Demographic Behaviour and the Modernization Process: A Cross-Sectional Study of Fertility Determinants in Slovakia 1930[1]

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Demographic Behaviour and the Modernization Process: A Cross-Sectional Study of Fertility Determinants in Slovakia 1930. In 1930, the population of Slovakia was in the middle of a demographic transition. Various models of fertility behaviour were common, and so were families with high and low numbers of children. This paper looks at the causes of differences in fertility by comparing the level of fertility with economic, social and cultural indicators in 81 districts of Slovakia. The results show that several social and economic factors had a strong relationship with fertility: illiteracy, infant mortality, the proportion of dependence on agriculture and other factors, most of which can be described as measures of the modernization of society. Ethnic and religious structures of the population were less important factors. Also the relationship of fertility with marriage age and the proportion of married was surprisingly weak. The paper discusses possible explanations for the relationship between fertility and indicators, i.e. mechanisms underlying these relations, but the available data do not allow sufficient verification. Instead of finding causal relations, it is possible to show the proxies of general modernization, which would be most effective in estimating the level of fertility. The level of education, which best reflects the change in economic conditions as well as change in values and attitudes of people – both necessary for fertility decline, proved to be such an indicator.
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Key words: *demographic transition; early 20th century; education; fertility; fertility determinants; illiteracy; interwar period; modernization; Slovakia; socioeconomic factors*

1. Introduction

Fertility decline in Slovakia began in the late 19th century, roughly around 1895. The decline in fertility was part of underlying social, cultural and economic changes. Some authors at that time paid close attention to this: "We see that the births in recent decades are also strongly decreasing in our country. The growing life needs and increasing sense of responsibility are reflected in the birth decline. It is also necessary to take into consideration that the gratifying fall in child mortality due to improving health conditions results in the reduction of the need for an abundance of children" (Stodola 1912: 64).

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Interwar Slovakia, where these fundamental modernization changes were proceeding, is in many ways convenient for exploring the relationship between fertility and different characteristics: *First*, Slovakia was a relatively backward country, whether compared with the countries of interwar Western Europe or modern Slovakia. This makes it possible to deal with the relationship between fertility and some "fundamental" aspects of development, such as illiteracy, the proportion of dependence on agriculture, and infant mortality. In analyses of more developed populations, these factors become unimportant. *Second*, populations with similar demographic characteristics to interwar Slovakia usually have a less advanced system of demographic statistics, and the study of such populations may therefore be limited. In the case of Slovakia, pre-war Austro-Hungarian statistics were already at a high level (Demeny 1972), and after the establishment of Czechoslovakia in 1918, their quality even increased. The Czech lands were among the more advanced regions of Europe, which was reflected in the detail and accuracy of published demographic data. The unification with the more developed Czech lands in one state and the shared organization of the collection and processing of demographic data allowed a relatively detailed demographic study of the less developed Slovak population. *Thirdly*, the transition from traditional to modern forms of demographic behaviour did not take place at the same speed in the whole population. Since the interwar period falls into the middle of the Slovak demographic transition, it can be expected that the values of many demographic variables reached temporary, but strong, intra-population differences (see van de Walle 1986; Engelen – Hillebrand 1986; Botev 1995). In Slovakia in 1930, there were regions with fertility below 2 children per woman alongside regions where fertility was still more than 5 children per woman. Such diversity is useful for finding relationships between fertility and other characteristics.

This paper tries to build on some earlier studies dealing with fertility in European countries and the USA in the second half of the 19th and early 20th century. Examples are papers analysing the relationship between fertility and various factors in Prussia (Galloway – Hammel – Lee 1994), Switzerland (van de Walle 1980), Bavaria (Brown – Guinnane 2002), the Netherlands (Engelen – Hillebrand 1986), the United States of America (Tolnay 1995; Vinovskis 1976; Easterlin 1976), New York State (Guest 1990), Iowa (Smith 1996), Bulgaria (Botev 1995), Ireland (Ó Gráda 1991), Spain (Leasure 1963), England and Wales (Crafts 1989), Hungary (Lengyel Cook – Repetto 1982) and Czechoslovakia (Fialová – Pavlík – Vereš 1990). Perhaps the most famous work in this field is *The Decline of Fertility in Europe* (Coale – Watkins 1986) and related monographs of several European countries. Most of these studies deal with a slightly earlier period than this paper. They may nevertheless be a good starting point, whether due to their choice of methods or some hypotheses

and interpretations, as the Slovak population lagged behind Western countries for several decades in many demographic and socioeconomic characteristics.

2. Fertility in interwar Slovakia

In the interwar period, Slovakia formed part of Czechoslovakia. The other parts of Czechoslovakia were Bohemia, Moravia and Silesia – now incorporated in the Czech Republic, and Carpathian Ruthenia – now part of Ukraine. Czechoslovakia was created after the First World War and the collapse of the Austro-Hungarian monarchy in 1918. In Central Europe, it was one of the more advanced countries and, unlike its neighbours, Czechoslovakia remained a democratic establishment throughout the interwar period. In the new state, Slovakia experienced a period of great development in education, as well as cultural and political life. On the other hand, Slovakia lagged behind the Czech lands substantially in terms of economic strength, and in some aspects of the situation, it was even worse compared with the pre-war period as a result of the loss of former markets in Hungary and the keen competition of Czech enterprises. This situation was worsened by several economic crises associated with high unemployment (Lipták 1998; Kováč 1999). Czechoslovakia had, for its time, relatively advanced legislation regarding the care of mothers and children. However it had minimal influence on demographic development (Koubek 1980). The first Czechoslovak republic broke up in 1939, although as early as 1938, after the Munich Agreement and the First Vienna Award, its borders were drastically changed, and some areas were annexed by Germany and Hungary. Interwar Czechoslovak vital registration data for 1919 – 1937 and the two censuses carried out in 1921 and 1930 can be considered, with respect to the period, as sufficiently detailed. Almost all data are available separately for Slovakia, with some minor changes in its present borders.

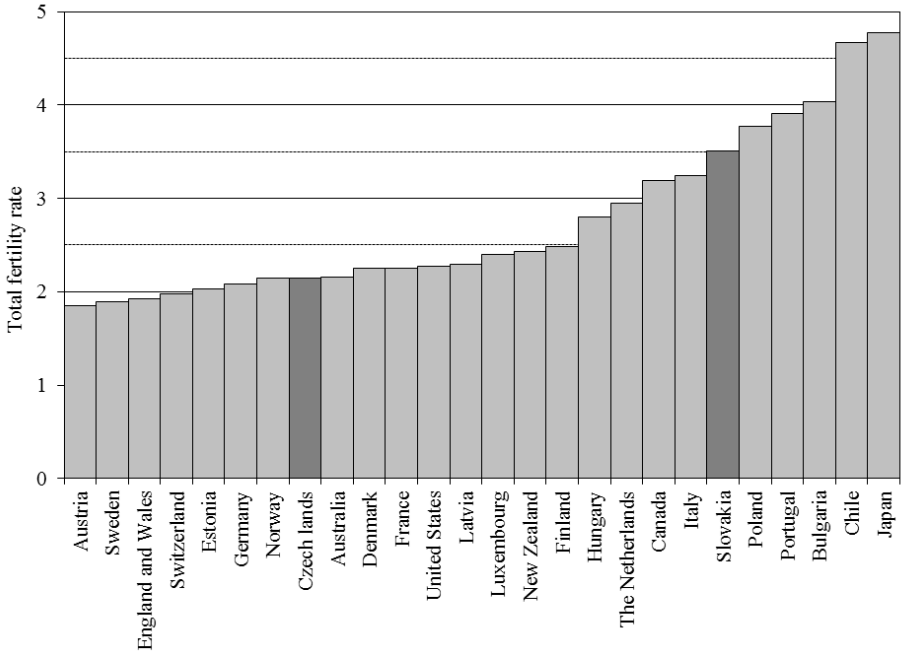
Table 1: **Slovakia in 1930 – selected demographic indicators**

Population (Census of 1 December)	3,329,793	Life expectancy at age 0 – males	50.0
Crude birth rate	29.2 ‰	Life expectancy at age 0 – females	52.3
Crude death rate	15.8 ‰	Infant mortality rate	162 ‰
Rate of natural increase	13.5 ‰	Crude marriage rate	8.7 ‰
Total fertility rate	3.51	Total first marriage rate – males	0.92
Gross reproduction rate	1.70	Total first marriage rate – females	0.87
Net reproduction rate	1.26	Mean age at first marriage – males	26.9
Mean age at childbirth	29.4	Mean age at first marriage – females	23.2
Mean age at birth of first child	23.6	Area	49,006 km^2
Percentage of nonmarital births	8.5 ‰	Population density	68/ km^2

Source: Author's calculation based on: Státní úřad statistický 1934a, 1936a

In the interwar period Slovakia was one of the European countries with relatively high fertility and mortality (Table 1). In 1930, the total fertility rate (TFR) in Slovakia was 3.5 children per woman, similar to the TFR of several Central and Eastern European countries, including Poland and Bulgaria, as well as Southern European countries like Italy and Portugal. The Czech lands in 1930 had substantially lower TFR, only 2.15 children per woman, like many Western and Northern European countries (Figure 1).

Figure 1: **Total fertility rate in selected countries around 1930**

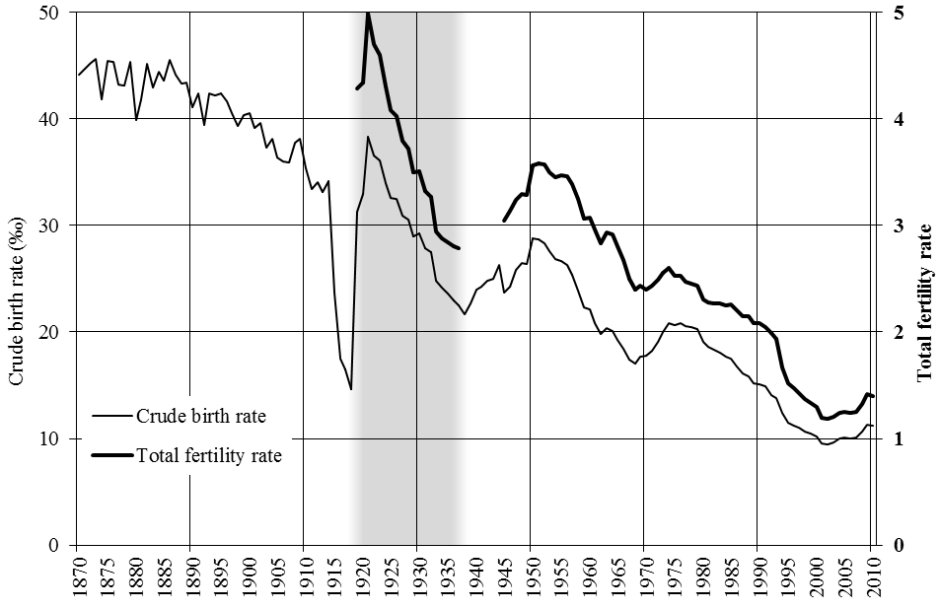


Note: Total fertility rates for the closest available year (usually 1929-32), sometimes it is the average TFR of the years preceding 1930 and after 1930
Source: League of Nations 1936, 1937, 1939; Federální statistický úřad 1982 (Czech lands); Author's calculation based on: Státní úřad statistický 1934a, 1936a (Slovakia)

Basic data on fertility trends have been processed in Slovakia since 1870 (Figure 2). From 1870 to 1895, the crude birth rate (CBR) in Slovakia ranged between 42‰ and 45‰. Around since 1895, CBR began to fall and before First World War reached a value of 34‰. The First World War had a negative impact on the fertility of the Slovak population. Although the war directly affected only a small part of Slovakia, a large number of Slovak men of reproductive age fought in the Austro-Hungarian army, and the war had a substantial negative economic impact on civilians. Fertility fell in 1915, and in

1918, CBR dropped to 14.6‰. Immediately after the war, fertility returned to pre-war levels. The war ended in November 1918. In July 1919, 5,800 children were born, but in August 1919, nine months after the war, the number rose to 10,300 children. Post-war fertility peaked in 1921 when the CBR was 38‰. For the interwar period, total fertility rate data are also available. In 1921, the TFR was nearly 5 children per woman. Such a high TFR was reached only thanks to births postponed until after the First World War. If the pre-war development had continued without interruption, TFR in the early 1920s would be less than 4 children per woman. That is why the TFR following the post-war compensatory phase quickly declined. The decline was accelerated due to the poor economic situation. Specifically, between 1932 and 1933 there was a sharp decline in TFR of 0.3 children per woman following the Great Depression. The Great Depression struck Czechoslovakia in 1931 and culminated in 1933 (Hallon 2005). By 1937, TFR had decreased to 2.78 children per woman. Although a bad economic situation could be an immediate trigger for a decline in fertility for some years, I am inclined to believe that in

Figure 2: **Development of fertility in Slovakia 1870 – 2010**

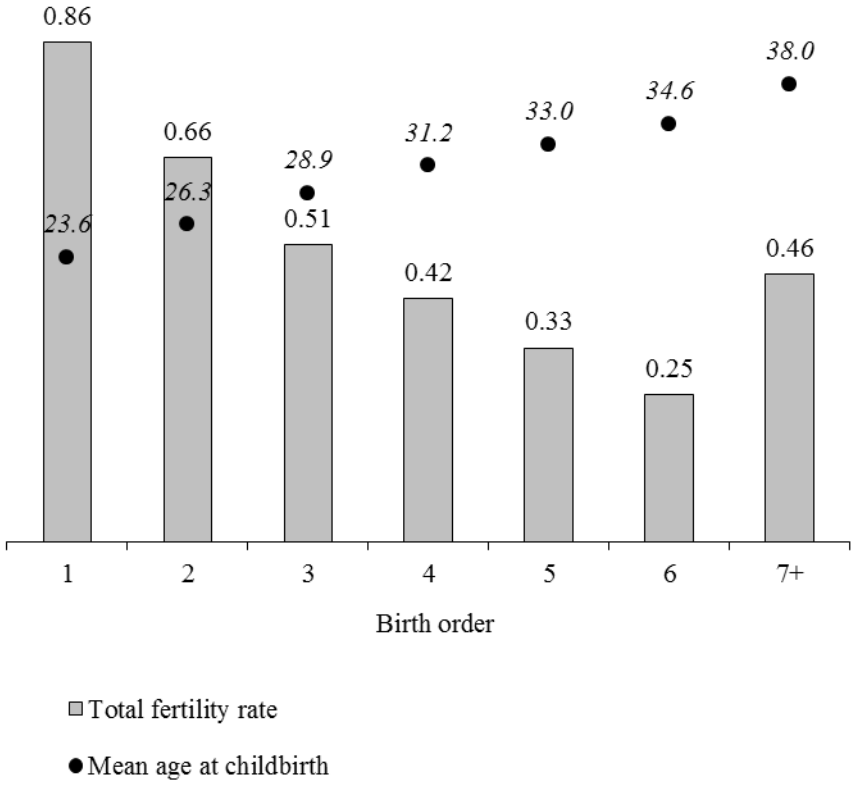


Source: Federální statistický úřad 1982 (years 1870 – 1918 and 1938 – 1949); Vaňo et al. 2011 (years 1950 – 2010); Author's calculation based on: Státní úřad statistický 1924, 1929a, 1929b, 1930, 1932a, 1934a, 1936a, 1938, Ústřední statistický úřad 1941 (years 1919 – 1937)

the case of the whole interwar period, the fertility decline was caused by the modernization of society and associated social changes (for a discussion of this topic, see Van Bavel 2010).

In 1930, the first order TFR was 0.86 children per woman, higher order TFRs declined gradually, without the sharp break between certain orders: TFR2 was 0.66, TFR3 0.51, TFR4 0.42, TFR5 0.33, TFR6 0.25 and TFR7+ 0.46 (Figure 3). Based on this data (although these data are period data, not cohort data), it is possible to suppose that there was not a dominating type of fertility behaviour or a characteristic number of children in the family in interwar Slovakia. On the contrary, there were very different types of fertility behaviour and families with both low and very high numbers of children. The aim of the following sections is to find out what factors influenced the differences in fertility level within the Slovak population.

Figure 3: **Total fertility rate and mean age of mother at childbirth by order in Slovakia in 1930**



Source: Author's calculation based on: Státní úřad statistický 1934a, 1936a

3. Data and methods

For most of the factors it is not possible to assess their relationship with fertility directly – the available statistics do not include a classification of birth by these factors. Therefore, this paper studied the relationship between the values of variables and the values of the general fertility rate (GFR) in the district. Restrictions resulting from such solutions are discussed later.

Most of the data comes from the census carried out on 1 December 1930. Vital registration data are for 1931.[3] In the period under review, there were 79 districts and 2 districts were divided into 2 parts for which statistical data were published separately, and hence 81 statistical unites were evaluated. A district (*okres*) was a territorial unit of state administration. It consisted of 1 to 103 municipalities and had an area of 81 km^2 to 1,611 km^2, with an average of 620 km^2. The smallest district had a population of 9,378, the largest district had a population of 123,844, the average district population was 42,149 inhabitants, and the average statistical unit had 41,109 inhabitants. Two districts, the Bratislava urban district and Košice urban district, consisted only of an urban population. In this analysis, districts are not weighted by their population size.

The selected size of the region may be one of the factors influencing the results of an analysis of this type. The inadequacy of using too large and heterogeneous regions is pointed out by Galloway, Hammel, and Lee (1994) in the case of Prussia after comparing their results using administrative units with approximately 60,000 inhabitants with works associated with the Princeton European Fertility Project using administrative units more than ten times larger. Brown and Guinnane (2002) warn about the same problem in their analysis of fertility in Bavaria, in which they used 176 regions as compared to 7 in the Princeton European Fertility Project. The use of large regions could have distorted the results of previous analyses of fertility in Czechoslovakia (Fialová – Pavlík – Vereš 1990) and pre-war Hungary (Szabady 1976; Lengyel Cook – Repetto 1982), both involving the Slovak population. The advantage of the districts as units of analysis is, in addition to small population, the structure of the district. It consisted of a town (sometimes a large village) and its surroundings. The residents of such a territory often met each other on various occasions, such as visiting the town for business, official duties, etc. It can be assumed that such a region, compared to higher administrative units, was socio-economically and culturally homogeneous, and that social norms could

[3] Vital registration data for 1930 were not yet compatible with the census data from the end of 1930. Unless otherwise stated, all calculations are based on census data and vital statistics published by the National Statistical Office of Czechoslovakia (Státní úřad statistický 1924, 1929a, 1929b, 1930, 1932a, 1932b, 1934a, 1934b, 1936a, 1936b, 1937, 1938; Ministerstvo vnútra and Štátny úrad štatistický 1936) and the Central Statistical Office of the Protectorate of Bohemia and Moravia (Ústřední statistický úřad 1941).

successfully diffuse within it, including norms that have an impact on fertility behaviour.

Most studies concerned with fertility in various European countries in the second half of the 19th and early 20th century focus on marital fertility. The use of marital fertility can be useful when comparing populations, some of which controlled fertility through late marriage age and a high proportion of never-married, and some did not, in order to eliminate the effect of this phenomenon and emphasize the impact of other factors. Because fertility control through marriage reduction did not occur to a significant extent in any Slovak region, I consider it more appropriate to work with overall fertility. Data do not allow a calculation of the total fertility rate for districts, and hence fertility is measured by the general fertility rate (number of live births per 1000 women aged 15 to 49 years in a given year). GFR values in Slovak districts ranged from 41.6‰ to 172.9‰ (Figure 4).[4] Nevertheless, correlations of socioeconomic and cultural factors with general marital fertility rate (number of marital live births per 1000 married women aged 15 to 49 years in a given year) are calculated for comparison.

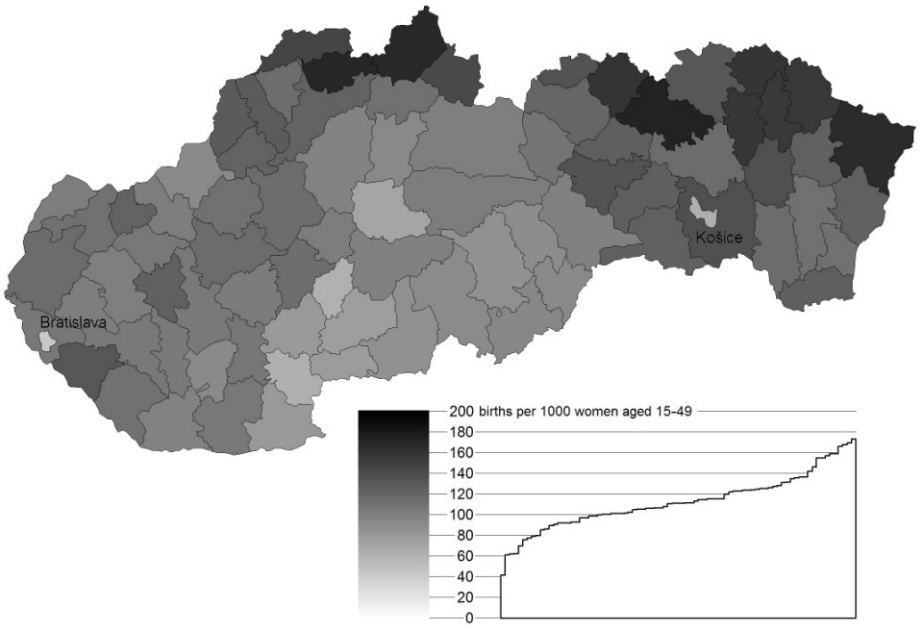
The relationship between variables and GFR was assessed using a linear correlation coefficient. Results are presented in Table 2. Thirty-nine variables were evaluated initially, and two other variables were added after the logarithmic transformation of the original variables. Variables are divided into ten sections – Infant mortality, Education, Material conditions, Occupation, Urbanization, Migration, Nuptiality, Ethnicity, Religion, and Liberality. In addition to the correlation coefficient, Table 2 presents an evaluation of its statistical significance (p-value and 0.95 confidence interval), coefficient of determination, correlation coefficient between the variable and general marital fertility rate, and the correlation coefficient between the variable and GFR after the exclusion of Bratislava and Košice urban districts. These two units, with the population of the two largest towns, are in some cases significant outliers. Variables whose frequency distributions are significantly different from the normal distribution are marked with a cross. The main results of the paper – zero-order correlations between fertility rate and general socioeconomic and cultural variables – are discussed in Section 4. Multiple relationships between GFR and selected indicators are investigated in Section 5. An overview of the values of the indicators can be found in the Appendix.

The important contribution in studying the relationship between fertility and socio-economic factors would be to examine the data for a longer time period. The use of such data is problematic because Slovakia in the first half of the

[4] For a better understanding: In 1931, the TFR of Slovakia was 3.33 and GFR was 106.1‰. If the relative age-specific fertility rates and age structures of women in all districts were approximately equal, the TFR would range from about 1.3 (GFR 41.6) to about 5.4 (GFR 172.9).

20th century formed part of several sovereign states,[5] which caused frequent changes of administrative boundaries and the fluctuation of the quantity and quality of recorded demographic data. The analysis of time series data would not rely on unified data, and this would adversely affect the accuracy of the results.

Figure 4: **General fertility rate in districts of Slovakia in 1931**



Source: Ježo 1923; Vojenský kartografický ústav 1996; Majtán 1998; Žudel 2002; Kusendová – Tomášiková 2006 (map); Author's calculation based on: Státní úřad statistický 1934a; 1938 (data)

[5] Austro-Hungarian Monarchy until 1918, Czechoslovakia 1918 – 1939, Slovakia 1939 – 1945 (without the territories annexed by Hungary), Czechoslovakia after 1945.

Table 2: **Correlation of general fertility rate with socioeconomic and cultural indicators in Slovakia in 1930**

		Correlation coefficient	Statistical signifi-cance	0.95 confidence interval		Coefficient of deter-mination	Correlation without Bratislava and Košice urban districts		Correlation with general marital fertility rate
		Pearson's r	p-value	lower limit	upper limit	r^2			
Infant mortality	Infant mortality rate (1931-32)	**0.49**	< 0.001	0.31	0.64	24.4%	0.46		0.50
Education	Percentage of illiterate population aged 10 and over	**0.76**	< 0.001	0.65	0.84	57.8%	0.76		0.64
	Logarithm of percentage of illiterate population aged 10 and over	**0.80**	< 0.001	0.70	0.87	63.7%	0.77		0.69
Material conditions	Property of municipalities per inhabitant (1929) (x)	**-0.45**	< 0.001	-0.61	-0.26	20.3%	-0.28		-0.37
	Annual income of municipalities per inhabitant (1929)	**-0.54**	< 0.001	-0.68	-0.37	29.2%	-0.43		-0.39
	Logarithm of annual income of municipalities per inhabitant (1929)	**-0.63**	< 0.001	-0.75	-0.48	40.1%	-0.58		-0.46
	Number of people per one physician (1935)	**0.62**	< 0.001	0.47	0.74	38.6%	0.59		0.47
Occupation	Percentage of population engaged in agriculture and forestry	**0.55**	< 0.001	0.38	0.69	30.4%	0.45		0.40
	Percentage of population engaged in mining and metallurgy (x)	**-0.11**	0.327	-0.32	0.11	1.2%	-0.14		-0.06
	Percentage of population engaged in industry	**-0.54**	< 0.001	-0.68	-0.37	29.5%	-0.49		-0.36
	Percentage of population engaged in trade and finance	**-0.35**	0.001	-0.53	-0.14	12.2%	-0.09		-0.24
	Percentage of population engaged in transport	**-0.26**	0.020	-0.45	-0.04	6.6%	-0.15		-0.15
	Percentage of population engaged in public service	**-0.57**	< 0.001	-0.70	-0.41	32.8%	-0.51		-0.54
	Percentage of population engaged in the military (x)	**-0.37**	< 0.001	-0.55	-0.17	13.9%	-0.24		-0.31
Urbanization	Percentage of population living in municipalities with 5,000 and more inhabitants (x)	**-0.54**	< 0.001	-0.68	-0.36	28.9%	-0.42		-0.43
	Percentage of population living in municipalities with 10,000 and more inhabitants (x)	**-0.49**	< 0.001	-0.64	-0.30	23.8%	-0.35		-0.40
	Number of inhabitants of the biggest municipality of the district	**-0.32**	0.004	-0.50	-0.11	10.0%	-0.34	**	-0.30
	Number of inhabitants of the administrative centre of the district	**-0.32**	0.004	-0.50	-0.11	10.2%	-0.34	**	-0.30
	Average number of inhabitants per municipality	**-0.38**	< 0.001	-0.55	-0.17	14.2%	-0.19		-0.34
Migration	Net migration from 1921 to 1930 per 1000 inhabitants in 1921	**-0.53**	< 0.001	-0.67	-0.35	28.0%	-0.49	*	-0.51
	Number of married men per 1000 married women	**-0.57**	< 0.001	-0.70	-0.40	32.7%	-0.53		-0.49
Nuptiality	Crude marriage rate (1931)	**0.36**	0.001	0.15	0.53	12.6%	0.42		0.25
	Percentage of married women aged 15-49	**0.22**	0.053	0.00	0.41	4.7%	0.08		-0.11
	Percentage of married women aged 15-24	**0.17**	0.131	-0.05	0.37	2.9%	0.06		-0.15
	Mean age of women at marriage (1931)	**-0.18**	0.103	-0.39	0.04	3.3%	0.00		0.07
	Mean age of men at marriage (1931)	**-0.34**	0.002	-0.52	-0.14	11.8%	-0,21		-0.13

		Correlation coefficient	Statistical significance	0.95 confidence interval		Coefficient of determination	Correlation without Bratislava and Košice urban districts		Correlation with general marital fertility rate
		Pearson's r	p-value	lower limit	upper limit	r^2			
Ethnicity	Percentage of Slovaks and Czechs (x)	**0.07**	0.563	-0.16	0.28	0.4%	0.04		0.16
	Percentage of Hungarians (x)	**-0.32**	0.003	-0.50	-0.11	10.3%	-0.34		-0.38
	Percentage of Germans (x)	**-0.10**	0.366	-0.31	0.12	1.0%	0.01		-0.01
	Percentage of Rusyns and Ukrainians (x)	**0.49**	< 0.001	0.30	0.64	23.7%	0.51		0.38
	Percentage of Jews (ethnicity)	**0.04**	0.741	-0.18	0.25	0.1%	0.23		-0.06
	Percentage of Gypsies (x)	**0.04**	0.698	-0.18	0.26	0.2%	0.00		-0.12
	Percentage of dominant ethnicity (x)	**0.10**	0.379	-0.12	0.31	1.0%	0.00		0.21
Religion	Percentage of Roman Catholics	**-0.12**	0.299	-0.33	0.10	1.4%	-0.13		0.08
	Percentage of Protestants (x)	**-0.40**	< 0.001	-0.57	-0.20	15.9%	-0.45		-0.43
	Percentage of Greek Catholics (x)	**0.55**	< 0.001	0.37	0.68	29.7%	0.57		0.35
	Percentage of Jews (religion)	**-0.05**	0.639	-0.27	0.17	0.3%	0.20		-0.12
	Percentage of dominant religion	**0.08**	0.463	-0.14	0.30	0.7%	0.07		0.27
Liberality	Percentage of population without religion (x)	**-0.48**	< 0.001	-0.63	-0.29	23.1%	-0.38	*	-0.43
	Crude divorce rate (1931-33)	**-0.62**	< 0.001	-0.74	-0.46	38.4%	-0.54		-0.57
	Percentage of nonmarital births (1931-32)	**-0.19**	0.093	-0.39	0.03	3.5%	0.00		-0.27

Notes: Number of units (districts) = 81
General fertility rate is the number of live births per 1000 women aged 15-49 years in a given year
General marital fertility rate is the number of marital live births per 1000 married women aged 15-49 years in a given year
Fertility rates are for 1931, indicators are for 1 December 1930 or for years in brackets
(x) frequency distribution of variable is significantly different from the normal distribution
* also without Bratislava rural district
** also without Bratislava and Košice rural districts
Source: Author's calculation based on: Státní úřad statistický 1934a, 1938; Státní úřad statistický 1937 (illiteracy); Státní úřad statistický 1932b (wealth); Chura – Kizlink 1939 (physicians); Státní úřad statistický 1934b (occupation); Ministerstvo vnútra and Štátny úrad štatistický 1936 (urbanization); Státní úřad statistický 1936b (married women 15-24)

4. Results

4.1 Infant mortality

I expect a positive relationship between infant mortality and fertility, that is, higher infant mortality in areas with higher fertility and vice versa. This correlation was caused mainly by *economic reasons*. It is possible that parents gave a greater priority to the number of children who survive to adulthood (and are later able to take care of parents) instead of the overall number of children born. In areas with greater infant mortality, families had additional children that were meant to "replace" dead siblings or act as a "reserve" in case of a sibling's death. As the risk of children's death decreased, the number of births necessary to achieve the desired family size decreased as well (van de Walle 1986; Livi-Bacci 1986; Galloway – Hammel – Lee 1994; Brown – Guinnane 2002; Lee 2003). There was also the possibility of a reverse economic influence on the fertility–infant mortality relationship. In the case of high fertility, it could be difficult for parents to adequately feed and take care of their children, which could result in higher infant mortality (Brown – Guinnane 2002; Lee 2003; Livi-Bacci 2003).

One must not forget about the *physiological aspects* behind the fertility–infant mortality relationship, especially the duration of breastfeeding, the length of intervals between births, and birth order. Breastfeeding tends to delay the return of ovulation and therefore also decreases the chance of pregnancy. Breastfed children also had a better chance of surviving thanks to better immunization and a healthier diet. Therefore in areas where children were breastfed for the correct amount of time, both fertility and infant mortality were lower (van de Walle 1986; Engelen – Hillebrand 1986; Livi-Bacci 2003). Unlike in, say, Bavaria (van de Walle 1986; Livi-Bacci 2003), breastfeeding was not against the cultural norms in Slovakia, therefore it is unwise to overestimate this relation between infant mortality and fertility. Nevertheless, the sudden death of an infant and the subsequent end of breastfeeding could precipitate the birth of the next child. Infant mortality could also be influenced by shorter intervals between births, as high frequencies could damage the health of the mother and negatively affect the health of an infant or expected child. Higher infant mortality was also common among the children of higher order, which were more represented in areas with higher fertility (van de Walle 1986; Livi-Bacci 2003).

The birth of a child could change the *behaviour of the parents*. Insufficient privacy or a lack of free time could lead to less sexual encounters. The death of a child could restore their personal lives in a way that led to another pregnancy (van de Walle 1986; Livi-Bacci 2003). The death of a child could also lead the

parents to attempt another pregnancy, not just for the above mentioned economic reasons but also for emotional reasons.

Infant mortality rate in Slovak districts ranged between 100‰ and 200‰, with an average of 166‰. As was expected, infant mortality rate and general fertility rate had a positive linear relationship with r = 0.49.

4.2 Education

Most of the studies of populations during the demographic transition show a clear inverse relationship between the level of education of the population and the level of fertility (van de Walle 1980). The relationship between education and fertility may have several explanations. *The first* is the emphasis that educated parents put on a child's wellbeing – the effort to ensure children a better diet and nutrition, better housing and clothing, sanitary conditions and better healthcare, better education, maybe even more attention to their individual needs, not necessarily just physical. Such an approach would require devoting more resources to each child, which makes it necessary to limit the total number of children in the family (van de Walle 1980; Galloway – Hammel – Lee 1994, Lee 2003, Livi-Bacci 2003). *Second*, education reduced the economic benefit of children of a certain age for the family. Children who devoted time to attending schools and studying, were less involved in various chores, e.g. in agriculture, and did not contribute as much to their livelihoods (van de Walle 1980; Galloway – Hammel – Lee 1994; Lee 2003). This explanation can be debatable in the case of interwar Slovakia, as all of the compared regions were located in one country and therefore had the same length of compulsory schooling. Differences arose mainly due to optional education.[1] *Thirdly*, educated women had a better chance of being employed, and could be more inclined to work outside the home. Working outside the home reduced the number of children a woman could raise. The increasing qualification of women, the growing number of job opportunities for women, and the rise in women's wages increased the opportunity cost of childbearing, and thus could reduce fertility (Easterlin 1976; Galloway – Hammel – Lee 1994; Lee 2003). However, the involvement of women in qualified work outside the home fell behind in comparison with Western Europe, and this phenomenon could affect fertility behaviour in only a relatively small proportion of the population. *Fourth*, education could affect the knowledge of techniques and practices of birth control. Education could also affect the willingness to use contraception because of the difference between educated and uneducated people in their attitudes toward its usefulness and its moral

[1] Compulsory schooling lasted for 6 years until 1927. Thereafter it lasted for 8 years. However, most likely, it was often not strictly adhered to (Mátej 1970; Galvánková 1997).

acceptability, and perhaps related embarrassed feelings (van de Walle 1980; Crafts 1989; Pitkänen 2003; Sogner 2003). All explanations of the relationship between fertility and education can be summarized as follows: "Education may help people adapt to modern society and teach them to cope rationally with the environment, to become less fatalistic and to plan more in all aspects of their lives" (van de Walle 1980: 463). The result of this rational attitude was a reduction in the number of children compared to the situation before the demographic transition.

The educational level of the population can be assessed through several indicators. The simplest – the proportion of illiterates – can be used only in a certain stage of development. In most Western countries at the turn of the 19th and 20th century, illiteracy was not a very good indicator of education because it was very low. More advanced indicators, such as length of schooling, had not yet been included in the censuses (van de Walle 1980). Similarly for the districts of Slovakia in 1930, the only information on the education of the population was the proportion of illiterates. *The percentage of illiterate population aged 10 and over* in Slovakia was 10%,[2] in districts ranging from 1.8% to 39%. Although illiteracy throughout the country was already relatively low, inter-district differences were not negligible, and therefore it seems appropriate to use this indicator to assess the level of education in Slovak districts during the interwar period.[3]

The correlation coefficient between the percentage of illiterates aged 10 and over and GFR was 0.76, the highest value of all evaluated variables. Among the districts with the lowest illiteracy, a small change in the proportion of illiterates corresponded to a big change in GFR, in districts with high illiteracy GFR increased more slowly. Therefore, after the logarithmic transformation of the variable percentage of illiterate population aged 10 and over, the correlation coefficient slightly increased to 0.80. The assumption that areas with a large number of illiterate inhabitants had higher fertility than regions with better educational levels, was confirmed. However, illiterate people themselves could not cause the district differences in fertility, since their proportion was on average 10%. Moreover, it is likely that mainly older people increased this number, as in other European countries (see Kirk 1968: 189; Botev 1995). Nevertheless, districts with higher illiteracy could fall behind in other aspects related to education. It may be assumed that literacy in these regions began to rise significantly only in recent times, that relatively few people educated

[2] Male illiteracy was 7.5%, female illiteracy was 12.2%. The correlation coefficient between male and female illiteracy was 0.97, so it was not necessary to evaluate separately the relationship between fertility and female illiteracy. Among the 10.0% of illiterates, people who were able to read but not to write are included. The proportion of totally illiterate persons was 8.2% of the total population.

[3] Moreover, even in populations for which data on school attendance are available, illiteracy, although already low, could be the better predictor of fertility level (see Guest 1990).

themselves by reading the books or newspapers, and that few people had higher than compulsory education.

4.3 Material conditions

A negative association between the fertility and material conditions of a family during the European demographic transition is well known. Reduction of fertility was first recorded in the highest social strata, and birth control spread to lower classes later (Livi-Bacci 2003). Material conditions may be a proxy for other factors affecting fertility decline – infant mortality, education, etc. Perhaps there was the opposite relationship – fertility had an impact on material conditions. More children could mean higher costs for basic needs, especially food, and less possibilities of purchasing more modern equipment or making investments. Many children also meant a gradual division of agricultural land, because the land was not passed on to one heir, but was divided among all sons (Botíková – Švecová – Jakubíková 1997).

In the section concerning material conditions, the variables used are the property of municipalities per inhabitant and the annual income of municipalities per inhabitant. As fertility decisions were made in families and not in the municipal council, it would be better to evaluate the property and income of families or family consumption. Such data are not available. The municipal budget, however, largely depended on the wealth of residents (see, e.g., Winter 2001: 55; Galvánková 1997: 337). The correlation coefficient between *the property of municipalities per inhabitant* and GFR was -0.45, the correlation coefficient between *the annual income of municipalities per inhabitant* and GFR was -0.54. In the poorer districts, fertility declined much faster with rising incomes, while in the richer districts, income disparities caused only small differences in GFR. Therefore, after the logarithmic transformation of the variable annual income of municipalities per inhabitant, the correlation coefficient increased to -0.63.

In this section I evaluate one more variable – *the number of people per one physician* – which can be regarded as a proxy of material conditions of the region's population, but also as an indicator associated with infant mortality or education. There was a linear relationship between the number of people per one physician and GFR with $r = 0.62$. Although the variables used are not ideal, it can be said that wealthier districts had lower fertility than poor districts.

4.4 Occupation

The substantial modernization of Slovak society, which took place gradually from about the end of the 19th century, brought important changes in the

structure of employment. Kirk (1968: 190) describes the proportion of employed outside agriculture as the "sharpest single measure of economic transformation" in the interwar period, particularly in Eastern and Southern Europe, because it well reflected the productivity in agriculture and industrial development. In Western and Northern Europe, it was a too crude measure of material progress at that time (Kirk 1968). In addition to the common connection of occupational structure and fertility with a general modernization of society, we can also consider more direct links between these phenomena. Examples include various economic costs per child in families with different sources of livelihood. Children in a farm family could be engaged in some sort of work (for example livestock grazing) from a very early age, and thus contribute to their own livelihood. Children in the family of a craftsman or trader had fewer opportunities to participate in work, or they started to work at an older age. The family of a factory worker, clerk or soldier could not involve children in work at all. This could lead to greater economic pressure to control birth in such families. Members of various professions could also share some specific values, social norms and models of behaviour (Vrzgulová 2001), which could have an impact on family life and, consequently, different fertility. An example might be the fatalism of farmers initially resulting from the erratic conditions of the natural environment (weather events, animal and plant diseases), which could sometimes turn into passiveness when facing situations which could be improved, or even a negative attitude towards people who were trying to raise their standard of living through hard work or innovation (Danglová 1992). This resignation towards actively influencing their own lives (which, for example, a trader could not afford) could also apply to birth control attitudes.

The published 1930 Census results included data about people directly working in a particular sector, but also data about non-employed people – especially children, the elderly and women – which were associated with the occupation of their breadwinner. The following figures refer to the whole population. GFR was positively correlated with *the percentage of population engaged in agriculture and forestry* with r = 0.55. A decreasing relationship existed between GFR and *the percentage of population engaged in public service* with a correlation coefficient of -0.57 and *the percentage of population engaged in industry* with r = -0.54. In the case of *the percentage of population engaged in the military* the correlation coefficient was -0.37, however the scatter diagram was heteroscedastic. In the case of *the percentage of population engaged in trade and finance* (r = -0.35), there were two significant outliers – the largest cities, Bratislava and Košice. After their removal the correlation coefficient fell to -0.09. Correlation coefficients between GFR and *the*

percentage of population engaged in transport (r = -0.26) and *the percentage of population engaged in mining and metallurgy* (r = -0.11) were very low.

Occupation was one of the attributes of the population for which published data allow to reveal the relationship with fertility directly, not only by comparing the values in the districts. The number of marital live births per 1000 married *men* aged 15-49 years who were employed in mining and metallurgy was 219. It was 209 in agriculture and forestry, 176 in industry, 135 in transport, 131 in trade and finance, 119 in public service and 59 in the military. Although the most extreme values of fertility were achieved in mining and metallurgy and in the military, the low population related to these professions had little effect on the differences in fertility between districts.

4.5 Urbanization

The specific social structure of a town and specific relationships between urban inhabitants (compared to rural areas) could have an impact on fertility. In towns there were many groups that had lower than average fertility, or even zero: soldiers, clergy, domestic servants, inmates in hospitals and prisons, vagrants, and prostitutes. A large number of immigrants did not have the chance to create a material base for a family, or they supported a family in their original home. Some immigrants did not wish to remain permanently in the town (Livi-Bacci 1986, 2003). People employed in industry, transport, trade, finance and public service, Jews, people without religion, Czech educated classes, and wealthy people all had above-average representation in Slovak towns and below-average fertility. In a densely populated and anonymous urban environment, a dissemination of fertility-related practices and ideas was simpler and pressure to behave according to traditional social norms was weaker than in rural conditions. People living in a town had more options concerning their private life due to less stringent social control, which also influenced fertility behaviour.

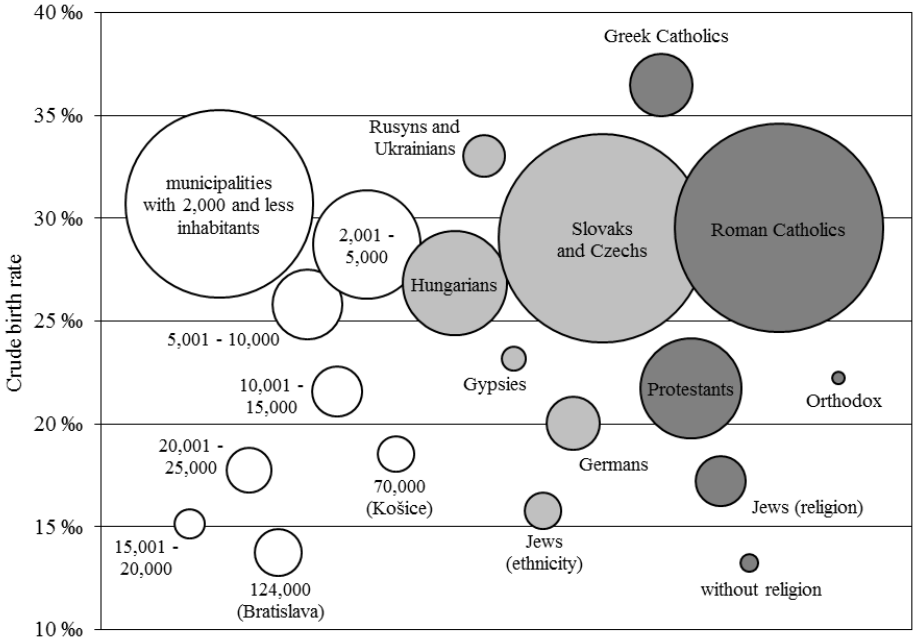
A major urban centre located in the district could affect the fertility of the district, whether simply by the weight of urban population in the district average, or because of the diffusion of certain ideas, innovations, and models of behaviour to the rest of the district.

The relationship between urbanization and fertility was evaluated first using the variables *percentage of population living in municipalities with 5,000 and more inhabitants* and *percentage of population living in municipalities with 10,000 and more inhabitants*.[4] For the first variable, the correlation coefficient with GFR was -0.54, for the second variable it was -0.49. However, the

[4] Municipality (*obec*) was the smallest administrative entity composed of one town or one village, not a group of towns or villages. In this paper it is used as the common name for town and village.

information value of these numbers is low – 35 of the 81 districts tcontained no municipality with over 5,000 inhabitants, and 61 of 81 districts had no municipality with over 10,000 inhabitants. These variables would work better with larger regions. The use of another threshold value, such as 2,000, would not be appropriate, because such a population can no longer be considered urban.[5] The variable *average number of inhabitants per municipality* (r = -0.38) was also problematic in terms of using in the correlation analysis – the urban districts of Bratislava and Košice were significant outliers. After their removal, the correlation coefficient becomes -0.19.

Figure 5: **Crude birth rate by size of municipality, ethnicity and religion in Slovakia in 1931**



Note: The size of the circle is proportional to the population. Average CBR of Slovakia was 28‰
Source: Author's calculation based on: Státní úřad statistický 1934a, 1938

[5] Marking municipalities with 5,000 inhabitants as towns can also be questionable and perhaps even some municipalities with 10,000 inhabitants. For example, in his memoirs, journalist Rozner (2010: 106) describes a visit to Turčiansky Svätý Martin (in the 1930s), a town with 8,500 inhabitants, an important cultural centre, and until 1918 the unofficial political centre of Slovakia. He describes a "procession" of cows passing slowly along the hotel where he was staying. On the main town street, the herd was divided and one part headed to the stables behind the houses on the right, the second part on the left. Even in studies specifically addressing the relationship between fertility and urbanization, the problem of determining the boundaries between urban and rural settlements is not clearly resolved (see, e.g., Sharlin 1986). Nevertheless, if an anonymous environment and a specific social structure of the population are considered to be the most important features of a town when considering its relationship with fertility, 5,000 inhabitants seems to be the most suitable dividing line.

The last variables of urbanization evaluation are *the number of inhabitants of the biggest municipality of the district* and *the number of inhabitants of the administrative centre of the district*. Correlation analysis in the case of these variables is, from a statistical point of view, correct. Several district centres, however, had a low population and clearly rural character, and the description of the urban population from the beginning of this section did not apply. This may explain the low correlation coefficients, -0.32 in both cases.

Urban areas most probably had lower fertility than less urbanized areas. However, an examination of this relationship by comparing the level of urbanization and level of fertility in the districts proved to be inappropriate. On the other hand, this factor is convenient for establishing a relationship with fertility directly, because the published fertility data were sorted by the size of the municipality where the mother resided. In municipalities with a population of 2,000 and less, where 58.2% of the Slovak population lived, the crude birth rate was 30.7‰. With the growing size of the municipality, CBR decreased. In municipalities with 5,000 to 10,000 inhabitants, CBR was 25.8‰, and in municipalities over 10,000 inhabitants it was only 17.6‰ (Figure 5).

4.6 Migration

For the period between the two censuses, from 15 February 1921 to 1 December 1930, Slovakia had a net migration of -122,000 inhabitants. The country lost four percent of its population during a 10 year span. A significant majority were of reproductive age. Emigrants headed mainly towards the United States, but also towards other overseas countries, Western European countries and Czech lands. If the numbers for each district are to be taken into consideration, one must also account for the migration to bigger towns, for example to Bratislava. Slovak demographic literature regarding the relationship of migration and fertility considered the impact of emigration on the number of young people in particular and consequently on the reduction in the number of births (Hanzlík 1967; Vereš 1986; Fialová 1987; Šprocha – Tišliar 2008: 5). In addition to reducing the number of couples of reproductive age, emigration may have reduced the fertility of the women present – the predominance of men among the migrants and the separation of spouses due to the relocation of the husband reduced the exposure of the wife to the risk of pregnancy (Anderson 1986; Galloway – Hammel – Lee 1994). Nevertheless, I suppose that districts with high intensity of emigration also had high fertility, because emigration was stronger in areas where high fertility led to local overpopulation. The impact of the backwardness of the region on both the motivation to emigrate and high fertility is also possible. Emigration is thus included in the analysis as a possible proxy of the overall economic level of the region.

In interwar Czechoslovakia, several types of migration statistics were published, but they are very complicated and often inaccurate.[6] Accurate data on migration in the districts can be found only indirectly and only for a 10-year period – by comparing the difference between population censuses in 1921 and 1930 after accounting for the difference between the births and deaths in this period. Thus the variable *net migration from 1921 to 1930 per 1000 inhabitants in 1921* was obtained, which had a correlation coefficient of -0.53 with GFR. Fertility was high especially in areas with substantial negative net migration.

In addition to Net migration, I also used an indirect indicator of migration – *the number of married men per 1000 married women*.[7] Among emigrants, approximately 70% were men and 30% women. This difference was mainly due to temporary labour migration, particularly regarding men. It was not just seasonal migration, but also years-long work trips, for example to the United States (Mann 1980). The migration of women, particularly as domestic servants or factory workers, typical for Western Europe (Leasure 1963; Sklar 1974), was less significant in Slovakia. Also, permanent migration had an impact on the predominance of men among the emigrants, because the husband moved first, and his wife and children emigrated later, when he was settled. Only 939 married men per 1000 married women were present in Slovakia in 1930. More married men than women lived only in four districts, especially in the largest city of Bratislava, where there were enough jobs. Between the number of married men per 1000 married women and GFR, there was a negative linear relationship with r = -0.57. Fertility was highest in areas where the highest number of men were absent.

Only 700 to 800 men per 1000 married women were present in the Kysuce region in northern Slovakia, which is a good example of the relationship between emigration and fertility. In this region, the male population traditionally earned a living through the door-to-door sale of goods and repairing of kitchenware, seasonal agricultural work, transporting wood down the rivers, and other employment outside their residence (Pranda 1965). Men spent several months a year on the road and during this time the women had to do all the work at home – in addition to household chores, they had to do farm work, care for animals, procure wood for the winter, and similar tasks. Money earned by the man on the road was able to cover only the basic needs of the

[6] Foreign emigration data can be found from a variety of sources. For example, the statistics of persons to whom the "emigrant passport" was issued (not all owners of passports subsequently moved out); the statistics of border passport control (where it was not always possible to make statistical records); the statistics of emigrants transported by steamship companies (only overseas emigration); the statistics of seasonal emigration of farm workers, etc. The incompleteness of this data is mentioned directly in the data sources themselves (Boháč 1928: 57; Státní úřad statistický 1929c: 1447-1454; Svetoň 1958: 168-169). Some data were also available for districts (Chura – Kizlink 1939), but accuracy was apparently even worse than the figures for the whole country.

[7] Only people physically present at the time of the census (regardless of legal residence) and people married at the time of the census (not widowed or divorced) were taken into calculation.

family. Long family separations often led to the destruction of family life – a disturbed relationship between the wife and the husband, and between the children and their father (Šusteková 2007). The Kysuce area had a low number of married men present and also very high fertility. It is possible to believe that these factors were closely related – door-to-door selling was a way out of a complicated situation when agricultural land was not enough to feed a large family.

4.7 Nuptiality

Unlike most analyses of fertility in European countries in the late 19th and early 20th century, this paper deals with overall fertility, not marital fertility. It is therefore appropriate to evaluate the impact of marriage on fertility, along with other cultural and socioeconomic factors. It is possible to expect a direct causal relationship between nuptiality and fertility. Specifically, the number of people entering marriage and at what age they married could have an impact on fertility. Since more than 90% of children were born in marriage, there should be higher overall fertility in areas with a greater proportion of married people. With a low marriage age, the reproduction period of the spouses was longer, the woman was at risk of pregnancy for a long time, and therefore higher overall fertility can be expected also in areas with a low marriage age.

In terms of marriage behaviour, Slovakia fits in with Eastern Europe which had, compared with Western European countries, a low age of marriage and a low proportion of people who never married (see, e.g., Hajnal 1965; Sklar 1974; Botev 1990; Fialová 1994). In Slovakia however, marriage patterns were not the same everywhere. *Crude marriage rate* in districts ranged from 5.7‰ to 11.1‰. There was only a weak positive relationship between the Crude marriage rate and the General fertility rate (r = 0.36). The coefficient of correlation between GFR and *the percentage of women aged 15-49 who were married* was only 0.22, between GFR and *the percentage of women aged 15-24 who were married* only 0.17. When excluding the Bratislava and Košice urban districts, the correlation coefficient was only 0.08 and 0.06 respectively. Although the three marriage indicators at a district level are not ideal, they suggest that the intensity of marriage or the proportion of married caused only slight differences in fertility between districts. The relationship between fertility and the age at which people married was also very weak. The correlation coefficient between GFR and *the mean age of women at marriage* was -0.18. Without Bratislava and Košice, it was 0.00. The correlation

coefficient between GFR and *the mean age of men at marriage* was -0.34 and excluding Bratislava and Košice only -0.21.[8]

In comparison with the number of marriages and marriage age, the number of children born in a marriage had a stronger impact on district differences in overall fertility. In other words, the extent of birth control within a marriage was more important than marriage behaviour. However, the impact of marriage on fertility cannot be completely ignored, as shown by the differences between the correlation coefficient of socio-economic indicators with general fertility rate and general marital fertility rate (see Table 2). Correlations with marital fertility were in some cases substantially weaker. The strength of the relationship between indicators and overall fertility was thus, to some extent, influenced by the proportion of married.

4.8 Ethnicity

The ethnic structure of the inhabitants of Slovakia changed substantially in the period from the second half of the 19th century to the end of the Second World War (Majo – Kusendová 2007). The cause of most of these changes was the political situation – ethnic assimilation policies implemented by the Hungarian authorities in the second half of the 19th and early 20th century; a growing portion of the population identifying themselves as Slovak after the creation of Czechoslovakia and the immigration of Czech educated classes in the same period; the emigration of Czech educated classes from Slovakia after the dissolution of Czechoslovakia before the Second World War; the genocide of Jews during the Second World War; the displacement of Germans and the Slovak-Hungarian population exchange after the Second World War, etc. However, outside the periods of major geopolitical change, the changes of the ethnic structure could be affected by the different fertility behaviour of ethnic groups. And conversely, ethnic structure could affect fertility differences between regions.

Ethnicity is one of the characteristics of the population for which it was possible to directly detect differences in fertility (Figure 5). The Poles had the highest fertility among the ethnicities (crude birth rate = 50.8‰, not on chart), but accounted for only 0.2% of the population. Among the more significant ethnicities, the Rusyns had the highest fertility (CBR = 33.0‰). Citizens of Czechoslovak ethnicity (CBR = 29.0‰)[9] were dominant in the population of

[8] Mean age at *first* marriage would be the better indicator, but the necessary district level data were not available. The proportion of remarriages of all marriages was 5% for women and 10% for men. The difference between the mean age at first marriage and the mean age at all marriages was 1.5 years for women and 3 years for men. That seems not to have substantial impact on district differences in overall mean marriage age.

[9] In the interwar period, Czechs and Slovaks officially had one Czechoslovak ethnicity. In Slovakia, most people of Czechoslovak ethnicity were Slovaks. According to Srb (2002: 10), of the 71.3% of the population which had Czechoslovak ethnicity, 67.6% were Slovaks and 3.7% were Czechs.

Slovakia and their fertility was close to the average of the entire population (28.0‰). Hungarians (CBR = 26.8‰) and Gypsies (CBR = 23.2‰)[10] had lower than average fertility, Germans (CBR = 20.0‰) and Jews (CBR = 15.8‰) had the lowest fertility.

Despite clear differences in fertility between ethnicities, ethnicity was not a factor that influenced differences in fertility between districts. The reason could be the low representation of ethnicities in the district, insufficient to affect the average fertility for the whole district (*Germans* r = -0.10, *Jews* r = 0.04, *Gypsies* r = 0.04). Slovaks, who were dominant in the country, did not have a "typical" level of GFR and their fertility was associated with factors other than ethnicity. The correlation coefficient between *the percentage of Slovaks and Czechs* and GFR was not statistically significant (r = 0.07). A slightly stronger relationship was between *the percentage of Hungarians* and GFR (r = -0.32), but the scatter diagram is not homoscedastic – Hungarians constituted 18% of Slovakia's population, but in half of the districts they made up less than 1% of the population. For the same reason, the standard preconditions for correlation analysis were not satisfied in the case of the relationship between GFR and *the percentage of Rusyns and Ukrainians* (r = 0.49). It can be concluded, however, that all districts with an above-average share of Rusyns had high fertility. The last variable evaluated in this section is *the percentage of dominant ethnicity*, which reflects the degree of ethnic heterogeneity of the district (the weaker the position of the most dominant ethnicity, the greater the heterogeneity). In more ethnically heterogeneous regions, the difficult diffusion of birth control related knowledge and ideas can be expected. This assumption was not confirmed since the correlation coefficient with GFR was weak (r = 0.10).

4.9 Religion

Religious structure is often a factor considered in the analysis of differences in fertility in the late 19th and early 20th century. In European countries, Roman Catholics are generally expected to have higher fertility than Protestants. The main reason is that Roman Catholics held more traditional views concerning birth control than Protestants (Galloway – Hammel – Lee 1994). Low fertility was common in many European Jewish populations from at least the 19th century, when sufficient data are available (Livi-Bacci 1986). On the other hand, some authors argue that low fertility among European Jews was not a general rule (Schellekens – van Poppel 2006). In the early 20th century, Jewish fertility was more affected by their socio-economic status than religious values (Livi-Bacci 1986). Economic and social status, which was to some extent

[10] CBR of Gypsies may be underestimated because a large proportion lived a nomadic way of life isolated from mainstream society. Since vital registration data could be less accurate than census data collected only once every ten years, the number in the nominator of the crude birth rate could be undercounted in comparison to the number in the denominator.

associated with different religions, could also affect their different fertility in Slovakia. Protestants were usually wealthier, better educated, owned more land, and took better care of their property compared to Roman Catholics. Jews had a specific position, as many were businessmen, engaged in trade and had a good education (Beňušková 2004; Nesládková 2008). Lastly, Greek Catholics had a very low standard of living.

As well as ethnicity, religion is characteristic of the population, for which it was possible to directly detect differences in fertility. Greek Catholics had the highest fertility (CBR = 36.5‰). The CBR of Roman Catholics, who constituted a majority of the Slovak population, was 29.5‰. Protestants had below-average fertility (CBR = 21.7‰)[11] together with the small population of Orthodox (CBR = 22.3‰).[12] Jews (CBR = 17.2‰)[13] and people without religion (CBR = 13.3‰) had the lowest fertility (Figure 5).

Despite differences in fertility between the religions, they only slightly influenced differences in fertility between districts. There was no relationship between GFR and *the percentage of Roman Catholics* (r = -0.12) and between GFR and *the percentage of Jews* (r = -0.05). The correlation coefficient between GFR and *the percentage of Protestants* was -0.40, however, the distribution of values was not optimal for correlation analysis. The correlation coefficient between GFR and *the percentage of Greek Catholics* was quite high (r = 0.55), but the distribution of values was absolutely different from the normal distribution. The relationship of GFR with the percentage of Greek Catholics was similar to the relationship with the percentage of Rusyns, because most of the Rusyns belonged to the Greek Catholic Church. The relationship between GFR and religious heterogeneity of the territory represented by the variable *percentage of dominant religion* was not statistically significant (r = 0.08), just as in the case of dominant ethnicity.

4.10 Liberality

In this section on liberality, I assess the relationship of fertility with three phenomena that might be related with the degree of liberality and secularity, the toleration of ideas that were rejected in a more traditional environment as they were contrary to established customs and ideas. Specifically, people without religion, divorces, and nonmarital births. I do not claim people without

[11] 72% of Protestants were Lutherans, 26% were Calvinists and 2% were other.

[12] Orthodox people in Europe were not known for low fertility. In Slovakia, however, they formed a specific group, consisting mainly of re-emigrants from the United States who returned home self-confident and experienced. Conversion to Orthodoxy was their revolt against the anachronisms in the Greek Catholic Church (church taxes and work on church property). This was not required by the Orthodox Church which was otherwise liturgically similar (Mann 1980). The lower passivity of re-emigrants could also influence fertility behaviour and the extent of birth control.

[13] In the census, Jews were included among religions as well as ethnicities. There were twice as many people identifying themselves with the Jewish religion than (also) with Jewish ethnicity.

religion, who are divorced or with an illegitimate child are liberal, but rather that a society that accepts their presence is. I do not expect these phenomena to directly affect the level of fertility in a district, because their presence (especially people without religion and divorced) was minimal. Rather, it is possible that the liberal and secular environment caused more of these phenomena and also caused lower fertility in comparison with the traditional environment, for example due to the acceptance of contraceptive use and less stringent social norms regarding fertility behaviour.

The CBR of the population without religion was 13.3‰, i.e. evidently less than the average of the entire population (28.0‰) (Figure 5). The representation of the population without religion was very low – only 0.5%. The correlation coefficient between GFR and *the percentage of population without religion* was -0.48.

The crude divorce rate in Slovakia was 0.21‰. Although divorced people had lower fertility than the married population, the divorce rate was so low that I do not assume a direct impact of divorce on fertility level in districts, but rather the impact of the liberal environment on both birth control and tolerance to divorce. The correlation coefficient between GFR and *crude divorce rate* was relatively high, r = -0.62.

The percentage of nonmarital births was 8.8%. Correlation coefficient with GFR was only -0.19, and after the removal of the two largest cities, it changed to 0.00. The percentage of nonmarital births was therefore not in relation to GFR. It seems likely that this factor cannot be regarded as a strong indicator of a liberal atmosphere in society. Statistical data show that births outside marriage were not a rarity, or a phenomenon occurring only in the more liberal environments. The first births of women were extramarital in 18% of cases.[14] On the other hand, ethnographic studies indicate that single mothers had a very poor status in early 20th century Slovakia. The single mother was socially isolated, had a special place in the church, wore special clothing, and later was often married to an older man (Salner 1995; Botíková – Švecová – Jakubíková 1997: 83; Herzánová 2002). A negative attitude towards the single mother could be associated with the effort to warn other young women in the community against ending up in this difficult situation.[15] However, some ethnographic studies claim that the attitude towards single mothers was dependent on the particular situation, and was not always negative. A clear presentation of the situation could be connected with the tendency of ethnographers to see older Slovak society as traditional and archaic (Botíková 2008: 22, 67, 82). Such a view could be supported by the fact that in the second

[14] Moreover, 21% of marital first births were conceived before marriage.

[15] For example, in 1931 – 1932, marital infant mortality was 160‰, while nonmarital infant mortality was 221‰.

half of the 20th century the proportion of nonmarital births was very low (around 5%), and markedly increased only after 1990 (see Potančoková et al. 2008). Nonmarital fertility in the interwar period proved to be unsuitable for reflecting a degree of liberality, which resulted in its not being related to fertility.

5. Multivariate analysis

This paper assesses the relationship between fertility, reflected by a response variable general fertility rate, and 41 explanatory variables. Seven explanatory variables were chosen for the multivariate analysis. I use only one variable of the variables assessing the same characteristic, as well as of the "inverse" variables (e.g. population in agriculture and population in industry with r = -0.89). Only variables that are individually most closely associated with GFR and are approximately normally distributed without distorting outliers are taken into calculation. The seven selected variables with their correlation coefficients and coefficients of determination with GFR are shown in Table 3.

The first issue solved in this section is: *What is the proportion of variation in fertility accounted for by each variable, if all other variables are controlled for?*[16] If a variable maintains a strong relation to fertility, even after other factors are taken into account, this would indicate its importance in explaining the differences in fertility, which might not be revealed by zero-order correlations. I am interested in a unique variation relative to the total variation in fertility. Therefore, I count *squared semipartial correlation coefficients*. The results are shown in Table 3.

Most variables in this section, i.e. variables with strong zero-order correlations with fertility, are in some way associated with a level of modernization. Therefore, it is not surprising that their unique contribution to the variation in fertility explained by the multivariable model is very small, and most of variation in fertility is shared by more explanatory variables. The only exception is the natural logarithm of illiteracy, which explains 12% of the variation in fertility, if other variables are controlled for. It also confirms the importance of this factor shown by zero-order correlations. Economic development and a change in attitudes towards the moral acceptability of birth control were both needed in order to change fertility. It appears that the level of education reflects the impact of economic conditions as well as the value system people had. Education is therefore the best overall proxy for the modernization of society, which explains its specific position in the correlation analysis with fertility (see Juster – Vinovskis 1987). The variation in fertility explained by ln of illiteracy itself (R^2 = 63.7%) even exceeds the variation in

[16] Variables used in this section.

fertility explained by the multivariate model with the six remaining variables (R^2 = 60.1%).

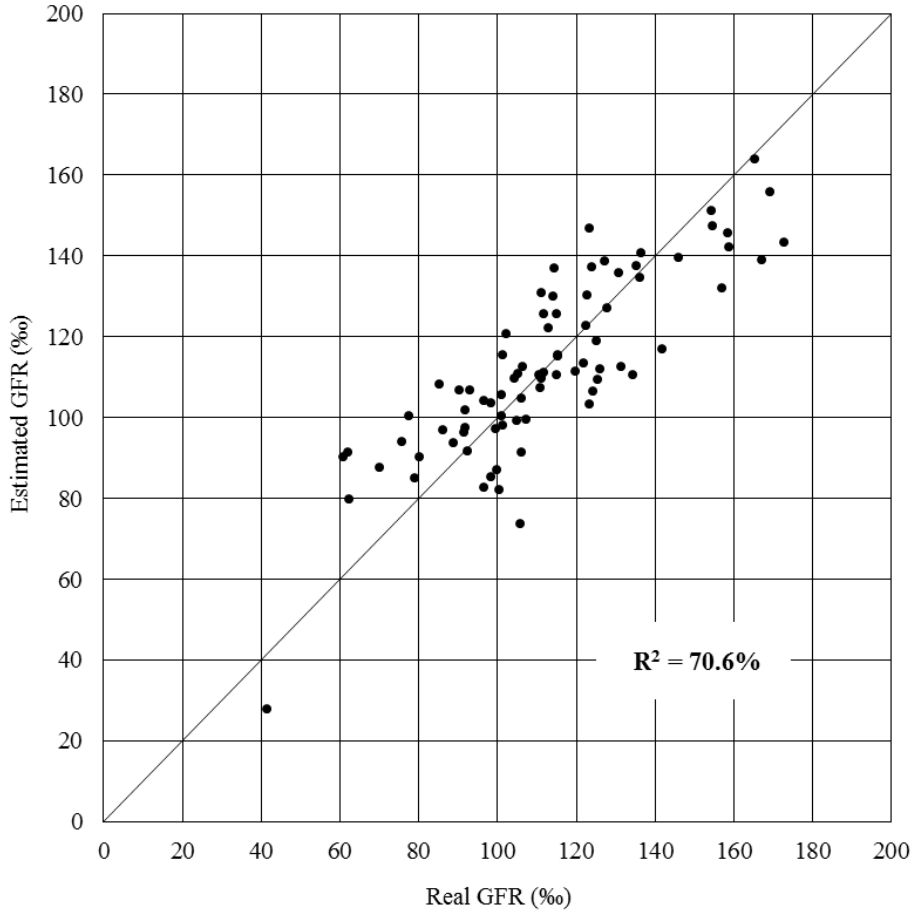
Table 3: **Multivariate analysis**

	Zero-order correlations		Squared semipartial correlation coefficients	Stepwise regression			Standardized multiple regression coefficients in model with three variables
	r	R^2		Step	Coefficient of multiple determination R^2	R^2 adjusted for the number of variables	
Ln of percentage of illiterates aged 10+	0.80	63.7%	11.8%	1	63.7%	63.2%	0.63 (p<0.001)
Infant mortality rate	0.49	24.4%	2.7%	2	68.9%	68.1%	0.20 (p=0.006)
Crude divorce rate	-0.62	38.4%	1.7%	3	70.6%	69.5%	-0.17 (p=0.035)
Number of people per one physician	0.62	38.6%	0.3%	4	71.0%	69.5%	
Percentage of population in agriculture and forestry	0.55	30.4%	0.6%	5	71.2%	69.3%	
Ln of annual income of municipalities per inhabitant	-0.63	40.1%	0.4%	6	71.5%	69.2%	
Number of maried men per 1000 married women	-0.57	32.7%	0.3%	7	71.8%	69.1%	

Source: Author's calculation based on: Státní úřad statistický 1934a, 1938; Státní úřad statistický 1937 (illiteracy); Státní úřad statistický 1932b (income); Státní úřad statistický 1934b (agriculture); Chura – Kizlink 1939 (physicians)

Among the other variables, the relatively highest proportion of variation in fertility not shared with other predictors is attributed to the infant mortality rate (2.7%) and the crude divorce rate (1.7%). Some physiological mechanisms, which are not connected with the level of modernization, appear to play a role in the relationship between fertility and infant mortality (see Section 4.1), so part of the variation in fertility is associated only with infant mortality and not with other variables. The crude divorce rate can be considered a measure of secularization. Although secularization usually progresses together with socio-economic development, occasional friction between these two components of the modernization process may be the reason why there is little impact of secularization on fertility even after controlling for other variables.

Figure 6: **Estimate of general fertility rate from the multiple regression model with ln of illiteracy, infant mortality, and crude divorce rate**



Ln of illiteracy–infant mortality–divorce model regression equation:
standardized *GFR* = 0.63 × stand. *ln of illiteracy* + 0.20 × stand. *infant mortality* – 0.17 × stand. *divorce*
GFR = (0.63 × ((*ln of illiteracy* – Mean *ln of illiteracy*) / SD *ln of illiteracy*)
+ 0.20 × ((*infant mortality* – Mean *infant mortality*) / SD *infant mortality*)
– 0.17 × ((*divorce* – Mean *divorce*) / SD *divorce*))
× SD *GFR* + mean *GFR*

Source: Author's calculation based on: Státní úřad statistický 1934a, 1937, 1938

The second part of this section searches for a suitable *multiple regression model* by *stepwise regression*. This procedure selects variables for the model one by one in the order that after each step, a model can explain as much of the variation in fertility as possible. Variables in Table 3 are ranked according to the sequence of a stepwise regression procedure. The variation explained by ln

of illiteracy itself is high enough – 63.7%. Adding the infant mortality rate increases the coefficient of multiple determination to 68.9%. After the addition of the crude divorce rate variable, the model accounts for 70.6% of the total variation in GFR. Adding other variables would increase the total amount of explained variation in fertility only slightly. *Standardized regression coefficients* from the multiple regression model with variables ln of illiteracy, infant mortality and crude divorce rate are shown in Table 3. The estimation of GFR values in the districts of Slovakia with the use of regression coefficients from the model with three variables is shown in Figure 6.

6. Conclusion

In 1930 fertility in Slovakia had a strong relation with several characteristics: illiteracy, emigration, the income of the municipality, the number of physicians, the divorce rate, infant mortality, and the proportion dependence on agriculture. These indicators were strongly correlated with each other, and together they can be described as measures of the modernization of society. It is difficult to determine which of these indicators were in a causal relation with fertility and which had a common relation with another factor. It is possible to discuss some mechanisms underlying relations between fertility and socioeconomic and cultural indicators, but verifying these explanations is difficult. Instead of finding indicators with the most direct links with fertility, it is possible to present the best proxies of general modernization. In this regard, illiteracy is a particularly important indicator. Although the relationship between education and fertility during the demographic transition has already been shown in many studies, the strength of this relationship is surprising ($r = 0.80$). Moreover, illiteracy is a sufficient indicator of education, despite the fact that illiteracy was already low. The relationship between fertility and education is, to a considerable extent, retained after controlling for other variables.

The relationship between fertility and these indicators is analysed by comparing their level in the districts. Thus, if the correlation coefficient was weak, it is not possible to clearly say that the relation between fertility and the indicator did not exist. For example, comparing the level of fertility in districts with the percentage of Jews showed no relation, despite the fact that Jews had very low fertility, which is clear from the sorting of births by religion. The proportion of Jews was insufficient to influence the fertility rate of a whole district.

Furthermore, based on data aggregated at the district level, one cannot clearly conclude if people with certain characteristics had a low/high fertility, or in a district with an above-average proportion of these people, all people had a low/high fertility. For example, in districts with a proportion of illiterates around 5%, GFR was around 80‰, and in districts with 30% illiteracy, GFR

was around 160‰. Such a difference in fertility could not be caused only by a different fertility between literates and illiterates – an educated society probably affected the fertility of low-educated individuals, and vice versa. Another problem is that ecological correlations may overstate the strength of the relationship. On the other hand, the overlap of individual characteristics by the aggregated data is not only a necessity arising from the lack of individual-level data. When analysing fertility behaviour, the application of ecological correlations can be in accordance with the possible interpretation of results – in some cases the attitudes of a community could be more important than the ideas, knowledge and experience of the individual. The reason was the existence of social norms, both in the form of direct pressure towards certain behaviour, and also in the form of a natural human tendency to conformity. The level of fertility could be more closely related to the educational level of community than to the education of individual persons. Although the decisions affecting the relation between fertility and indicators could be of a more individual nature in some other cases (e.g. the relation between fertility and infant mortality), in general the impact of social norms seems to be substantial.

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Appendix
Values of indicators in districts of Slovakia in 1930

		District minimum	Value in Slovakia	District maximum
Population	Number of inhabitants	9378	41109*	123844
Fertility	General fertility rate	42‰	**106‰**	173‰
	General marital fertility rate	75‰	**163‰**	267‰
Infant mortality	Infant mortality rate (1931-32)	105‰	**166‰**	209‰
Education	Percentage of illiterate population aged 10 and over	1.8%	**10.0%**	39.0%
	Logarithm of percentage of illiterate population aged 10 and over	0.57	**2.30**	3.66
Material conditions	Property of municipalities per inhabitant (1929)	33**	**556****	4 471**
	Annual income of municipalities per inhabitant (1929)	18**	**138****	519**
	Logarithm of annual income of municipalities per inhabitant (1929)	2.88	**4.92**	6.25
	Number of people per one physician (1935)	525	**2,171**	9,639
Occupation	Percentage of population engaged in agriculture and forestry	1.8%	**56.8%**	89.0%
	Percentage of population engaged in mining and metallurgy	0.0%	**1.2%**	17.1%
	Percentage of population engaged in industry	4.0%	**17.8%**	34.0%
	Percentage of population engaged in trade and finance	1.5%	**5.4%**	19.3%
	Percentage of population engaged in transport	0.3%	**4.7%**	14.0%
	Percentage of population engaged in public service	1.6%	**4.7%**	16.3%
	Percentage of population engaged in the military	0.0%	**1.6%**	10.6%
Urbanization	Percentage of population living in municipalities with 5,000 and more inhabitants	0.0%	**22.5%**	100.0%
	Percentage of population living in municipalities with 10,000 and more inhabitants	0.0%	**14.6%**	100.0%
	Number of inhabitants of the biggest municipality of the district	668	**11,499***	123,844
	Number of inhabitants of the administrative centre of the district	668	**11,204***	123,844
	Average number of inhabitants per municipality	289	**957**	123,844
Migration	Net migration from 1921 to 1930 per 1000 inhabitants in 1921	-199	**-41**	273
	Number of married men per 1000 married women	704	**939**	1,031
Nuptiality	Crude marriage rate (1931)	5.7‰	**8.2‰**	11.1‰
	Percentage of married women aged 15-49	46.0%	**59.4%**	72.3%
	Percentage of married women aged 15-24	13.0%	**28.2%**	50.0%
	Mean age of women at marriage (1931)	21.4	**23.7**	27.3
	Mean age of men at marriage (1931)	24.7	**27.4**	31.1
Ethnicity	Percentage of Slovaks and Czechs	4.9%	**71.3%**	99.6%
	Percentage of Hungarians	0.0%	**17.8%**	87.8%
	Percentage of Germans	0.0%	**4.6%**	37.7%
	Percentage of Rusyns and Ukrainians	0.0%	**2.9%**	80.5%
	Percentage of Jews (ethnicity)	0.1%	**2.2%**	10.1%
	Percentage of Gypsies	0.0%	**0.9%**	7.3%
	Percentage of dominant ethnicity	36.2%	**71.3%**	99.6%

		District minimum	Value in Slovakia	District maximum
Religion	Percentage of Roman Catholics	8.1%	**71.6%**	99.3%
	Percentage of Protestants	0.2%	**16.7%**	83.8%
	Percentage of Greek Catholics	0.0%	**6.4%**	78.7%
	Percentage of Jews (religion)	0.4%	**4.1%**	16.0%
	Percentage of dominant religion	36.4%	**71.6%**	99.3%
Liberality	Percentage of population without religion	0.04%	**0.5%**	3.4%
	Crude divorce rate (1931-33)	0.02‰	**0.21‰**	0.97‰
	Percentage of nonmarital births (1931-32)	3.0%	**8.8%**	20.5%

Notes: * arithmetic mean of districts values ** Czechoslovak korunas

Source: Author's calculation based on: Státní úřad statistický 1934a, 1938; Státní úřad statistický 1937 (illiteracy); Státní úřad statistický 1932b (wealth); Chura – Kizlink 1939 (physicians); Státní úřad statistický 1934b (occupation); Ministerstvo vnútra and Štátny úrad štatistický 1936 (urbanization); Státní úřad statistický 1936b (married women 15-24)