ESTIMATING THE NUMBER OF THE POPULATION BY SUPERPOSING TREND FUNCTIONS

Katharine DUX
(Budapest)

I. Introduction

One fundamental task of historical demography is to produce homogeneous time series relating to the number and composition of populations in periods prior to official censuses. In solving this problem the demographer relies on contemporary sources, but their applicability is made rather difficult by the fact that old censuses differ essentially from the modern ones of today mainly in that none of the former was specifically aimed at counting the population as it is done in the modern sense. A special difficulty is presented in Hungary by the circumstance that the majority of the censuses - except the one under Joseph II - were taken for taxation or military purposes and did not therefore cover the entire population; they contained, for instance, no data on the nobility. Other registrations on the other hand covered the nobility only, again others were limited to tradesmen, merchants, or the clergy and teachers. And such censuses were usually taken in years other than those relating to the census of commoners. Further difficulties originate from changes in regional division, and from the fact that the instructions issued for taking particular censuses were different. [1/]

Because of the aforesaid limitations of contemporary sources, historico-demographic research work is usually composed of two fundamental activities in addition to the exploration of sources. These are:

1/ critical evaluation of sources

2/ estimative rectification of explored data.

As the writer of this paper is not engaged in the cultivation of historical demography - only in the application of modern statistical methods - it is not attempted here to explore new sources or to give a critical analysis of data. The aim of this paper is to present a method, based on trend computation, that makes possible with the use of data on various groups of population and different points of time series that applies to the entire population. If there occur, in addition, occasional explorations of data and criticisms of sources, this is only where it was considered as indispensable for realising the aims of our work, and may therefore be regarded as a by-product of research work. It was therefore that the data of the nobility censuses of 1820, 1834 and 1846 were collected and summarised. The remarks in the field of source criticism for supporting the selection of data I have used for my computations contain conclusions that are well known by experts[2/, 3/, 4/]. Should there emerge any new aspects in the course of this novel manner of processing, they are herewith recommended to the scholars of historical demography.

II. Description of sources used and the rectification of data

Within the scope of my investigations I did not undertake to produce a time series that would apply to the total number of the country's population; exploration of the rich sources of historical demography is still under way on a national scale, thus the fullness of data that relate to the total number of the population can by no means be compared to that of certain administrative districts where such data had already been processed in a monographic manner. It was these considerations that led to the choice of County Veszprém as it is in this County that the exploration and critical evaluation of archival and statistical sources relating to the County's population have been completed, and the County therefore surpasses all counties in Hungary as concerns the abundance of data.[5/]

In the following I give an outline description of available data on the County's population with an indication of sources.

POPULATION OF THE COUNTY VESZPRÉM IN THE 100 YEARS PRECEDING THE FIRST HUNGARIAN OFFICIAL POPULATION CENSUS

Table 1.

Year	Not noble	Noble	Total	Source of data
	population			
1754-1755	..	1 736	..	Investigation of the nobility in the year 1754-1755
1770	63 950	..	..	Tabella numerum animarum 1770.
1771	64 301	..	..	Conscriptio animarum 1771.
1777	82 867	..	..	Conscription of the population 1777. (Synopsis)
1780	132 621	12 616	145 237	Investigation of the nobility in the year 1780.
1780	98 967	..	..	Tabella exhibens
1782	101 872	..	..	Population census of Joseph II
1784	..	..	140 749	" "
1785-1787	..	9 487	140 789	" "
1787	..	9 410	143 572	" "
1793	..	..	145 782	Manuscript on the Chair of Statistics ELTE
1804	132 621	..	..	Summarium der Bevölkerung
1820	..	14 602	..	Investigation of the nobility 1820.
1821	137 119	..	..	Manuscript of Gusztáv THIRRING
1822	138 837	..	..	" "
1827	..	..	170 605	Ludovicus NAGY: Notitiae Hungariae
1830	144 322	..	..	Manuscript of Gusztáv THIRRING
1830	..	..	211 925	Tafeln
1831	132 356	..		Manuscript of Gusztáv THIRRING
1832	..	..	222 663	Tafeln
1833	..	..	223 778	"
1834	..	13 414	..	Investigation of the nobility 1834.

POPULATION OF THE COUNTY VESZPRÉM IN THE 100 YEARS PRECEDING THE FIRST HUNGARIAN OFFICIAL POPULATION CENSUS (continued)

Year	Not noble	Noble	Total	Source of data
	population			
1834	..	..	226 100	Tafeln
1835	..	..	228 400	"
1836	..	..	230 700	"
1837	..	..	232 800	"
1838	..	..	235 200	"
1838	142 320	..	..	Manuscript of Gusztáv THIRRING
1838	..	..	185 167	Elek FÉNYES
1839	..	..	237 600	Tafeln
1840	..	..	240 000	"
1840	..	..	202 930	Statistical Pocketbook of Hungary
1840	138 175	..	..	Manuscript of Gusztáv THIRRING
1841	..	..	193 900	Tafeln
1841	142 532	..	..	Manuscript of Gusztáv THIRRING
1842	..	..	193 800	Tafeln
1842	142 275	..	..	Manuscript of Gusztáv THIRRING
1843	142 142	..	..	" "
1844	..	..	193 900	Tafeln
1846	..	..	212 100	"
1846	..	12 335	..	Investigation of the nobility 1846.
1850	..	..	189 308	Austrian census
1851	..	..	184 876	" "
1857	..	..	190 427	" "
1857	..	..	189 204	Tafeln
1869	..	..	201 431	Hungarian population census 1870.

From among the above data, those originating further back than 1780 were disregarded in the course of my computations, as a comparison with more recent data of the series resulted in implausibly low values; it cannot reasonably be assumed, for example, that the population of commoners should have doubled during the 15 years that elapsed from 1770 to the census under Joseph II. It seems likely that part of the population was left out from the early sources: "Village mayors and villagers believed that an increase in taxes or some other wrong must rise from such censuses and tried therefore to conceal and leave out as many of the inhabitants as possible."[6] Of further data on the noble population, the very rich collection contained in Gusztáv THIRRING's still existing manuscript is worth mentioning.[7] These data result from an extension of the census of commoners taken in 1804. This is why the early data of the series are probably the most realistic as the values relating to the 40's are likely to contain the sources of error that necessarily result frum such extension.

Except for the census taken under Joseph II, acceptable data on the entire population are available practically only for the period after 1850. In the period between 1830 and 1846, the volumes of the "Tafeln" published population numbers almost every year, but these values are higher by 20-25 per cent than given in any other source and their reliability is highly doubtful, too, as has been shown by earlier investigations.[8]

The greatest difficulty encountered in the exploration of population numbers is probably the determination of the number of the noble population. Except for the census under Joseph II, the nobility was not willing to submit to any sort of census as this was considered as an infringement of privileges. Thus their number can be concluded only from rather incomplete secondary sources, such as the material of various investigations and censuses of nobility. An attempt was made at noting down and summing up the results of nobility censuses to be found in the State Archives of County Veszprém. Most of the years investigated revealed but very scanty data of census: not all localities had been covered, or the data survived in fragments only. The most complete lists were found in 1820, 1834 and 1846, thus our data relate to these years; a contemporary summary relating to 1780 was also found. But the completeness even of these lists is only relative and their main deficiencies are as follows:

1/ All of the censuses covered only noblemen, the wives do not appear or the lists. Women were included only if - as widows - they were regarded as heads of family. This deficiency has been rectified by means of multiplicative estimation. Although the majority of writers[9/, 10/, 11/] estimate the total number of nobility by using index number 2, I for my part do consider the index number 1,9 to be sufficient, partly because widowed women as heads of family occasionally figure among the data of noblemen, and partly because the numerical superiority of women had not yet taken shape by that time. It would seem probable that the distribution by sex of the noble population can be estimated according to that of the commoners.

2/ As has been mentioned above, the lack of uniformity and unambiguity of instructions for taking censuses resulted in various differences between districts. Although the censuses of nobility taken in the last decades of the investigated period are by and large uniform in that only male children were included in addition to heads of family, the census of 1820, for instance, covered only male children in one district, but all children in another. It has been found that in the years and in the districts where only male children were included in addition to heads of family, the number of male children per 100 heads of family varied between 85 and 100. In districts where both boys and girls were covered, the number of children per 100 heads of family was 202,6. Supposing that the number of boys was 90 on the average within this figure, we have to deduct 112,6 girls from the number of children for every 100 heads of family:

2. Table

Year	Number of heads of family	Number of noble children		Total number of nobles+/
		by census	rectified (boys only)	
1820	5 807	8 795	5 182	20 879
1834	6 722	6 692	6 692	25 487
1846	6 354	5 981	5 981	23 436

+/ Applying the 1,9 factor.

3/ As mentioned before, the data of 1820, 1834 and 1846 can be regarded as relatively complete in respect of region. But an identification of localities revealed that the census of 1820 does not contain the localities of the Enying District, and

that the nobles of Szentgál Village are missing from among the data of the 1846 census, although a considerable proportion of the County's nobility lived at Szentgál (about 9 per cent of noble heads of family in 1834). I have rectified these deficiencies by means of linear interpolation.

3. Table — Enying District

Year	Heads of Family	Children
1834	479	424
1846	494	423
estimated value for 1820	463	425

4. Table — Szentgál

Year	Heads of Family	Children
1820	737	668
1834	596	497
estimated value for 1846	476	353

In obtaining these data, rectification was made with factor 1, 9 of course.

In addition to the data of these three years, I have made use of the number of nobles figuring in the census under Joseph II. I have disregarded the number of nobles figuring in the census of 1780 as it cannot be ascertained to which population it applies; it is probably higher than the number of men and male children, but certainly less than the total number of nobles, thus it cannot be included in a homogeneous series.

III. Method: The superposition of trend functions

Having selected the data with careful weighing on the basis of considerations adduced in the foregoing chapter, and having carried out the necessary minor rectifications, I obtained three time series: one for the commoners, one for the nobility and one for the entire population. The time co-ordinates are not equidistant, nor do they coincide in any of the time series (Table 5)

The data used

5. Table

Year	Not noble	Noble	Total
	population		
1780	98 967	..	..
1782	101 872	..	..
1787	125 693	17 879	143 572
1793	..	..	145 782
1804	132 621	..	..
1820	..	22 566	..
1821	137 119	..	..
1827	..	..	170 605
1831	132 356	..	..
1834	..	25 489	..
1838	142 320	..	185 167
1846	..	25 011	..
1851	..	..	184 876
1857	..	..	189 204
1869	..	..	201 431

As a first step of estimation, I established trend functions on the basis of each of the time series.

Linear trend of commoners

Table 6.

Year X_i	Not nobles Y_i	x_i	y_i	x_i^2	$x_i y_i$	y_i^2
1780	98 967	-26	-25 454	676	661 804	647 906 116
1782	101 872	-24	-22 549	576	541 176	508 457 401
1787	125 693	-19	1 272	361	-24 168	1 617 984
1804	132 621	- 2	8 200	4	-16 400	67 240 000
1821	137 119	15	12 698	225	190 470	161 239 204
1831	132 356	25	7 935	625	198 375	62 964 225
1838	142 320	32	17 899	1 024	572 768	320 374 201
			Total	3 491	2 124 025	1 769 799 131

Linear trend of commoners

The average value of the data:

$$\bar{X} = 1\,806$$
$$\bar{Y} = 124\,421$$

Transformating the zero point of the coordinate system into the $(\bar{X}, \bar{Y},)$ point, the new coordinates are the following:

$$x_i = X_i - \bar{X}$$
$$y_i = Y_i - \bar{Y}$$

The coefficient of correlation is:

$$r = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2 \sum y_i^2}} = \frac{2\ 124\ 025}{\sqrt{6\ 178\ 368\ 766\ 321}} =$$

$$= \frac{2\ 124\ 025}{2\ 485\ 632} = 0,8545$$

Therefore the application of linear trend function is justified.

The regresson coefficient is:

$$b = \frac{\sum x_i y_i}{\sum x_i^2} = \frac{2\ 124\ 025}{3\ 491} = 608,4$$

The equation of the regression line in the original coordinate system is the following:

$$Y = 124\ 421 + 608,4\ X$$

Linear trend of nobility

Table 7.

Year	Nobles					
X_i	Y_i	x_i	y_i	x_i^2	$x_i y_i$	y_i^2
1787	17 879	-35	-4 857	1 225	169 995	23 590 449
1820	22 566	- 2	- 170	4	340	28 900
1834	25 487	12	2 751	144	33 012	7 568 001
1846	25 011	24	2 275	576	54 600	5 175 625
		Total		1 949	257 947	36 362 975

The average value of the data:

$$\bar{X} = 1\ 822$$

$$\bar{Y} = 22\ 736$$

Transformating the zero point of the coordinate system into the $(\bar{X}, \bar{Y})$ point, the new coordinates are the following:

$$x_i = X_i - \bar{X}$$

$$y_i = Y_i - \bar{Y}$$

The coefficient of correlation is:

$$r = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2 \sum y_i^2}} = \frac{257\,947}{\sqrt{70\,871\,438\,275}} =$$

$$= \frac{257\,947}{266\,216} = 0,9689$$

therefore the application of linear trend function is justified.

The regression coefficient is:

$$b = \frac{\sum x_i y_i}{\sum x_i^2} = \frac{257\,947}{1\,949} = 132,3$$

The equation of the regression line in the original coordinate system is the following:

$$Y = 22\,736 + 132,3\,X$$

Linear trend of entire population

Table 8.

Year X_i	Population Y_i	x_i	y_i	x_i^2	$x_i y_i$	y_i^2
1787	143 572	-44	-30 805	1 936	1 355 420	948 948 025
1793	145 782	-38	-28 595	1 444	1 086 610	817 674 025
1827	170 605	- 4	- 3 772	16	15 088	14 227 984
1838	185 167	7	10 790	49	75 530	116 424 100
1851	184 876	20	10 499	400	209 980	110 229 001
1857	189 204	26	14 827	676	385 502	219 839 929
1869	201 431	38	27 054	1 444	1 028 052	731 918 916
		Total		5 965	4 156 182	2 959 261 980

The average value of the data:

$$\bar{X} = 1\,831$$

$$\bar{Y} = 174\,377$$

Transformating the zero point of the coordinate system into the $(\bar{X}, \bar{Y})$ point, the new coordinates are the following:

$$x_i = X_i - \bar{X}$$

$$y_i = Y_i - \bar{Y}$$

The coefficient of correlation is:

$$r = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2 \sum y_i^2}} = \frac{4\,156\,182}{\sqrt{17\,651\,997\,710\,700}} =$$

$$= \frac{4\,156\,182}{4\,201\,427} = 0,989$$

therefore the application of linear trend function is justified.

The regression coefficient is:

$$b = \frac{\sum x_i y_i}{\sum x_i^2} = \frac{4\,156\,182}{5\,965} = 696,8$$

The equation of the regression line in the original coordinate system is the following:

$$Y = 174\,377 + 696,8\,X$$

Each of the three time series can be interpolated with trend functions, as appears from the correlation factor. Naturally, if the linear trend function had not proved suitable for interpolation, we could have applied a trend function with a discretional curve to find with its help a curve that fits the given time series in the best possible manner (where the standard error is the smallest), as it is absolutely

irrelevant in respect of the superposition method what type of line is used for adjusting the original series. Since the trend functions of each of the three time series have been established, we can now produce the missing values of the given time series: we shall compute interpolated values in each time series for every year for which data are contained in at least one of the original time series.

Data interpolated

Table 9.

Year	Non nobles		Nobles		Entire population	
	x_i	y_i	x_i	y_i	x_i	y_i
1780	-26	108 602	-42	17 177	-51	238 842
1782	-24	109 819	-40	17 442	-49	140 236
1787	-19	112 861	-35	18 104	-44	143 719
1793	-13	116 511	-29	18 898	-38	147 900
1804	- 2	123 204	-18	20 354	-27	155 564
1820	14	132 939	- 2	22 471	-11	166 713
1821	15	133 547	- 1	22 604	-10	167 409
1827	21	137 198	5	23 398	- 4	171 590
1831	25	139 632	9	23 927	0	174 377
1834	28	141 457	12	24 324	3	176 467
1838	32	143 891	16	24 854	7	179 254
1846	40	148 758	24	25 912	15	184 828
1851	45	151 800	29	26 574	20	188 312
1857	51	155 451	35	27 368	26	192 493
1869	63	162 752	47	28 956	38	200 854

It should be noted that the value x_i applied at computation is shown at the interpolation of each of the three time series; as regards identical dates, this value is different in each of the three series, since the origin of the new co-ordinate systems of the three series was shifted in the course of coordinate transformation as the trend function was established.

Having established the trend of each of the three time series, I arrived at the second step of estimation, the superposition of trend functions; this is carried out in the following manner:

a time series is established, which contains data for every year that figures in at least one of the original time series. If data on the entire population, based on original census, are found for any of the years, the data of this year are used. If a year is found for which contemporary data on the population of commoners are known, data interpolated for that year with the trend function of the noble population are added to the value found. For years in which the number of the noble population is known, the value established with the linear trend of the commoners is added to the number of the nobles (these rectified data are marked with + on Table 10).

Finally, as the last step of estimation, I have computed the trend of the time series established with this additive rectification.

The linear trend of rectified data

The average value of the data:

$$\bar{X} = 1\,823$$
$$\bar{Y} = 161\,420$$

Transformating the zero point of the coordinate system into the $(\bar{X}, \bar{Y})$ point, the new coordinates are the following:

$$x_i = X_i - \bar{X}_o$$
$$y_i = Y_i - \bar{Y}$$

The coefficient of correlation is:

$$r = \frac{\sum x_i y_i}{\sqrt{\sum x_i^2 \sum y_i^2}} = \frac{9\,105\,046}{\sqrt{91\,952\,577\,265\,032}} = \frac{9\,105\,046}{9\,589\,191} =$$

$$= 0,9495$$

therefore the application of linear trend function is justified.

The regression coefficient is:

$$b = \frac{\sum x_i y_i}{\sum x_i^2} = \frac{9\ 105\ 046}{11\ 111} = 819,5$$

The equation of the regression line in the original coordinate system is the following:

$$Y = 161\ 420 + 819,5\ X$$

10. Table

The linear trend of rectified data

Year X_i	Population Y_i	x_i	y_i	x_i^2	$x_i y_i$	y_i^2
1780	116 144 +	-43	-45 276	1 849	1 946 868	2 049 916 176
1782	119 314 +	-41	-42 106	1 681	1 726 346	1 772 915 236
1787	143 572	-36	-17 848	1 296	642 528	318 551 104
1793	145 782	-30	-15 638	900	469 140	244 547 044
1804	152 975	-19	- 8 445	361	160 455	71 318 025
1820	155 505 +	- 3	- 5 915	9	17 745	34 987 225
1821	159 723 +	- 2	- 1 697	4	3 394	2 879 809
1827	170 605	4	9 185	16	36 740	84 364 225
1831	156 283 +	8	- 5 137	64	- 41 096	26 388 769
1834	166 944 +	11	5 524	121	60 764	30 514 576
1838	185 167	15	23 747	225	356 205	563 920 009
1846	173 769 +	23	12 349	529	284 027	152 497 801
1851	184 876	28	23 456	784	656 768	550 183 936
1857	189 204	34	27 784	1 156	944 656	771 950 656
1869	201 431	46	40 011	2 116	1 840 506	1 600 880 121
			Total	11 111	9 105 046	8 275 814 712

IV. Conclusions

Before drawing final conclusions from the method described above, let us have a look at the time series thus established, and let us compare it with the data of the original series.

Table 11.

Year	Number of population based on		The percent of deviation concerning the original data
	original sources	estimation by superposing trend functions	
1780	.	126 183	.
1782	.	127 822	.
1787	143 572	131 919	- 8,2
1793	145 782	136 836	- 6,2
1804	.	145 850	.
1820	.	158 962	.
1821	.	159 781	.
1827	170 605	164 698	- 3,5
1831	.	167 976	.
1834	.	170 434	.
1838	185 107	173 712	- 6,2
1846	.	180 268	.
1851	184 876	184 365	- 0,3
1857	189 204	189 282	0,04
1869	201 431	199 115	- 1,2

The first members of the time series show a comparatively significant deviation from the results of the census taken under Joseph II; this deviation decreases gradually during the first half of the 19th century, but is still not insignificant. The cause of this deviation is that very few data were available for this period of some 70 years, especially as concerns the entire population. Data relating to the number of nobles and commoners at various times result in much smaller figures, even if summed up, than the data computed for the entire population, thus their trend increases the regression coefficient of the superposition trend. By the

second half of the 19th century, the values of the superposition trend approximate the census values, considered reliable by this time, by an accuracy greater than 1,2 per cent.

It is evident from the comparison that data computed with the superposition method are in close relationship with the census data available. Thus the superposition method does not render a thorough source criticism unnecessary - on the contrary, it is conditional on it. In case of incomplete but otherwise reliable time series, the superposition method is suitable for establishing in an additive manner, by summing up conformable data, a single rectified time series based on data available on several different populations and different points of time.

Finally I feel bound to express my thanks to all who have been of great help to me in taking the first steps in the field of historical demography: to Professor Dr. József KOVACSICS, who has called my attention to this unsolved problem of historic demography, to Dr. Endre TAKÁCS - Director of Archives, for his professional assistance in selecting data on the noble population, to Dr. József HUNGLER -schoolmaster, for treating the material of the nobility investigations, as well as to Professor Dr. Lajos THIRRING, Dr. Bálint ILA - Chief Archivist, and Dr. Győző KENÉZ - research worker, for their many, highly appreciated advices.

NOTES

1/ KOVACSICS József: Bevezetés a történeti demográfia forrásainak tanulmányozásába (Introduction into the Study of Sources of Historical Demography). Vol. Magyarország történeti demográfiája. Ed. Dr. K.J., Budapest 1963, p 3.

2/ A történeti statisztika forrásai (Sources of Historical Statistics). Ed. KOVACSICS József, Budapest 1957.

3/ Magyarország történeti demográfiája (Historical Demography of Hungary). Ed. KOVACSICS József, Budapest 1963.

4/ ILA Bálint - KOVACSICS József: Veszprém megye helytörténeti lexikona (An Encyclopedia of the Local History of County Veszprém). Budapest 1964.

5/ ILA Bálint - KOVACSICS József: Veszprém megye helytörténeti lexikona. (An Encyclopedia of the Local History of County Veszprém). Budapest 1964.

6/ ILA Bálint - KOVACSICS József: Veszprém megye helytörténeti lexikona (An Encyclopedia of the Local History of County Veszprém). Budapest 1964. p 29.

7/ Népösszeirási adatok és adatforrások a nem nemes népességről a XIX. sz. első feléből (Census Data and Sources of Data on the Population of Commoners from the First Half of the 19th Century). Ed. by THIRRING Lajos on the basis of studies and posthumus papers of THIRRING Gusztáv. Történeti Statisztikai Közlemények, Vol. III, No. 1-2, 1959, pp 132-206.

8/ KOVACSICS József, Dr.: The Rectification of Historico-Demographical Data by the Aid of Extrapolation and Interpolation. International Population Conference, Ottawa 1963. p. 455-468.

9/ MAGDA Pál: Magyarországnak és a határőrző katonaság vidékinek legujabb statistikai és geographiai leirása (A Recent Statistical and Geographical Description of Hungary and the Region of the Frontier Guards). Pest 1849. p 586.

10/ FÉNYES Elek: Magyarország leirása (A Description of Hungary). Pest 1847. p 520.

11/ THIRRING Gusztáv: Magyarország népessége II. József korában (The Population of Hungary at the Time of Joseph II. Budapest 1938. p. 192.

BIBLIOGRAPHY

A történeti statisztika forrásai (Sources of Historical Statistics). Ed. KOVACSICS József, Budapest 1957.

Magyarország történeti demográfiája (Historical Demography of Hungary). Ed. KOVACSICS József, Budapest 1963.

ILA Bálint - KOVACSICS József: Veszprém megye helytörténeti lexikona (An Encyclopedia of the Local History of County Veszprém). Budapest 1964.

KOVACSICS Joseph: The rectification of historico-demographical data by the aid of extrapolation and interpolation. International Population Conference, Ottawa 1963. p. 455-468.

Népösszeirási adatok és adatforrások a nem nemes népességről a XIX. sz. első feléből (Census Data and Sources of Data on the Population of Commoners from the First Half of the 19th Century). Ed by THIRRING Lajos on the basis of studies and posthumus papers of THIRRING Gusztáv. Történeti Statisztikai Közlemények, Vol. III. No. 1-2, 1959, pp 132-206.

THIRRING Gusztáv: Magyarország népessége II. József korában (The Population of Hungary under Joseph II). Budapest, 1938. 192 p.

FÉNYES Elek: Magyarország leirása (A Description of Hungary). Pest 1847. p. 520.

Dr. ILLÉSY János: Az 1754-55. évi országos nemesi összeirás (Investigation of the nobility in the year 1754-55). Budapest 1902.

MAGDA Pál: Magyarországnak és a határőrző katonaság vidékinek legujabb statistikai és geographiai leirása (A Recent Statistical and Geographical Description of Hungary and the Region of the Frontier Guards). Pest 1849. p. 586.

Az első magyarországi népszámlálás (1784-1787). (The first Hungarian Population census 1784-87). Budapest 1960.