Agricultural & Rural Studies

Article

Determining Factors Effecting the Population Growth Rate of Villages in Turkey: An Econometric Perspective

Murat Öztürk * and Esin Cumhur Yalçın

Faculty of Economic and Administrative Sciences, Kırklareli University, Kırklareli 39000, Turkey; yalcin@klu.edu.tr
* Correspondence: moztrk@gmail.com

Abstract: Assuming core (permanent) population to be vital to the maintenance of the village and rural life, this study investigates the population growth rate (PGR) of villages in Turkey. PGR is used as a dependent variable in the analysis, using a sample of 201 villages. The independent variables are ascertained through face-to-face interviews with village heads (mukhtars). Hypothesis tests, correlation analysis and econometric models are used to examine the development/decline trends of the PGR of the village. The results show that total land property of the village and land property per household are the strongest variables supporting the continuity of population. Agricultural income remains the biggest income item in most villages, and this increases according to land size. Beyond this, opportunities for paid work outside the village while living in it (extra-village employment) positively affect the rate of increase of the village population.

Keywords: econometric analysis of village survival; village population changes; land property; extra-village income; viability of villages

Citation: Öztürk, M.; Yalçın, E. C.; Determining Factors Effecting the Population Growth Rate of Villages in Turkey: An Econometric Perspective. *Agricultural & Rural Studies*, 2023, *1*, 0013.
https://doi.org/10.59978/ar01030013

Received: 15 August 2023
Revised: 5 November 2023
Accepted: 10 November 2023
Published: 20 November 2023

1. Introduction

The territory nowadays comprising Turkey, in Anatolia and Thrace, has one of the oldest histories of sedentary life, dating back around 12,000 years to circa 10,000 BCE. Although the first settlements were quite different from those of today, they were still in the form of a village settlement and the main economic occupation of people was agriculture. The survival of these villages as communities also depended on meeting the needs of the population with the products obtained via agricultural activities, either directly (farm-based production) or indirectly (exchanging farming produce for items made outside). In other words, as long as the total agricultural product and the total needs of the population were in balance, and assuming no environmental disaster, people would continue to live in that place. When this balance was not achieved, some or all of the population would eventually migrate out and establish new villages. As Mayozer and Roudart (2009, p. 266) state, "many Mediterranean regions (Palestine, Anatolia, Cyprus, Malta), which included Anatolia in the Neolithic age, witnessed successive abandonment and resettlement periods of peoples". The same source also states that village populations could not exceed 300 people in this period due to transportation problems. Today, Turkey has a rapidly decreasing population in the countryside as a whole, with falling average populations by village and a growing population in just 10 percent of villages. This study looks at the weakening and developing population of villages of Turkish villages in the context of contemporary socio-economic conditions. Comprehensive quantitative data and similar analyses using them are rarely found in the literature. In this respect, this study aims to contribute to the change in rural areas and quantitative rural analysis beyond just providing information about villages in Turkey. It will make more clear some recent developments in the Turkey rural like villages are declining and disappearing or return from cities to villages in the last 40 years. While the rural population is decreasing in general, non-agricultural activities and incomes are increasing in the villages, and tourism and industry are developing in some regions. Therefore, this study also aims to contribute to understanding the recent changes about Turkish villages.

Resilience and the disappearance or development of rural settlements is a complex subject related to ecological, economic and cultural systems (Anthopoulou et al., 2017). According to Li, Westlund and Liu (2019, p. 137), "Generally, the development of rural communities consists of both the material and immaterial content", where the "material" content includes "physical space, geographic characteristics, population and resource endowments", and the "immaterial" content involves such things as "personal relationships, values, attitudes, culture and institutions". Li and

his colleagues draw attention to the growth, decline, and even death of rural communities as depending on interaction between rural settlements and areas and the external environment. Rural development in the knowledge economy is determined by linked endogenous and exogenous factors. Important factors for rural settlement resilience range from climate conditions and natural resources through location and land opportunities to regional development and agricultural policies. Moreover, rural resilience "reflects the capacity to adapt to interruptions and changes" which is itself the result of a "long process of transformations and reconstructions, adaptations and integration of intrinsic resources and forces operating in the social and ecological system" (Folke et al., 2010; Pike et al., 2010, cited in Anthopoulou et al., 2017, p. 3).

In the literature, studies examining the sustainability of rural areas on the basis of rural households have included the following variables in their analyses: productivity of the agricultural sector, farmer incomes, and loss of livelihoods (Ratnasari et al., 2023), economic ability (Miller, 2023), the ability of "... use urban opportunities and assets to diversify income sources and thereby avoid the uncertainties..." (Baker,1995, p. 117), resources like financial reserves, social resources, organizational resources, and community resources.(Scharlach et al., 2019, P. 708), sanitation conditions of the community, household expenditure, income satisfaction (Xie et al. 2023, pp. 15–16). While Ali Boloor and Asima Nusrath point out that villages close to the city can attract more population (Boloor & Nusrath, 2015, p. 1162), and Salisbury et al. argue "Village population change and city distance are negatively correlated" (Salisbury et al., 2005, p. 149).

In summary, the adaptation and expansion, survival and extinction of rural settlements is determined by a variety of conditions and factors that are influenced by changes in historical, socio-economic, geographical situations and governmental policies at both national and international levels. Therefore, to understand evolution of the rural settlements need to research each specific condition in its context. Because there are huge numbers of rural settlements with many different characteristics as well as common ones, quantitative approaches to the issue of rural survival are implied. However, "with academic and professional attention increasingly focusing on the quantitative analysis of urban and regional change, the rural had been relegated from being at the core of geography to an inferior position" (Phillips & Smith, 2018, p. 4). Such analysis focusing on the village is thus at once an important subject in its own right and also constitutive of a redressing the balance. Expressed in another way, the mass population shift of recent times known as "urban migration" is equally "rural migration" – what is into one is out from the other. Thus, consideration of the continued viability of the countryside as a space for living communities – in Turkish, villages are literally "alive/living" (canlı) or otherwise – acts as a corrective to what may be dubbed the urban centric assumption.

The urban centric assumption is an analytical perspective that prioritizes the city (urban space and its places) and others the village (rurality) (Jongerden, 2021). This is grounded in the historical transformation of economies, in which value became increasingly added by industry as opposed to agriculture as a function of technological and systems development (mass production, financial capital) – along with the situation of researchers, it might be added, who are typically based in urban centers, attached to institutions with a similarly urban perspective or interest bias. Currently, tertiary sector developments (radically stimulated by communication exchange facilitated by the Internet) indicate the possibility of a new transformation – perhaps even going beyond the rural-urban binary, eventually. For the moment, however, Turkey remains mostly in the "developing world" position – notwithstanding its designation as a newly industrialized country" (NIC) – with respect to population balance.

There are many historical and socio-economic dimensions of the villages population changes, agricultural activities, such as mechanization, general government economy policies, birth and death rate, in and out-migration both domestic and international, political reasons, rural development policies, rural population adaptation strategies i.e. All these subjects are analyzed more detailed in previous research and publications, see Öztürk (2012, 2019), Öztürk et al. (2014, 2017, 2020).Turkey has seen a demographic shift of historical proportions – quite literally – during the last period of economic neoliberalism, essentially with an inversion of the traditional 3:1 rural-to-urban population ratio over the last half century or so (the current reversal stands at around 1:4) (Öztürk, 2012, pp. 139 ff.). Changes in counting classification make official statistics difficult to interpret, but certainly they have also shown an overall absolute as well as relative decline in the numbers of people living in Turkey's countryside, notwithstanding the development of out-of-city suburbia (belde, banliyö), or "urban villages" (Öztürk et al., 2014).

It is in this context, therefore, that the present study is presented as a review and extension to the project Socio-Economic and Cultural Transformation of Rural Space: Modernizing and Disappearing Traditional Spaces and Meanings (2014–2017). The research project employed both quantitative and qualitative research methods. Here we have utilized further quantitative data on Turkish villages and interpretations of those in addition to the original qualitative research. The qualitative

part of the research project consists of 60 focus group discussions (FGDs), 30 with women and the other 30 with men, in 30 different villages across Turkey.

The project was realized in 26 (NUTS 2) statistical regions to represent the country as a whole. Face-to-face interviews were conducted with village headmen (mukhtars) in 201 villages, used to investigate the development and decline of the villages. For these mukhtar interviews, 71 questions were asked, both open-ended and closed, on a range of subjects including the village's land assets, agricultural activities, technology, food production, non-agricultural income, relations with the nearest town/city, migration and cultural issues. Some of the data obtained from these questions were accepted as independent variables, with population change being taken as the dependent variable. Then, econometric models were created based on meaningful relations of the dependent with independent variables. Increase in population is employed as the primary indicator of settlement development/decline because it is the most emphasized indicator in the literature as well as in the raw historical data.

2. Materials and Methods

Studies conducted in developed countries mostly show a positive relationship between population density and population size (Singh et al., 2008). Manifestly, the fact that a population lives more densely in a place means that the people are able to continue their lives there. However, the facilities of the settlement or region may become insufficient in the face of population growth over time; thus, "researchers draw attention to the relationship between population pressure and livelihoods and economic factors, especially between population density and quantity and location and availability of means of subsistence" (Kuijt, 2000, p. 77). At this point, in its simplest form, rural settlement evolution (survival/extinction) can be considered a phenomenon wherein livelihoods are determined by the existence and quality of land and climate conditions specific to the village, and usage rights and ownership are defined within the framework of the rules of the social system. For this reason, one of the first independent variables examined in the analyses was the land property of the village.

Table 1: Variables used in analysis and their explanations

Dependent Variable		
Variable	**Definition**	**Explanation**
PGR	Population growth rate	0=decreasing less or increasing* 1=decreasing more
Independent Variables		
Variable	**Definition**	**Explanation**
	Land Property of Village	
LAND	Land per household	
TRAC	Tractors per household	
NOH	Number of households	
HWL	Households without land	
TLV	Total land of village	
	Variables Used in Econometric Model 1	
DIST	Distance to town/city	
ILH	Land/irrigated land per household	
CCOL	Lives in the city and cultivates own land	0*=No, 1=Yes
WCOL	Has non-farming village work and cultivates own land	0*=No, 1=Yes
VWC	Lives in the village but works in the town/city	0*=No, 1=Yes
IVE	Investment/aid sent to the village after emigration	0*=No, 1=Yes
MIG	Migration from town/city to village	0*=No, 1=Yes
	Variables Used in Econometric Model 2	
WLAND	Household without land	0*=No, 1=Yes
DLAND	Decline in household land	0*=No, 1=Yes
ILAND	Increase in household land	0*=No, 1=Yes

* Categories encoded “0” are defined as the reference (base) class.

Both historical data and contemporary literature show that population size, infrastructure and social facilities have a positive effect on the survival of the rural settlement. In addition, the fact that the villages are of different types even within a country and the conditions are constantly changing over time requires that the analyses to be made on the villages include different or newly developing characteristics. According to our field research, one of the new significant factors in the differentiation of villages is the level of non-agricultural activities, employment and income; roughly, the greater the external and non-agricultural inputs, the more vibrant the village. The data on non-agricultural activities, incomes and the population living in the village and going to the town/city for daily work are also included in the econometric analysis here. These variables have been assessed at both the household and village level in the field study. This data and methodology that we used econometric analyses are distinctive characteristics of this study.

Another important factor is immigration to village, which supports the population of the village. People wanting to migrate to the village and those who want to invest should be able to acquire land from the village. For this reason, these two variables were also included in the analysis to determine whether they were effective in village development (as measured by population). According to the qualitative research observations, ease of access to urban social facilities, shopping places and entertainment venues has a decreasing effect on village out-migration and can be effective in villages receiving migration. In this context, information about the variables used in the study is given in Table 1.

In the first step of the analysis, the population change between 1965 and 2008 in the villages surveyed was calculated. For general population growth rate (PGR), villages across Turkey were allocated to two groups. The first group of villages had a population decrease at rates lower than the (−13%) national average (or an increase), and the second group had a decrease at rates faster than the average.

The population survival of a settlement is primarily due to births. If there are no young people in the village to become partners and have children together, the number of people in the village

decreases and the ability to regenerate weakens. In addition, young people staying in the community and finding a spouse (i.e., from another village or elsewhere) contributes to maintaining or increasing the human presence in the village. (Non-marital) migration from and to the village also affects the population size and the characteristics.

Living in a place requires that people have the means to meet their needs there, starting with food and shelter. This requires consideration of livelihood. In the villages within the scope of this research, agricultural income (including animal husbandry) was found to constitute the first biggest source of income in 66.6% of the villages and the second biggest source in 47.8%. Clearly, the main income in most of the villages is derived from agricultural activities. Determinants of the level of agricultural income include total land of the village, size of the land per household and, as a negative of the same indicator, households without land. In addition, as an indicator of agricultural income, the presence of a tractor and animals are also significant variables.

In this context, three main research questions were addressed:

(1) Are there differences among village land/property types (land per household, tractors per household, number of households, households without land, total land of village) according to PGR?
(2) Is there a correlation between land property of a village and PGR?
(3) What are the factors affecting PGR according to the econometric models obtained?

3. Results and Discussion

3.1. Mann-Whitney U Test

In the first analysis, the differences among village land/properties (land per household, tractors per household, number of households, households without land, total land of village) according to PGR was tested. First, a Kolmogorov-Smirnov normality test is performed, and it was observed that the variables are not distributed normally. Thus, in order to test the differences according to PGR, a Mann-Whitney U test was applied. The results of this test are shown in Table 2

Table 2. Results of differences by PGR.

	LAND	**TRAC**	**NOH**	**HWL**	**TLV**
Mann-Whitney U	2608.500	2577.000	2998.000	503.000	3841.500
Wilcoxon W	7073.500	7137.000	8048.000	1064.000	8306.500
Z	−5.272	−4.572	−4.720	−2.671	−2.096
Asymp. Sig. (2-tailed)	.000**	.000**	.000**	.008**	.036**
** Significance at 5%					

As a result of the analysis, when it was seen that the variables were not distributed normally, a Mann Whitney U test was applied instead of the independent t-test. Since the probe values obtained were 0.000 (i.e., < 0.05), it was decided that the medians were not equal according to the PGR groups – in other words, there was a significant difference between the groups. Table 3 shows where these differences were.

Table 3. Mean-rank values.

	PGR	**N**	**Mean Rank**	**Sum of Ranks**
LAND	Decreasing less and rising	99	117.65	11647.50
	Decreasing more	94	75.25	7073.50
	Total	***193***		
TRAC	Decreasing less and rising	89	111.04	9883.00
	Decreasing more	95	75.13	7137.00
	Total	184		
NOH	Decreasing less and rising	100	80.48	8048.00
	Decreasing more	98	118.91	11653.00
	Total	***198***		
HWL	Decreasing less and rising	33	32.24	1064.00
	Decreasing more	47	46.30	2176.00
	Total	***80***		
TVL	Decreasing less and rising	99	105.20	10414.50
	Decreasing more	94	88.37	8306.50
	Total	**193**		

The mean-rank values in Table 3 show that in villages with lower than average decreases or a growing population, the total land, total land per household and the number of tractors per household was higher. In rapidly population decreasing villages, the number of households without land and the number of households was higher. These results show a significant relationship between agricultural assets, which are the most important determinants of agricultural income, and population development. Although in some villages non-agricultural income exceeds agricultural income, agricultural income is still a primary factor in village population change.

The other side of the same coin was that the population decrease rate was shown to be higher than average in villages with more landless households and with a higher number of households. If households lose their land, those households migrate, and the population decreases (faster). If the number of households is high, the amount of land per household decreases and/or landlessness increases, depending on the division of land by inheritance. In this case, people will emigrate to find better living conditions. In fact, among the reasons given for the decline in living standards in villages, that of "agricultural products do not pay off/agricultural income and/or livestock number decrease" was given most commonly (at a rate of 32%). Other reasons mainly pointed to general income decrease and livelihood difficulties. This was confirmed by the reasons for migration from the village; a little over 60% of the reasons given for leaving were unemployment, to find a job, and financial difficulties.

3.2. Correlation Analysis

In the second analysis, the correlation between land properties of villages is tested, using the same variables. This analysis method is commonly used to test the linear relationship between two variables or the relationship of a variable with two or more variables and to measure the relationship between these, if any.

Table 4. Results of Spearman correlation test.

			TLV	HWL	LAND	TRAC	NOH
Spearman's rho	TLV	Correlation coefficient	1.000	−0.133	0.680**	0.185*	0.205**
		Sig. (2-tailed)	.	0.240	0.000	0.013	0.004
		N	196	80	196	182	196
	HWL	Correlation coefficient		1.000	−0.425**	−0.295**	0.379**
		Sig. (2-tailed)		.	0.000	0.008	0.000
		N		81	80	80	81
	LAND	Correlation coefficient			1.000	0.426**	−0.526**
		Sig. (2-tailed)			.	0.000	0.000
		N			196	182	196
	TRAC	Correlation coefficient				1.000	−0.350**
		Sig. (2-tailed)				.	0.000
		N				187	187
	NOH	Correlation coefficient					1.000
		Sig. (2-tailed)					.
		N					201

** Correlation significant at 0.01 level (2-tailed).

* Correlation significant at 0.05 level (2-tailed).

The correlation coefficient can be obtained by various methods. Generally, three types of correlation coefficients are used, namely Pearson, Kendall's tau-b and Spearman's rho. If the data of the variables to be correlated are normally distributed, the Pearson correlation coefficient is preferred, and if one or more are not normally distributed, then Kendall's Tau-b or Spearman's correlation coefficient is preferred. The following definitions are made regarding the power of the correlation coefficient:

0.00 – 0.25 Very weak relationship
0.26 – 0.49 Weak relationship
0.50 – 0.69 Moderate relationship
0.70 – 0.89 High relationship
0.90 – 1.00 Very high relationship

Since the variables obtained from the research data were not distributed normally, the evaluation was made according to the Spearman correlation coefficient, from which the following eight conclusions can be drawn.

(1) The relationship between LAND and TLV shows a moderate positive correlation between the coefficient value of 0.680 and the significance level of 0.01 (p = 0.0000).

Since the total land assets are fixed, the land per household will naturally decrease as the number of households increases. The positive but weak aspect of this relationship can be interpreted thus: if the total land is large, it allows the village to support more households, but the imbalance of land distribution and land assets are not the only determinants of land per household. In fact, out-migration from many villages occurs due to landless households and related livelihood difficulties.

(2) TLV and TRAC have a very weak positive and significant relationship, with the coefficient value of 0.185 and the significance level of 0.05 (p = 0.013).

The availability of a large amount of land in a village does not require tractors in all or most of the households in the village. Depending on the distribution of land among households, relatively large land-owning households may own tractors, while those with less do not. For a small-scale landowner to own a tractor may not be economic. Small landowners may not have the opportunity to accumulate and borrow money to buy a tractor. In fact, small landowners typically rent a tractor when necessary.

(3) TLV and NOH have a very weak positive and significant relationship, with a 0.205 *coefficient* value at the 0.01 significance level (p = 0.004).

As stated above (in the first analysis), if the total land is relatively large, the number of households is expected to be higher where there is a balanced distribution of land, but as the number of

households increases, the amount of land per household will decrease with divisions by inheritance, and the smaller land will not support the large number of households in the long run (since a certain size of land will only support a certain number of households). Considering that agricultural land reached its maximum at the end of the 1960s in Turkey, and that the total number of farms did not change much after that, there was a decrease in small landowners. The positive but weak land size-to-household relationship is thus in accordance with historical developments.

(4) HWL and the LAND have a negative significant weak relationship, with a coefficient value of 0.425 at a significance level of 0.01 (p = 0.000).

It is significant that the relationship between households without land and land per household is negative. The same amount of land is divided by more households, and households with shrinking lands become landless more quickly. Conversely, the increase in the amount of land per household coincides with the migration of households without land.

(5) HWL and TRAC have a negative significant weak relationship, with a coefficient value of 0.295 at a significance level of 0.01 (p = 0.004).

This can be evaluated similarly to Conclusion 4.

(6) HWL and the NOH have a positive and significant weak relationship, with a coefficient value of 0.379 at the level of 0.01 significance (p = 0.000).

The increase in the number of households causes an increase in the number of households without land due to the division of the land by inheritance. However, the weakness of the relationship indicates that the landless households migrated from the village.

(7) LAND and TRAC have a weak positive relationship, with the coefficient value of 0.426 at the level of 0.01 significance (p = 0.000).

It is meaningful that households that have more land own tractors.

(8) LAND and the NOH have a weak and negative relationship, with the coefficient value of 0.350 at the significance level of 0.01 (p = 0.000).

Increasing total land per household implies that larger households buy some of the land of other households. A total of 21.5%. households who sold their land had either migrated or were about to take the first place, which was the largest proportion in this category. This relationship between migration and land sales supports the negative relationship between the number of households and the amount of land per household.

3.3. Econometric Models

- **Model 1**

After analysing the correlations between certain variables and population change rates, we looked at some other variables in relation to the dependent variable and conducted modelling analyses.

In these models we used, the following (three) open and (five) yes/no variables: (open) distance of village from town/city, village tractor number and amount of (irrigated) land per household; (yes/no) cultivate own land but lives in the town/city, cultivates own land but (also) has non-farming work in the village, lives in the village but works in the town/city, receives investment/aid in the village after emigration, and migration from town/city to village.

We found the following variables in the field that supported the village population: People who were cultivating their own land but were either living outside the village or who had non-farming work in the village (thus, not entirely dependent on agricultural income); villagers who were living in the village but going to work (daily) in the town/city (extra-village employment); some people who had emigrated from the village but later made investments and/or gave aid to the village; and some people who had migrated from the town/city to the village.

In a multivariate model in which dependent and independent variables are separated when the dependent variable is a nominal-scale variable, the ordinary least squares method (OLS) is inadequate as the estimation technique. In this case, discriminant and logistic regression models can be used as an alternative.

The dependent variable consists of two or more groups in the discriminative model, and the parameters of the model are calculated to best distinguish the groups from one another. However, in order for discriminative analysis to make this distinction in the best way, the independent variables should be suitable for normal distribution and the covariances of the independent variables should be equal at each group level. If nominal or ordinal scale variables are included among the independent variables, these two assumptions cannot be provided. This assumption is not sought for independent variables in logistic regression models. The general form of the logistic regression model is as follows (Gujarati, 2001, p. 555):

$$L = \ln\left[\frac{pi}{1-pi}\right] = b_0 + b_1X_i + e_i \quad (1)$$

Because analytical methods cannot be used in parameter estimations in the logistic regression model, the maximum likelihood (ML) technique, which is an iterative method, is used (Stock & Watson, 2011, p. 401). A logistics distribution function is used to explain the model. In the logit model, coefficients cannot be directly interpreted as the effect of a change in independent variables on the expected value of the dependent variable. The sign of the coefficient indicates the direction of the relationship between the argument and the probability of the event occurring.

Table 5. Descriptive statistics of the recommended variables (Model 1).

Variables	Observations (no.)	Mean	Standard Deviation	Minimum Value	Maximum Value
PGR	198	0.5050	0.5012	0	1
DIST	197	47.461	31.239	2	156
LAND	196	98.938	187.31	0	1800
ILH	193	33.929	92.588	0	740.7407
TRAC	187	0.4401	0.3495	0.00285	1.5
CCOL	201	0.6517	0.4776	0	1
WCOL	201	0.6766	0.4689	0	1
VWC	201	0.7114	0.4542	0	1
IVE	194	0.5257	0.5006	0	1
MIG	201	0.5970	0.4917	0	1

Table 5 shows the descriptive statistics of the variables used in the binary logistic regression (Model 1) and Table 6 shows the parameter estimations of Model 1

Table 6. Parameter estimations of binary logistic regression (Model 1).

Model 1	Coefficient	Standard Error	z	$P>\|z\|$	Marginal Effect
DIST	−0.0039	0.0059	− 0.67	0.504	−0.00098
LAND	0.0037	0.0024	1.53	0.126	0.00092
ILH	0.0027	0.0032	0.86	0.388	0.00069
TRAC	1.6437	0.6132	2.68	0.007	0.4091*
CCOL	0.0277	0.4323	0.06	0.949	0.00691
WCOL	−0.0409	0.4465	−0.09	0.927	−0.01019
VWC	−1.3601	0.4725	−2.88	0.004	−0.31604*
IVE	0.6566	0.3864	1.70	0.089	0.16209
MIG	−0.5429	0.4106	−1.32	0.186	−0.13371
Constant	22.6734	23.1248	0.98	0.327	
		* Significance at 5%			
		No. obs. =161			
		LR chi2 (10) = 46.09			
		Prob > chi2 = 0,000			
		Pseudo R2 = 0.2066			

According to Table 6, the variables of distance, total land per household, irrigated land per household, living in the city and cultivating own land, working in other jobs, and migration from

city to village do not have a significant effect on village population growth rate. The number of tractors per household and extra-village employment variables do have a significant effect on this.

Next, in order to interpret the model, we looked at the marginal effects. According to the model, the probability of a village having a relatively negative population growth (i.e., the population decreasing there faster than the average) was 53.35%.

Increasing the number of tractors per household by 1 increases the probability of a faster decrease in the population of the village by 0.4091%. In simple terms, an increase in the number of tractors per household correlates with a rapid decrease in the village population. This can be explained by recognizing the increase in the number of tractors in terms of the tractor function to replace human labor and, as a consequence, idle labor leaving the village and ultimately bringing about a decrease in the number of households. Tractors have been improving in quantity and quality in recent decades in Turkey. The number of tractors increased more than six-fold between 1979 and 2016 (Table 7). We observed as a frequently expressed opinion in the field that it is difficult to do agriculture without tractor. It is necessary to say that: Mechanisation started in 1950 in Turkey, with tractor numbers rising ever since; the 1950s also saw the beginnings of mass internal migration. Many social scientists explained this movement of people as having resulted from the mechanisation, but later this explanation became weak because agricultural employment increased up the 1990s, so other factors were suggested, such as the pull of cities. An important reason for internal migration in Turkey after 2000 was the closure of primary schools in villages, which prompted many villagers to migrate to urban areas for their children's education.

Table 7. Tractor Number, 1979–2020.

Year	Tractor Number
1979	318, 571
1990	769, 456
2000	1, 159, 070
2020*	1, 958, 727

Source: Turkstat https://data.tuik.gov.tr/Bulten/Index?p=Motorlu-Kara-Tasitlari-Aralik-2020-37410

The probability of a rapid decrease in the population of the village decreases by 31.6% when people go daily to work in the town/city. People living in the village but going outside to work in the town or city (extra-village employment) is an increasing phenomenon, both in Turkey and elsewhere in the world. This type of dual life is becoming more popular for a number of reasons, including the increase in ease/means of transportation, the growing preference to live in a rural environment, the lower cost of living in the countryside, better opportunities for/from non-agricultural employment and simple economics (access to income/lower living costs) for poor villagers. Extra-village employment is clearly a development that reduces the loss of village population.

Although the establishment of factories and mines alongside villages is a suggestion that has been voiced for a long time for the increase in the welfare of the villages, today's development tends to be the reverse of that, related to the increase in transportation facilities and the cheap labor supply of the villages. We observed that people going daily to work outside the village would in many cases travel some distance (up to 100 km) and take jobs with relatively low wages.

- **Model 2**

Another model trial was made with the data collected from village-based questionnaires. For this, we used data on village households becoming landless and having increasing/decreasing land as independent variables and population change as the dependent variable.

Table 8. Parameter estimation of binary logistic regression (Model 2).

Model 2	Coefficient	Standard Error	z	$P > \|z\|$	Marginal Effect
WLAND	0.9268	0.3252	2.85	0.004	0.2276*
DLAND	0.0069	0.4157	0.02	0.987	0.0017
ILAND	−0.4941	0.3331	−1.48	0.138	−0.1228
Constant	−0.2406	0.2928	−0 .82	0.411	
		* 5% significance level			
		No. obs. =198			
		LR chi2 (10) = 11.74			
		Prob > chi2 = 0,0083			
		Pseudo R2 = 0.0428			

In this model, the probability of a village's population decreasing faster than average was 49.46%.

The variables of decrease/expansion of household land do not have a significant effect on village population growth rate. The landlessness variable has a significant effect. Considering the marginal effects, when the number of households without land increases by 1, the probability of rapid decline of the village population increases by 0.2276%.

As stated in the above analyses, if a household loses its land, the family is very likely to leave the village. According to our qualitative research, the fact that those who migrate or are the most likely to sell their land confirms this result.

4. Conclusions

In the light of all these data's, ranging from the amount of land to non-agricultural activities, from the distance to the city to the size of the village population, and analyzes of them shows that it is necessary to start from the fact that the development of rural settlements is reshaped again and again by human activities. Just as there is no single reason that determines the continuation of rural life and settlement, there is no single reason for its changes. In this context, the approach to rural areas should be developed by taking into account both a multifaceted analysis of contemporary developments and local differences. Most fundamentally, it is necessary to take into account the continuity of rural life, the existence of income sources and employment opportunities, especially agriculture, and the fact that people expect welfare at the country average.

We used the PGR as dependent variable and in order to look at independent variables for 201 villages, for which we ran hypothesis tests, correlation analysis and econometric models based on a set of questions asked of the village *mukhtar*s in order to examine the development/decline trends of the village. The following two points summarise the main outcomes.

The total land assets of the village and the land assets per household are the strongest variables indicated as supporting the continuity of the village population. Agricultural income is still the biggest income item in most of the villages, and clearly, agricultural income will broadly increase according to the land size. If a farmer cultivates the land, perhaps together with livestock breeding (when feed production for livestock is produced, which is common in Turkey), the size of the land positively affects the amount of agricultural income. This constitutes the material basis for the people living in the village. In this respect, continuity of village life is strengthened insofar as the people living there have sufficient agricultural assets, especially land, to earn their livelihood from farming.

Although land reform has fallen from the agenda in Turkey (and the world generally), its historical as well as socio-economic importance of is keenly shown here. In the light of contemporary developments, the issue becomes especially meaningful within the framework of the survival of the village, impacting on villager livelihoods, poverty reduction, food security, environmental

protection and sustainability. Hopes for a more balanced distribution of land among farmers may not be realistic in the current climate, in which largescale agriculture is encouraged. However, within the framework of the advantages of peasant agriculture and small production, it is clear that agricultural subsistence and sustainability are on the world agenda, with successful practices in countries with large agricultural populations, such as China and Brazil. Undoubtedly, the inability of urban service and industry sectors to find solutions to employment as well as the inconveniences of food security and industrial agriculture are also effective promoters of the small-scale in farming.

Having the opportunity to work in a job outside of village while living in the village positively affects the rate of increase of village population. This development can be evaluated from at least two angles. The first is that extra-village/non-agricultural employment may bolster insufficient agricultural earnings or, generally, to increase the overall household income while living in the village enables the continuation of the family farming life on family-held land. A sufficiently high income level mitigates the push to migrate from the village, and the village population can be maintained.

Second, this development is based on a sufficient development of the opportunities that allow living in the village and working outside the village. The development in transportation and communication technologies and infrastructure especially enable people to meet their needs in both their business and social and private lives without having to change the move from where they live. Again, this supports the survival of the village.

On the one hand, the research findings once again reveal the importance of agriculture and livelihood opportunities for the viability of rural settlements. And, on the other hand, it is obvious that rural residents want to both earn a relatively high income and access the opportunities available in the urban areas. This fact actually manifests itself in the rural population doing agricultural and non-agricultural work together and living both in the village and in the city. Therefore, policies regarding the general development and development of agriculture and rural areas have to take into account these two basic facts and the spontaneous tendency that develops accordingly.

Considering the strengthening trend of urban-rural migration in recent years and the increase in traffic, housing and livelihood problems in cities, villages constitute an alternative for those who want to get away from cities. If it is known which features a village can maintain its population or attract population from elsewhere, it will be easier to direct those who move from the city to the village. This study indicates that villages close to the city can protect or increase their population. This information becomes even more important in the context of reverse migration, considering that those who come from the city to the countryside are unable to completely break away from the city.

In recent years, rural settlements have been turned into neighbourhoods and rural services have been centralized in provinces with metropolitan municipalities. This policy reduced the development opportunities of some villages, which had the potential to increase their population, on their own initiative. Improving the opportunities of villages which have development potential, would not only increase the welfare of these settlements, but also contribute to reducing the problems of cities by encouraging migration from cities to these villages.

CRediT Author Statement: Murat Öztürk: Investigation, Supervision and Writing – review & editing; **Esin Cumhur Yalçın:** Conceptualization, Methodology, Data curation, Writing – original draft and Validation.

Data Availability Statement: Restrictions apply to the availability of these data. Data was obtained from Prof. Dr. Ferhat Kentel, and are available from the authors with the permission of Prof. Dr. Ferhat Kentel.

Funding: This research was funded by the Scientific and Technological Research Council of Turkey (Tübitak) (114K145).

Conflicts of Interest: The authors declare no conflict of interest.

Acknowledgments: The researchers are grateful to Tübitak (Scientific and Technological Research Council of Turkey) for its support. All numerical data used here without citation are drawn from this research project. And authors thanks to Ferhat Kentel who is the project manager for let to using the data in this study.

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