potentially decisive, are subjective dimensions that are often overlooked or insufficiently quantified in econometric analyses.

This study addresses two questions: *What factors most significantly influence income diversification among rural households in North Macedonia, and how can policymakers leverage these insights to bolster rural resilience?* Given the importance of agriculture in North Macedonia, this study asserts that income diversification is influenced by two main factors: (1) household-level characteristics such as land size, education and entrepreneurial motivation and (2) structural conditions like market access and access to finance.

Materials and methods

Sampling and data collection methodology

This study examines rural livelihood strategies through primary data collected from two distinct NUTS-3-level of regions of North Macedonia: Polog and Pelagonia. These regions collectively encompass 28.6% of the country's territory (State Statistical Office, 2022). The analyzed regions were strategically selected to represent the country's socioeconomic and agroecological diversity. In Pelagonia, the sample reflected the region's aging population, Macedonian ethnic majority

(86%), and crop-dominated farming systems specializing in tobacco, apples and dairy production (Kovachevikj, 2021). Conversely, the Polog sample represented that region's younger demographics, Albanian ethnic majority (73%), and livestock-based livelihoods centered around pastoral activities (Kovachevikj, 2021). The research employed a stratified random sampling approach to select 140 farm households (70 from each region) from the National Extension Agency registries. The sampling design incorporated critical factors to ensure comprehensive representation, including farm size categories (from smallholdings under 2 hectares to medium farms exceeding 10 hectares), varying levels of access to markets and services, the distinct ethnic compositions characteristic of each region's demographics, and balanced geographic distribution within both Polog and Pelagonia regions.

Trained enumerators conducted in-person interviews using pretested questionnaires that systematically captured: all agricultural and non-agricultural income sources, comprehensive household demographic characteristics, detailed information on asset ownership and productive resources, access to financial services and markets, and perceived constraints and opportunities for livelihood improvement. This multidimensional data collection approach enabled robust analysis of income diversification patterns.

Rural Economic Diversification and Classification of Rural Income Sources

Rural areas are increasingly recognized as spaces of diverse economic activity aimed at supporting the livelihoods of rural populations. These activities include the production of traditional specialty foods, the collection of medicinal, aromatic and ornamental plants, rural tourism, the valorisation of natural assets and traditional landscapes, as well as artisanal crafts and services (Kovachevikj, 2013). This diversification of rural economies reflects a growing shift toward multifunctionality in rural development. The extent and nature of income diversification depend on several interrelated factors: the availability and accessibility of alternative income sources, household capacity to engage in them, and their responsiveness to changing opportunities. These responses are shaped by geographic location, proximity to labour and product markets, access to infrastructure and services, human and social capital, and broader policy environments (*ibid*). Rural income can be broadly categorized into several types, reflecting the multifaceted nature of rural livelihoods. Classification used in this research is adapted from Reardon, Berdegué and Escobar (2001) and Ellis (2000), which helps distinguish between different economic activities based on their relationship to farm resources. The main categories include: *(1) agricultural income on the farm, (2) non-agricultural rural income on the farm, (3) off-farm income, (4) transfer income* and *(5) other income*. *Agricultural Income* remains the cornerstone of rural livelihoods. It includes earnings from crop cultivation and livestock rearing. For numerous households, it serves as the primary income base, especially in more remote or farming-oriented communities. *Non-Agricultural Rural Income* includes activities not directly tied to primary agriculture but still embedded within rural contexts. These include food processing (e.g., cheese-making, grain milling), rural tourism (e.g., agrotourism, homestays, cultural tours), local services (e.g., repair shops, rural transport), artisanal crafts and others. These sectors are vital for promoting rural entrepreneurship, value addition, and economic diversification (Start & Johnson, 2001). *Off-Farm Income* refers to income from employment beyond the household's agricultural or rural enterprises. Examples include employment in nearby towns or urban centres, seasonal work in construction, or factory jobs. Although often used interchangeably with non-farm income, some scholars differentiate off-farm income as that specifically tied to employment not based on self-enterprise (Ellis, 2000; Barrett et al., 2001). It is particularly significant for households vulnerable to agricultural risks and looking to smooth income flows. *Transfer Income* includes unearned income from external sources, such as government subsidies, pensions, unemployment benefits and remittances sent by emigrants or diaspora. These transfers provide crucial safety nets and contribute to income stability, especially during agricultural downturns or economic shocks (World Bank, 2008). *Other Income* encompasses irregular or miscellaneous sources, such as revenue from informal gigs, digital freelancing, or online sales of handmade goods.

Measurement of income diversification

There are several methods to measure the diversification of rural incomes, including the Shannon Index (Wan et al., 2016), the Simpson Index (Koiry et al., 2024) and the Herfindahl-Hirschman Index (HHI) (Banerjee & Mistri, 2019). In this study, the Shannon Index is used as it effectively captures the number of income sources and their proportional distribution. Unlike the Simpson Index and HHI, the Shannon Index is sensitive to variations in smaller income sources and applies logarithmic weighting, preventing dominance bias. Additionally, the Shannon Equitability Index (E), derived from the Shannon Index and commonly used to assess the structural stability of species (Magurran, 1988), is applied to evaluate the equitability of income distribution across households (Wan et al., 2016). The Shannon index for equality is calculated as follows (Schwarze & Zeller, 2005):

$$E = \left[\frac{H_{income}}{-\sum_{i=1}^{S} \left[\left(\frac{I}{S} * \ln\left(\frac{1}{S}\right) \right) \right]} \right] * 100$$

$$H_{income} = -\sum_{i=1}^{S} [(incshare_i) * ln(incshare_i)]$$

E – Shannon index for equality
S – Number of income sources
$incshare_i$ – The share of income from activity i in the total household income
Ln – Natural logarithm
H_{income} – Shannon index for income diversity within a household, which incorporates the number of income sources and their evenness.
The Shannon index E ranges from 0 to 100 and represents the actual percentage of income diversification relative to the maximum possible income diversification. As the value of the index increases, the degree of income diversification within a household also increases.

Assessing the Influence of Key Determinants on Income Diversification

To assess the influence of key determinants (total income, age structure, education, motivation for RNA, access to finance, agricultural land, clean environment, traditional food and events and market access) on income diversification among rural households, a multiple linear regression model is employed (Wooldridge, 2016). The regression quantifies how these variables collectively explain variations in the Shannon Equitability Index (E), which measures income diversification.
The multiple linear regression model used in this study is specified as follows:

$$E = \beta_0 + \beta_{1x1} + \beta_{2x2} + \ldots + \beta_{kxk} + \varepsilon_i, i = 1, 2, \ldots, n$$

Where:
E = Shannon Index value for household (dependent variable).
β_0 = intercept
$/\beta_1, \beta_2, \beta_3, \beta_4, \ldots\beta_k$ =regression coefficients for the independent variables (determinants),
$x_1, x_2 \ldots x_i$ = explanatory variables
ε_i = error term

In the context of this study, the model is specified as:

$$E = \beta_0 + \beta_1(total\ income) + \beta_2(agricultural\ land) + \beta_3(age) + \beta_4(education) + \beta_5(motivation) + \beta_6(access\ to\ finance) + \beta_7(market\ access) + \beta_8(clean\ environment) + \beta_9(tradition) + \varepsilon_i$$

RESULTS AND DISCUSSIONS

Table 1 provides a comprehensive overview of annual rural income dynamics across five categories. Agricultural income emerges as the dominant source, contributing 53% to total income, with a mean value of 11,794.90 EUR. However, its high variability (coefficient of variation of 80%) underscores significant disparities among households, likely driven by factors such as land ownership, crop yields or market access. Non-agricultural rural activities, while offering a substantial maximum income of 69,430.89 EUR, exhibit extreme variability (coefficient of variation of 230%), reflecting uneven opportunities in sectors like trade, crafts, or services. Despite this potential, the mean income for non-agricultural activities remains low (3,121.94 EUR), indicating that only a minority of households benefit significantly from these ventures. Transfer income (unearned income), which includes remittances, pensions, or welfare payments, serves as a stable and critical component of rural livelihoods. With a coefficient of variation of 72%, it is the least volatile income source and contributes 23% to total income, highlighting its role as a reliable safety net. In contrast, off-farm income (e.g., wage labor) and other income categories are marginal contributors, accounting for 9% and 0.2% of total income, respectively.

Table 1. Descriptive statistics of rural income sources.

Annual rural income categories	Min (EUR)	Max (EUR)	Mean (EUR)	Std. Deviation (EUR)	Coefficient of Variation (%)	Share in Total Income (%)
Agricultural income	-	39,382.11	11,794.90	9,474.26	80.33	52.86
Non-Agricultural rural income	-	69,430.89	3,121.94	7,189.18	230.28	16.12
Off-Farm income	-	10,894.31	1,304.92	2,030.60	155.61	9.32
Transfer income	-	13,034.15	4,082.94	2,940.08	72.01	22.52
Other income	-	2,926.83	47.04	312.23	663.78	0.18
Total income	2,926.83	69,430.89	20,351.73	11,807.45	80.33	100.00

Table 2 presents the descriptive statistics of the variables used in the regression model. The Shannon index, used as the dependent variable, shows moderate variability among the surveyed households, with a coefficient of variation (CV) of 19.75%, indicating a certain level of diversity in income sources across the sample. The average value of the Shannon index is 77.59%, indicating a relatively high level of income diversification among rural households, suggesting that most families rely on multiple income sources, though with moderate variation across the sample. Among the explanatory variables, total annual income averages 20,352 EUR, with a high CV of 80%, suggesting significant economic disparities among rural households. Agricultural land, a key physical asset for economic activity, ranges widely across respondents (0.1 to 45 ha), showing substantial variation (CV = 125.02%), which reflects the unequal distribution of land resources. Age of the household head, who typically serves as the main decision-maker for livelihood strategies, averages 59 years, with relatively low variability (CV = 11.73%), indicating an older population involved in diversification decisions. Education is measured on a scale from 1 to 4 (1 = incomplete primary, 2 = primary, 3 = secondary, 4 = higher/university education), with an average score of 3.01, suggesting that most household heads have completed secondary education. Education, as an important form of human capital, can influence knowledge and skills relevant for non-agricultural activities. Motivation for rural non-agricultural (RNA) entrepreneurship was measured on a scale from

1 (very low) to 5 (very high), averaging 3.26 (CV = 33.63%), pointing to moderate levels of entrepreneurial drive among rural residents. Access to finance, a structural enabler, is included as a binary variable (1 = access, 0 = no access). With a mean of 0.39 and a very high CV (124.76%), the data highlight the unequal availability of financial services, which may constrain diversification opportunities. Market access, also measured as a dummy variable (1 = access, 0 = no access), shows a mean of 0.54 (CV = 92.10%), indicating that slightly more than half of the respondents have some degree of market connectivity. Clean environment is a subjective measure based on residents' perception of environmental quality in their village (1 = clean, 0 = not clean), with a mean of 0.53 and CV of 94.78%. This captures environmental awareness and its potential to support diversification into areas such as eco-tourism or organic agriculture. Finally, traditional food and events are also measured as a binary variable (1 = yes, 0 = no), asking whether respondents believe their village possesses distinct culinary or cultural traditions. A mean of 0.71, suggests that the majority recognize such cultural assets, which can be important for tourism or branding rural products (CV = 64.58%).

Table 2. Descriptive statistics of the determinants used in the regression model.

No	Determinants	Unit	Min	Max	Mean	Std. Deviation	Coefficient of Variance (%)
1	Shannon index	%	34.00	100.00	77.59	15.33	19.75
2	Total income	euros	2,926.83	69,430.89	20,351.73	11,807.45	80.33
3	Agricultural land	ha	0.10	45.00	4.61	5.76	125.02
4	Age of the household head	years	25.00	70.00	59.07	6.93	11.73
5	Education degree	degree*	1.00	4.00	3.01	0.50	16.69
6	Motivation for RNA	metric	1.00	5.00	3.26	1.10	33.63
7	Access to finance	dummy	0	1	0.39	0.49	124.76
8	Market access	dummy	0	1	0.54	0.50	92.10
9	Clean environment	dummy	0	1	0.53	0.50	94.78
10	Traditional food and events	dummy	0	1	0.71	0.46	64.58

*1=incomplete primary education, 2=primary education, 3=secondary education, 4=higher and university education

The results of the Pearson correlation between the Shannon index and each independent variable are displayed in Table 3. Motivation for RNA ($r = 0.82$, $p<0.05$), agricultural land ($r = 0.27$, $p<0.05$), market access ($r = 0.25$, $p<0.05$), age ($r = 0.24$, $p<0.05$) and access to finance ($r = 0.212$, $p<0.05$) are positively and significantly correlated with the Shannon index, indicating their notable role in shaping income diversification patterns among rural households. In contrast, total income and clean environment do not indicate statistically significant correlations with the Shannon index. The low influence of income may reflect the current underdevelopment of rural non-agricultural activities (RNA) in North Macedonia, where income sources remain limited and concentrated in traditional sectors, such as agriculture. Regarding the clean environment, the lack of correlation might stem from insufficient awareness among rural residents that environmental quality is a fundamental condition for the development of sustainable rural economies, such as eco-tourism or organic production.

Table 3. Pearson correlation coefficients between determinants and the Shannon index of income diversification.

Variable	Pearson Correlation	Sig. (1-tailed)
Total income	0.04	0.321
Agricultural land	0.27	0.001***
Age	0.24	0.002**
Education	0.19	0.014*
Motivation	0.82	0.001***
Access to finance	0.21	0.006**
Market access	0.25	0.002**
Clean environment	−0.02	0.422
Tradition	0.18	0.019*

* ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

Table 4 displays the model summary of the multiple linear regression. The model explains 73.4% of the variance in the Shannon index ($R^2 = 0.734$), with a good overall model fit (Adjusted $R^2 = 0.716$; $F(9,130) = 39.87$, $p < 0.001$). The Durbin-Watson statistic is 2.047, indicating no autocorrelation in the residuals.

Table 4. Model summary of the multiple linear regression model.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
				R Square Change	F Change	df1	df2	Sig. F Change	
0.857[a]	0.734	0.716	0.08173	0.734	39.866	9	130	0.000	2.047

Table 5 reports the coefficients of the regression model. Motivation for RNA ($\beta = 0.751$, $p < 0.001$), market access ($\beta = 0.162$, $p = 0.001$), age ($\beta = 0.133$, $p = 0.006$), and education ($\beta = 0.113$, $p = 0.018$) have significant positive effects on the Shannon index. Other variables, such as income, access to finance, agricultural land, clean environment, and traditional food and events, do not show statistically significant effects. VIF values are all below 1.2, indicating no multicollinearity issues.

Table 5. Coefficients of multiple linear regression model (Dependent variable: Shannon index).

Variable	B (Unstandardized)	Std. Error	Beta (Standardized)	t	Sig.	VIF
(Constant)	0.11	0.08	–	1.43	0.16	–
Total Income	–5.567E-7	-	–0.043	–0.919	0.36	1.07
Agricultural Land	0.00	0.00	0.03	0.62	0.54	1.15
Age	0.00	0.00	0.13	2.79	0.01**	1.11
Education	0.04	0.01	0.11	2.40	0.02*	1.09
Motivation For RNA	0.11	0.01	0.75	15.18	0.000***	1.20
Access To Finance	0.01	0.02	0.04	0.78	0.44	1.14
Market Access	0.05	0.01	0.16	3.51	0.00***	1.04
Clean Environment	0.00	0.02	0.00	0.07	0.94	1.11
Tradition	0.03	0.02	0.08	1.62	0.11	1.04

* ($p < 0.05$), ** ($p < 0.01$), *** ($p < 0.001$)

Conclusions

The findings on the structure of rural income sources underscore the dual challenges facing rural economies: a predominant dependence on agriculture, often unstable due to climate variability and market risks, and unequal access to rural non-agricultural (RNA) opportunities. Although agriculture remains the backbone of rural livelihoods, its volatility exposes households to considerable vulnerability. Non-agricultural activities, while holding strong potential for diversification, remain underutilized due to barriers such as limited access to finance, lack of skills, or inadequate infrastructure. The relatively stable share of transfer income further highlights the critical role of social protection mechanisms in cushioning rural poverty.

The statistical results highlight the complexity of rural income diversification. Motivation emerges as the strongest driver, supported by market access, age and education. These findings emphasize the combined role of personal initiative and supportive conditions, while factors like income, land, finance and environmental or cultural aspects show limited direct influence.

Successful diversification strategies in rural areas rely less on economic resources alone and more on personal readiness, accessible markets and educational background. For policymakers, this underlines the need to go beyond financial support and address the broader social and institutional conditions that empower rural households to engage in non-agricultural activities and reduce their vulnerability. Additionally, the limited influence of environmental factors points to the need for greater awareness among rural populations about the potential of environmental quality for economic diversification. In terms of access to finance, although a strong influence was initially expected, the results showed otherwise. This may indicate that financial support alone is not sufficient to drive diversification. Rather, it probably needs to be complemented by additional measures such as training, advisory services and targeted investment programs to effectively empower rural households to engage in non-agricultural activities. Future research could include a more detailed classification of income sources to better capture their impact.

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