The Diversity Puzzle – Fertility in the Interwar Poland and its Determinants.

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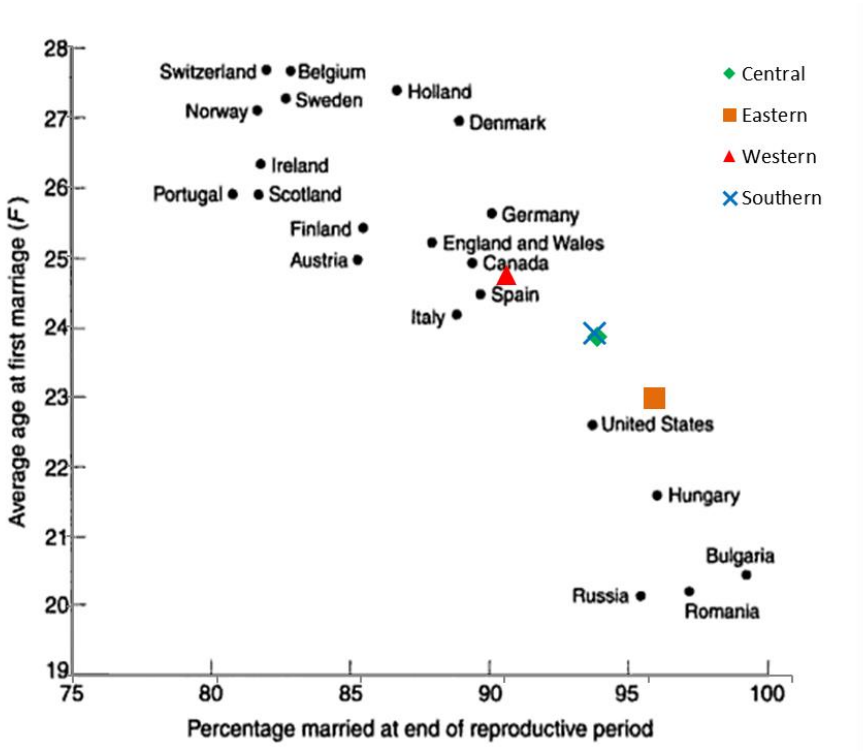
Introduction

This paper aims to investigate the regional diversity of fertility in the interwar Poland and its basic determinants. The debate, whether the fertility diversity was a typical west-east division and which socio-economic and cultural determinants were crucial for shaping this situation lasts since the 1930s (Adamowiczowa 1937; Szulc 1939; Borowski 1974; Iglicka 1994). Contemporary authors as well as later studies attributed differences in fertility to the unequal economic development in rather speculative manner. This explanation coincided with the contrast between industrialized and modern "Poland A" west to the Vistula river and backward "Poland B" in the east. Conversely to the cases of Czechoslovakia, Hungary or Bulgaria (Fialova et al. 1990; Botev 1995; Béla 2002; Roupa 2012) the fertility of Polish population has not been carefully investigated yet. Most notably, the population of Second Polish Republic shows remarkable diversity in potential fertility determinants (see Table 1). Thus, the research on the interwar demography of Poland could add important arguments to the more general discussion on causes and course of fertility decline in Europe. At the same time some regions of interwar Poland (mainly Wołyń and Polesie – today parts of Belarus and Ukraine) in the 1930s were still in the eve of modernisation. With much backward economy and social structure they resembled to some extent the early modern population. Hence, thanks to the high quality data provided by Polish Statistical Office we gain insight into the fertility patterns of a traditional society. Moreover the population of study is a population in transition, so despite of capturing only one moment in time (1931), we investigate the different stages of the fertility transition.

Research problem

Rich literature on the theories of fertility decline summarized i.a. by Alter (1992), Mason (1997), van de Kaa (1996) and Szołtysek (2007) suggest different sets of potential fertility determinants triggering the transition as well as shaping its course and pace. In this study we use the set of variables described below. Some of them fits better the structural – adjustment explanation, while the others can be associated with cultural changes and innovation/diffusion explanations. Alongside the classical approach to demographic determinants, represented here by use of the infant mortality rate, we propose to pay more attention to the determinants connected to the family model. This is of course motivated by the longstanding tradition of placing on the territory under the study the borderline separating western and eastern family system (Szołtysek and Zuber-Goldstein 2009; Fauve-Chamoux and Ochiai 2009). However the idea of a strict linear division seems unreasonable, it is tempting to see the territory of the interwar Poland as the "bridge" between Western European and Eastern European demographic systems. This "centrical" position can be seen when analyzing the marriage patterns in European countries in the first half of the 20th century (Figure 1).

Figure 1 Relation between average age at marriage and proportion of women married at the end of the reproductive period for several countries (generations born toward the end of the nineteenth century) and groups of provinces of interwar Poland (1931)



Source: own calculations and P. Festy, *La fécondité des pays occidentaux de 1870 a 1970*, Paris 1979, p. 29.

While the western voivodships (provinces) of Second Polish Republic corresponds to England, German and Spain in terms of age at first marriage and definitive celibacy, the eastern ones lies closer to Hungary or Bulgaria and the central/southern part of the country falls in between of those two.

There are three research problems we would like to investigate. The first one is connected to the question of spatial distribution of fertility on the district level. We would like to know whether indeed any linear division can be spotted and if west-east or north-south division applies to fertility of interwar Poland. Moreover, it is interesting to see whether the coordinates gains or loose the predictive strength when controlling for the determinants, as this could indicate the spatial distribution of some unobserved factors, not included in the model.

The second research problem is related to the relative importance of the demographic factors connected to the family size and household structure as the predictors of fertility. We would like to see whether fertility is more strongly associated with family model than with classical, innovation or adjustment factors.

The third, more general question is about the strength and direction of effects of factors connected to economic and cultural modernization as well as to the standard of living. We are interested to know which of the variables described below explains the differences in fertility best.

Sources and Methods

In order to examine proposed research problems we turn to descriptive and regression analysis. The first part is based on basic statistics accompanied by maps of the spatial distribution of the main variables of interest (GFR, number of persons per dwelling and percentage of multifamilial/multihousehold dwelling units). The remainder of the maps is included in the appendix. The GIS database and resulting maps were produced in MapWindow software. The OLS regression analysis consist of three models containing different sets of variables listed below. This part of study was performed in STATA software. Several statistical problems occur in a study and for now remain unresolved, as this paper is a research reconnaissance. Among them the most important are the potential spatial autocorrelation of the variables as well as

endogeneity between the independent variable and person per dwelling unit and infant mortality variables.

All the data used for the study comes from the official publications of the Main Statistical Office of II Polish Republic (Główny Urząd Statystyczny [GUS]). The population numbers and the characteristics of the individual districts are drawn from the results of the second population census held December 9th, 1931[1]. Unfortunately, conversely to the data on the voivodship level, data on the population of districts lacks sufficient gradient. The most bothersome deficiency here is inability to determine population age distribution by marital status. The data on number of demographic events in the districts was taken from publication: *Małżeństwa, urodzenia i zgony*, Statystyka Polski, Seria A, t. 27; Seria C, t. 45 i 102, GUS, Warszawa 1935-1939. The data on meat consumption in 1931 was derived from: *Okręgi hodowlane, produkcja i spożycie mięsa w Polsce*, Statystyka Polski, Seria B, t. 11, GUS, Warszawa 1933. Information of districts expenditure in 1932 comes from: *Wydatki i dochody gmin wiejskich*, Statystyka Polski, Seria C, t. 14, GUS, Warszawa 1934. Finally, the results of 1928 elections reported in: *Statystyka wyborów do sejmu i senatu odbytych w dniu 4 i 11 marca 1928*, GUS, Warszawa 1930, were used.

The dependent variable used in each model is General Fertility Rate in 1931, understood as the number of livebirths per 1000 women in reproductive age (15-49). We are aware that failing to capture the differences between total and marital fertility reduces the relevance of the study, but the data limitations discussed above makes such a distinction impossible on the district level.

Geographical coordinates, latitude and longitude of the districts centorids, capture not only the linear west-east and north-south distribution of the dependent variable, but also, the potential geographical distribution of the unobserved determinants of fertility.

Crude marriage rate serves as the only indicator of nuptiality levels. Clearly, we expect strong, positive association between GFR and CMR, as marriage patterns are considered one of the main proximate determinants of fertility (Bongaarts 1978). At the same time a crude rate ignores the well-known factors coining the actual marriage pattern i.e. age at marriage and percentage of celibacy, and is sensitive to the shifts in age structure. We expect the problem to

[1] *Drugi Powszechny Spis Ludności z dn. 9.XII.1931 r.: mieszkania i gospodarstwa domowe, ludność, stosunki zawodowe* [Dokument elektroniczny: http://statlibr.stat.gov.pl]: voivodeships, GUS, Warszawa 1936-1938.

be even more severe due to the mentioned dichotomy of the analyzed population and the high importance of marriage behavior in the demographic transition (Sklar 1974; Ogórek 2012).

Infant mortality rate is a crucial independent variable related to the classical DTT explanations of the differences in fertility levels. In our case, it is hard to predict the strength and the significance of the association with GFR, as the registration of the infant deaths in some regions of the Second Polish Republic was highly deficient leading to underestimation of IMR (Szulc 1936; Vielrose 1984).

Persons per dwelling unit variable is used as a proxy for the mean household size in the district. It does not take into account the institutional households. We expect the strong, positive association between the mean household size and fertility, however we are well aware of the endogeneity issue in this case.

Percentage of multifamilial and multihousehold dwellings represents a share of those residences where either one household composed of more than one family or more than one households lived. It is worth noting that household in the census was defined as "a) each family or several families living and providing for themselves together; b) each person living alone"[2]. This variable considered as the indicator of the family model should significantly rise the GFR with each unit of increase, as the complex households tend to be more reluctant to fertility decline and less sensitive to the adverse economic conditions than the nuclear ones.

Percentage of multifamilial farm units shows the fraction of the farm units which were run by two families or more among the farms under 15 hectares that did not hire any additional workers. This variable could indicate regions where due to the property fragmentation some relatives had to share the land. Those families could, but did not have to live in the same household. It is hard to distinguish two potential features of the variable. It can indicate both the importance of complex family model in a district or simply poor economic conditions.

The two variables – percentage of population with Polish mother tongue and percentage of Roman-Catholic – show the cultural heterogeneity of the district population. However, these variables take into account only the spread of the most dominant language and religion in the country, it fails to capture the specific otherness of the district. The only other variable connected to religion that was used in the modelling was the percentage of Jewish population (in religious not ethnic sense), but was then excluded as irrelevant to the model.

Percentage of illiterate among the population older than 6 years can be perceived as the measure of the schooling system universality, as well as social modernization. We expect this variable

[2] Drugi Powszechny Spis Ludności z dnia 9 grudnia 1931 r, mieszkania i gospodarstwa domowe, ludność, stosunki zawodowe: województwo kieleckie, Warszawa 1938, p. X.

to be negatively correlated with GFR as compulsory education rises the cost of children as well as better education opens new opportunities and eases the spread of family regulation ideas.

Another cultural variable is the percentage of extramarital births – alongside the percentage of votes for the left wing parties it is treated as the symptom of social liberalization. The auxiliary variable mentioned above – percentage of Jewish population was used to check whether there is a correlation between share of extramarital births and fraction of Jews, as some authors suggest that followers of that religion did not registered their marriages properly. The practice could artificially boost the percentage of "illegitimate" births, but this analysis discredited this concern. The share of votes for left wing parties was calculated based on the 1928 election results. Left wing here means PPS (Polish Socialistic Party), PSL "Wyzwolenie" (Polish Peasant Party "Liberation") or local socialist, communist and radical peasant local lists.

Finally, we use a set of structural variables connected to the economic development and the standard of living. Percentage of population employed in agriculture and mining and industry reflects the levels of economic modernization. While agriculture is associated with traditional societies of high fertility, industrialization should reduce the GFR.

One of the most important aspects of modernization is the rise of female labour force participation. We include a specific variable in the models that captures the percentage of the women active on the non-agricultural labour market among all women in this sector. As economic activity of a woman increase the opportunity cost of childbearing and childrearing, we expect significant, negative relationship here.

Another aspect of development is expressed by the percentage of district population living in the cities. It is important to note that we do not use purely urban districts in our analysis, as they differ in both administrative and demographic terms from the majority of units, so this variable never reaches 100%. Even though, we expect the level of urbanization to be significantly, negatively correlated with GFR as for many reasons cities are usually considered to be the epicenters of fertility decline.

Percentage of farm units smaller than 15 ha serves as a measure of districts' land owners prosperity. Alongside meat consumption and expenditure of the district administration, both expressed per capita, this variables roughly indicate the welfare of the population. We approach these factors without prior assumptions, as on the micro level well-being is positively correlated with fertility, while on the macro level the relation is opposite.

Results

The title diversity of the Second Polish Republic can be easily tracked by inspection of the table of descriptive statistics (Table 1). The GFR ranges from very low 39 to high 167 births per 1000 woman in fertile ages. The wide range of values is present in almost every aspect of live captured by the selected variables.

Table 1 Descriptive statistics

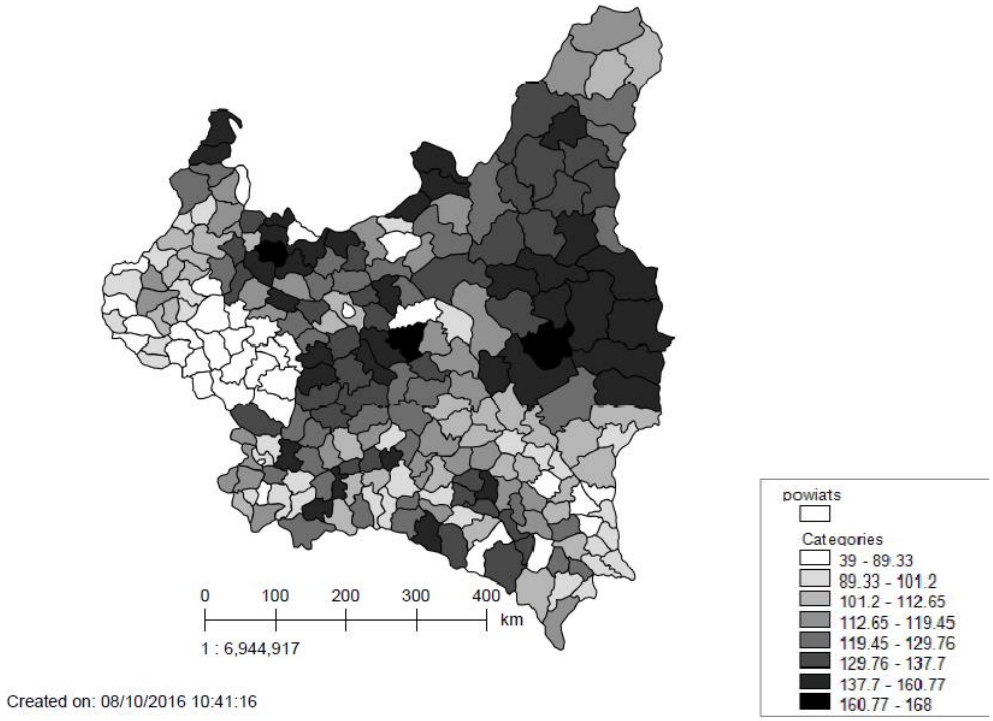
Variable	n	Mean	Std. dev.	Min	Max
GFR	239	113.62	25.04	39.51	167.16
Longitude (km)[1]	239	689.30	202.33	299.89	1049.59
Latitude (km)[1]	239	406.40	176.94	43.73	889.72
Crude marriage rate	239	8.07	1.39	4.01	11.44
Infant mortality rate	239	146.60	30.77	83.49	245.85
Persons per dwelling unit	239	5.06	0.32	4.13	6.12
% of multifamilial/multihousehold dwellings	239	18.46	5.07	8.31	35.28
% of multifamilial farm units	235	17.93	7.93	1.43	62.25
Population density	239	89.09	92.90	19.10	1394.30
% of Polish speaking population	239	69.95	28.35	6.67	99.21
% od Roman Catholic population	239	66.06	30.43	5.30	98.62
% of illiterate	239	17.15	10.15	0.84	45.83
% of extramarital births	239	5.94	2.31	1.98	12.38
% of votes for left wing parties	239	19.75	18.55	0.00	70.25
% of population in agriculture	239	70.19	15.00	0.85	92.80
% of population in mining and industry	239	14.36	9.62	3.08	65.24
% of urban population	239	17.42	8.91	0.00	51.61
% of farm units below 15 ha	239	85.04	9.65	53.03	96.41
% of women active on the non-agricultural labour market	239	23.26	4.03	13.05	39.44
Per capita meat consumption (kg)	239	17.47	9.12	4.30	55.10
Per capita expenditure of the district (złoty)	239	3.72	2.15	1.04	22.31

[1] ETRS89-Poland-CS92 (kilometers).

The spatial distribution of GFR revealed by the graphical presentation (Figure 2) does not show the clear west-east division as proposed by the contemporary authors. However, the concentration of low fertility districts can be easily spotted in the western part of the country (łódzkie and wielkopolskie voivodships), the lowest category districts are present in six more provinces (pomorskie, śląskie, warszawskie, lubelskie, tarnopolskie, stanisławowskie). This is even more important as some historians associated the levels of fertility in II Polish Republic

with the heritage of partitions, here we can see that in each former partition there were low fertility spots.

Figure 2 General Fertility Rate by district, Poland 1931



Even the least developed regions in the east, characterized by the highest levels of fertility (wołyńskie and poleskie voivodships) include some districts with reasonably low fertility, which proofs the diversity of the distribution far from being determined by any linear division. Similar is the case of the number of persons per dwelling unit, a proxy for family size, which distribution seems in a general accordance with the one of GFR (Figure 3).

At the same time the distribution of the percentage of multifamilial and multihousehold dwelling units, which serves as a proxy for family model, seems much more regular (Figure 4). In this case the simple west-east divisions could be appropriate, as complex households constituted over one-fourth of total number in almost every district of wołyńskie and poleskie voivodships and several district in lwowskie, tarnopolskie , nowogrodzkie and białostockie.

Figure 3 Persons per dwelling unit by district, Poland 1931

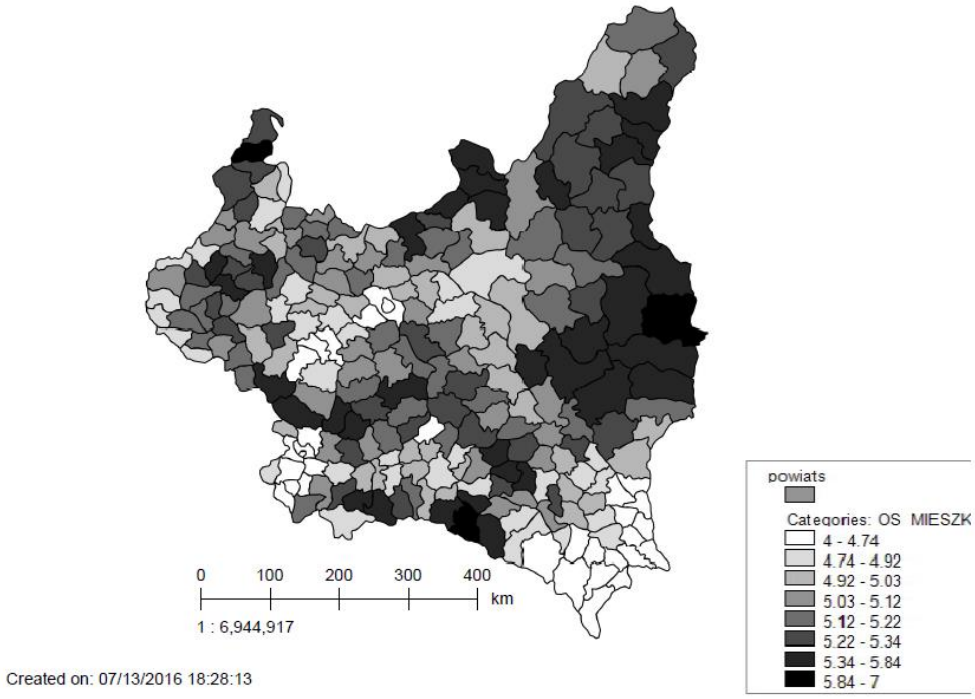


Figure 4 Percentage of dwellings inhabited by multifamilial households or multiple households by districts, Poland 1931

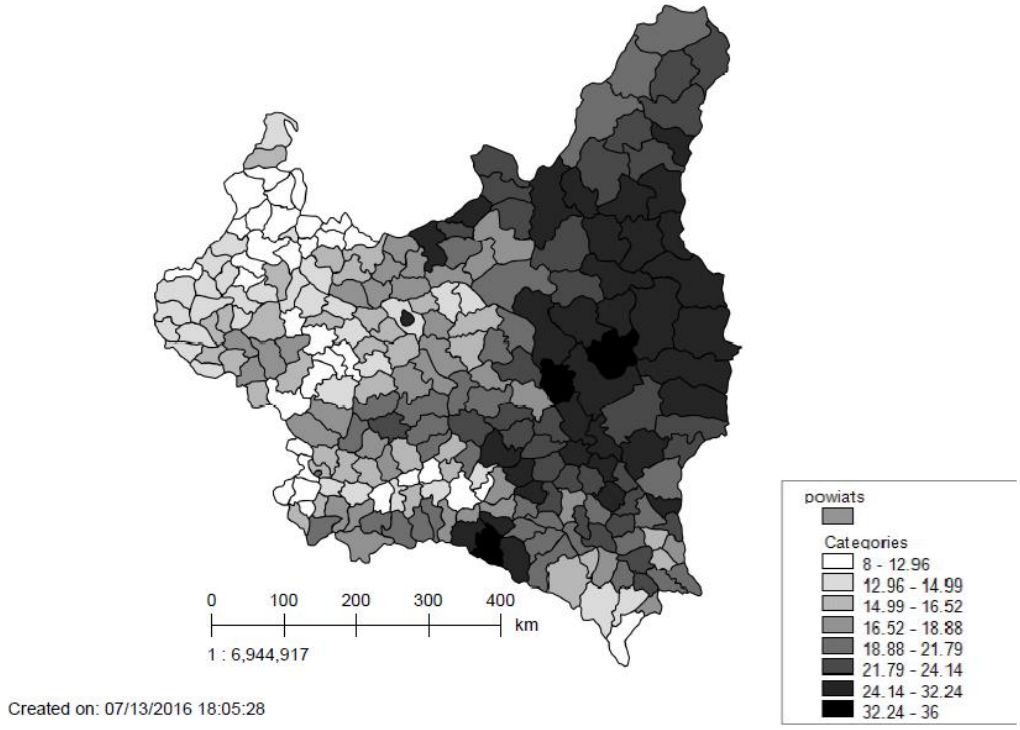


Table 2 Regression results

Variable	Model 1 geographic model		Model 2 demographic model		Model 3 full model	
	Coefficient	**Std. error**	**Coefficient**	**Std. error**	**Coefficient**	**Std. error**
Longitude (km)[1]	0.042 ***	0.008	-		0.026	0.017
Latitude (km)[1]	0.032 ***	0.009	-		0.026 *	0.012
Crude marriage rate	-		5.331 ***	0.938	5.653 ***	1.002
Infant mortality rate	-		0.115 **	0.044	0.136 **	0.050
Persons per dwelling unit	-		52.22 ***	4.908	46.996 ***	7.246
% of multifamilial/multihousehold dwellings	-		2.468 ***	0.386	1.646 *	0.768
% of multifamilial farm units	-		-2.101 ***	0.245	-0.16 ***	0.314
Population density	-		-		-0.044 *	0.019
% of Polish speaking population	-		-		0.067	0.148
% of Roman Catholic population	-		-		0.132	0.162
% of illiterate	-		-		0.397	0.306
% of extramarital births	-		-		1.446 °	0.774
% of votes for left wing parties	-		-		-0.225 *	0.088
% of population in agriculture	-		-		-0.160	0.314
% of population in mining and industry	-		-		-0.039	0.435
% of urban population	-		-		-0.182	0.230
% of farm units below 15 ha	-		-		0.314	0.191
% of women active on the non-agricultural labour market	-		-		-0.858 *	0.361
Per capita meat consumption (kg)	-		-		0.06	0.212
Per capita expenditure of the district	-		-		0.758	0.955
Constant	71.725 ***	7.133	-2.101 ***	27.947	-232.9844 ***	53.747
Adjusted r square	0.13		0.46		0.51	
F (df,n)	18.16 ***		41.13 ***		12.95 ***	
Number of observations	239		235		235	

[1] ETRS89-Poland-CS92 (kilometers). Significance levels: *** 0.001; ** 0.01; * 0.05; ° 0.1

Relaying on the models results presented in Table 2 we find that the geographical distribution of GFR in interwar Poland could be seen as west-east as well as north-south division. The further to the east and to the north, the higher GFR. Quite obviously, when controlled for other variables, the association of coordinates with fertility diminishes substantially. In addition the effect of the west-east division is no longer significant. Hence, it seems that the remaining fertility determinants that we fail to capture in the model have rather latitudinal distribution.

The relation between fertility and the demographic variables seems to be very strong. Among them, the most notable factors are the number of persons per dwelling, crude marriage rate and percentage of multifamilial farm units. The proxy for family size shows remarkable correlation with GFR – with each additional person in the district average fertility rose by approximately 50 births per 1000 fertile women. Interestingly, the percentage of complex households/dwellings also boosted the fertility levels moderately. The only demographic factor negatively related to GFR is share of the farm units under 15 hectares ran by two or more families. What is important, the effects of demographic determinants do not disappear when controlled for innovation, adjustment and standard of living variables.

Among the non-demographic variables, the strongest and most significant ones were percentage of votes per left-wing parties and share of women active on the non-agricultural labor market, both significantly reducing the fertility levels. In general, there is no support for neither – adaptation nor innovation hypothesis. None of the living standards indicators are associated with distinctive fertility. Despite that fact, the explanatory power of the full model is quite substantial as it explains more than 50% of variation in interwar Poland's GFR.

Discussion

Several further questions arises from the preliminary results of this introductory study as it has some serious limitations. Firstly, the inability to distinct between the marital and total fertility, prevents us to specifically attribute some of the variables to different scenarios of fertility limitation. Previous study have shown that in the south-western part of Poland Malthusian practices were still present in the 1930s, as the reduction of total fertility levels relied strongly on postponement of marriage and rise in celibacy rates (Ogórek 2012). At the same time marital fertility stayed relatively high. On the contrary, in the areas where marriage was early and universal, the transition happened from the start within the families. This distinction could be

crucial for refining the results of this study. Further archival queries have to be pursued in Main Statistical Office in search for district level data on age – marital status structure of the population. This would also allow us to use better nuptiality variables capturing not only current levels but more robust patterns and trends. Another issue is the endogeneity between GFR and some independent variables, most notably family size. Together with need for correction of potential spatial autocorrelation it calls for a more sophisticated statistical methods.

However, the results presented above could be also a proof for the persistence of family and household models found by Szołtysek (2008), the lack of significance among the cultural variables as language or religion is unclear. On the one hand it is possible that specific minority rites/religions had different effect on fertility and including each of those in the model would reveal some relations. On the other, it is clear from research that at least notable part of population in the eastern regions of country was not able to determine its ethnic and language affiliation indicating "local language" during the census interrogation (Cichoracki 2014).

Finally, it is interesting what other potential determinants could explain the remaining half of the variation in GFR. Some researchers if the epoch suggested a link between the household models and the material culture (Dworakowski 1938; Mosyzński 1934; Ormicki 1930). It is possible that the cultural differences indeed shaped the demographic reality of the country, but they did not revealed themselves in religion or language, but in more ethnographical indicators.

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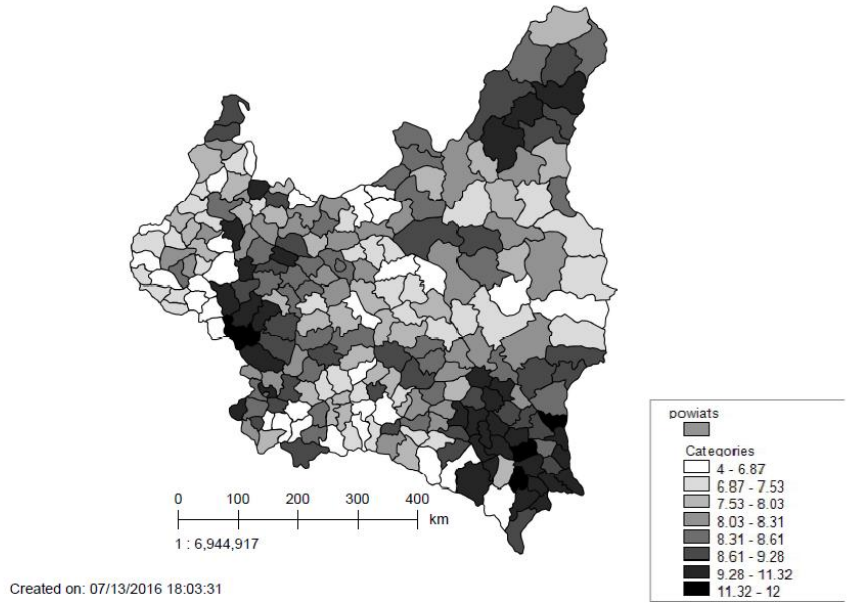
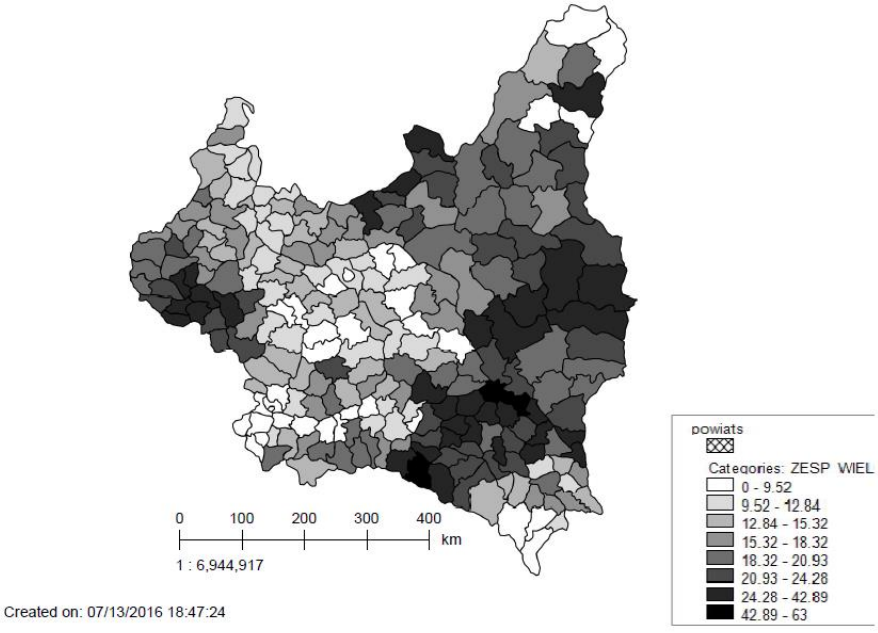
Appendix – maps

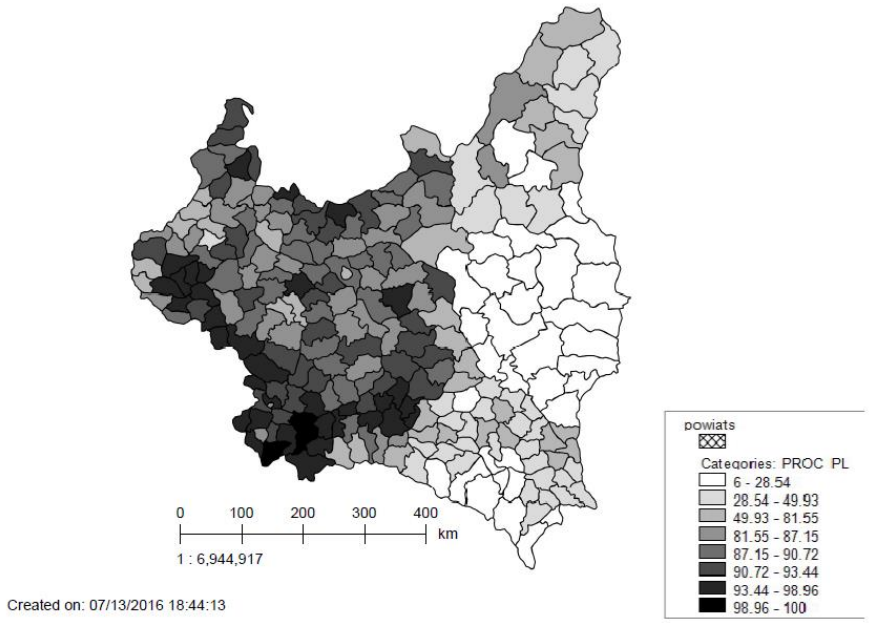
Crude Marriage Rate, districts, Poland 1931



Percentage of multifamilial farm units, districts, Poland 1931



Percentage of Polish speaking population, districts, Poland 1931



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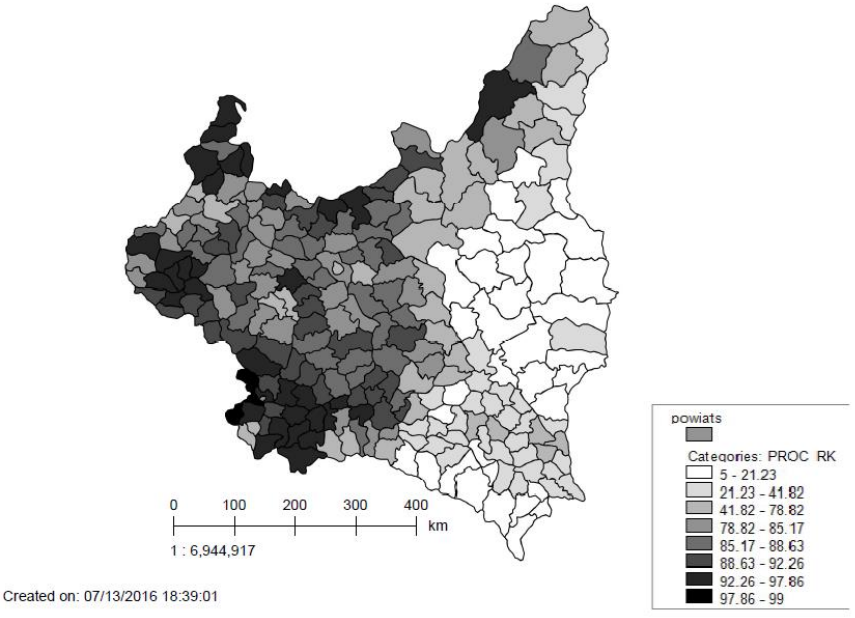
Percentage of Roman Catholic population, districts, Poland 1931



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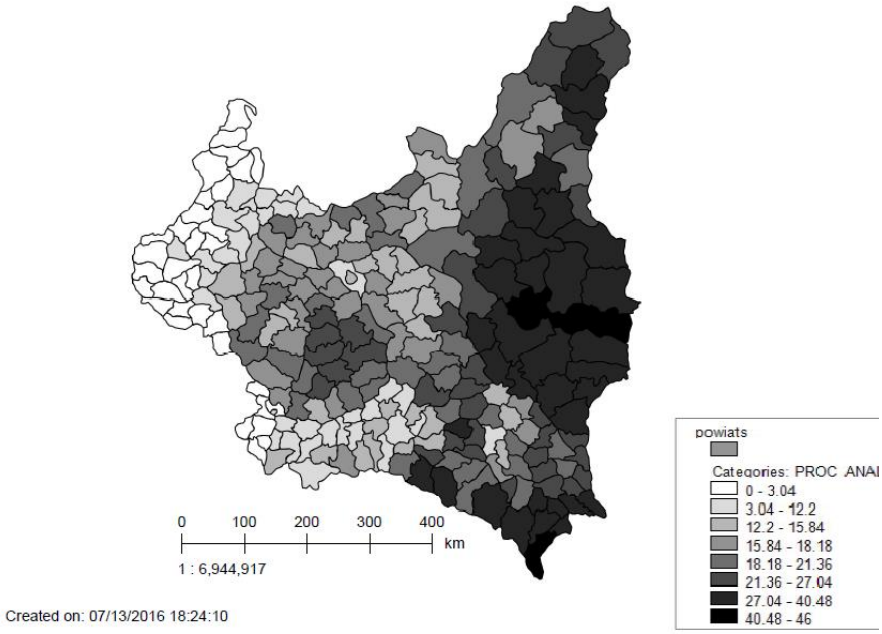
Percentage illiterate, districts, Poland 1931



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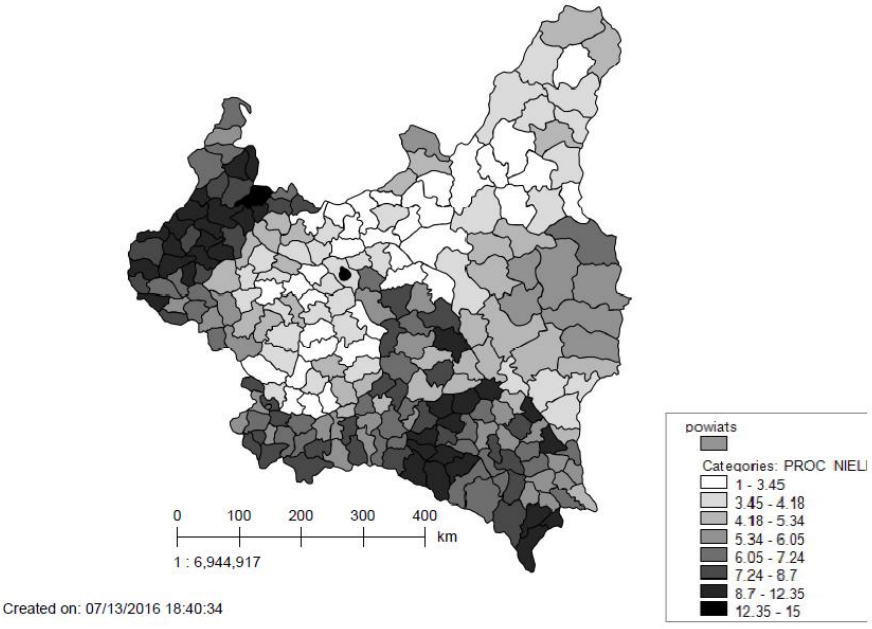
Precentage of extramarital births, districts, Poland 1931



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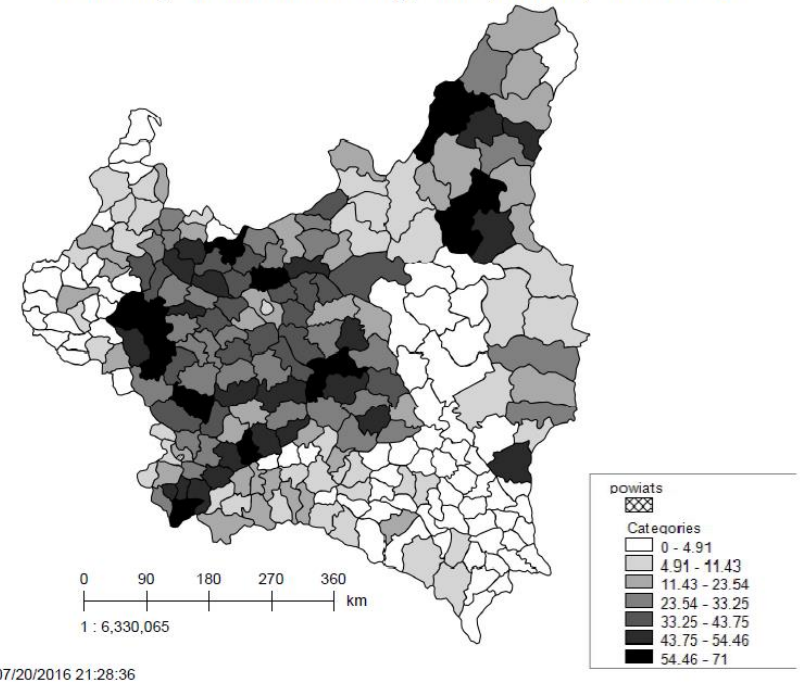
Percentage of votes for left wing parties, districts, Poland 1928



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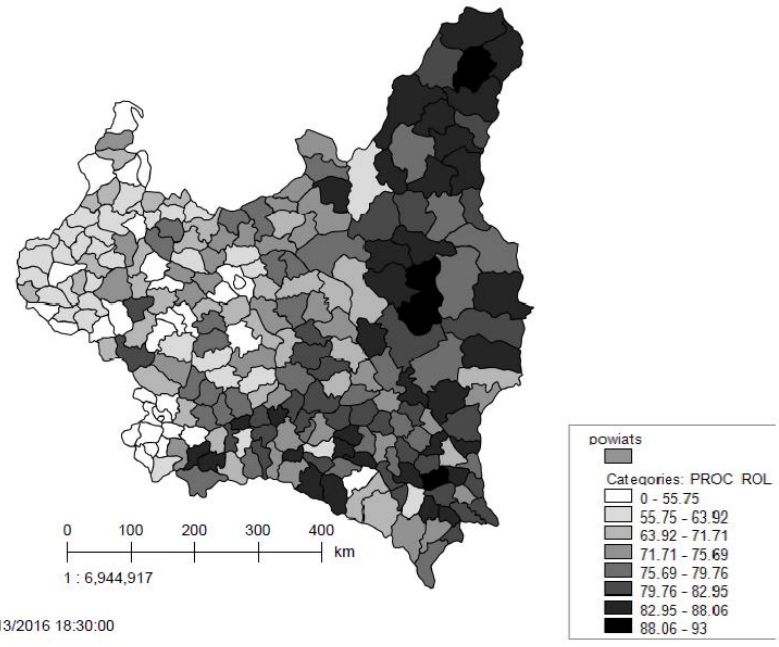
Percantage of population in agriculture, districts, Poland 1931



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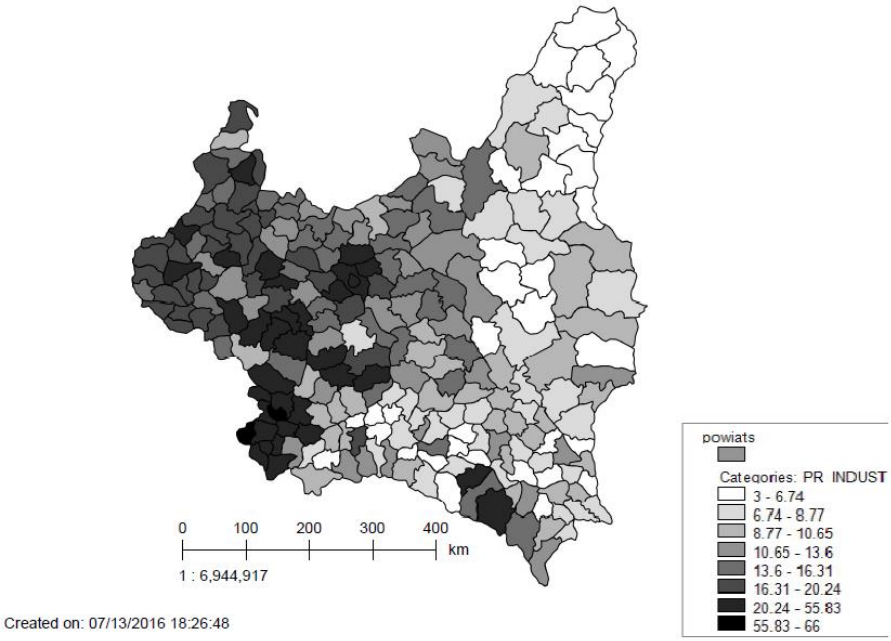
Percentage in mining and industry, districts, Poland 1931



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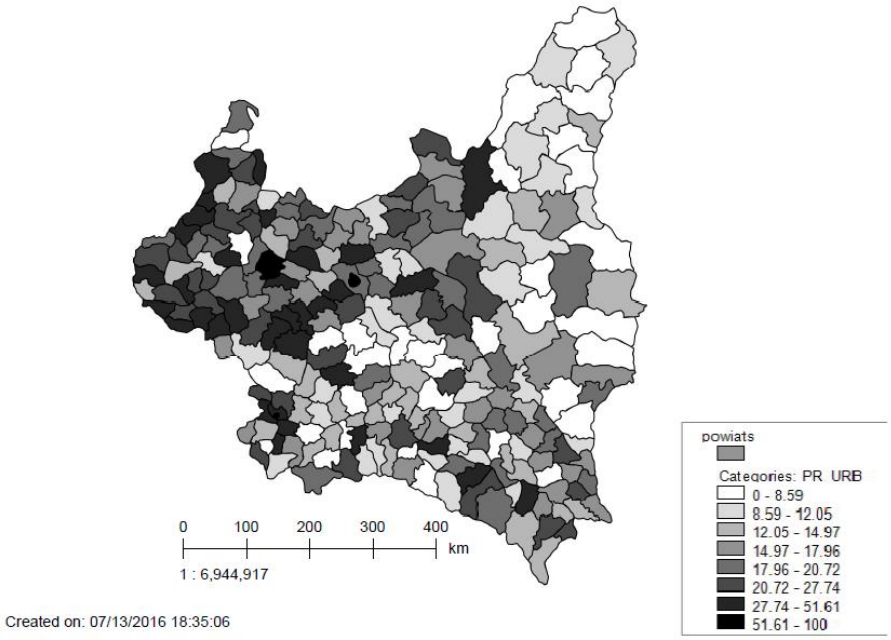
Percentage of urban population, districts, Poland 1931



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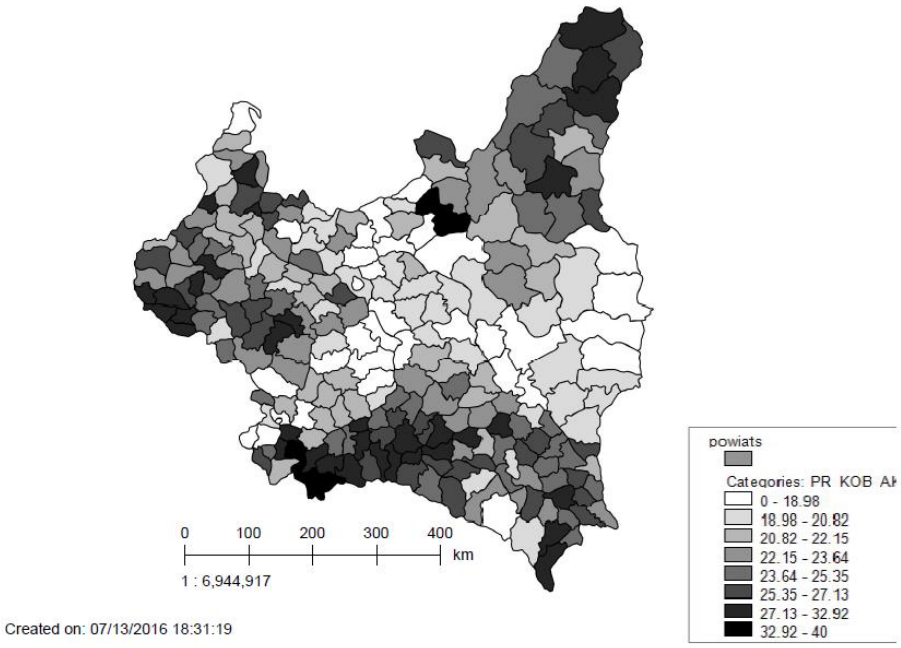
Percentage of women active on the non-agricultural labour market, districts, Poland 1931



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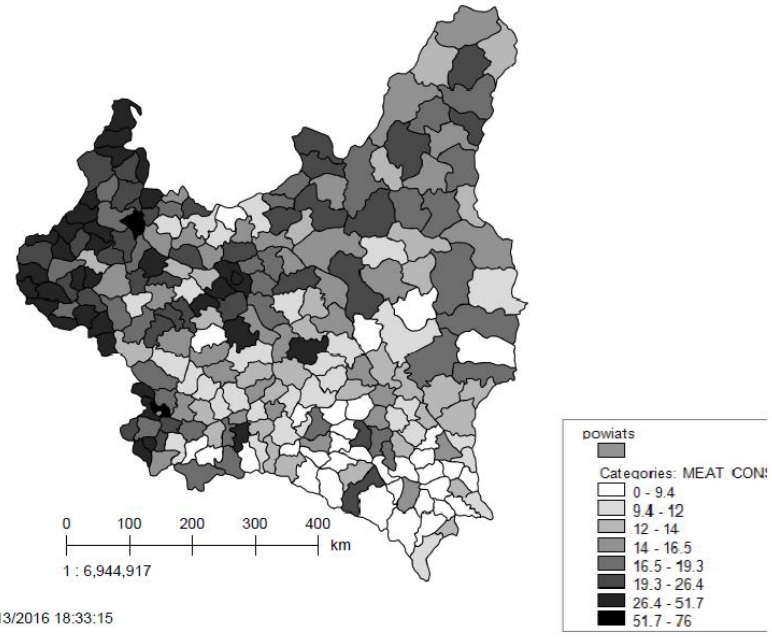
Per capita meat consumption, districts, Poland 1931



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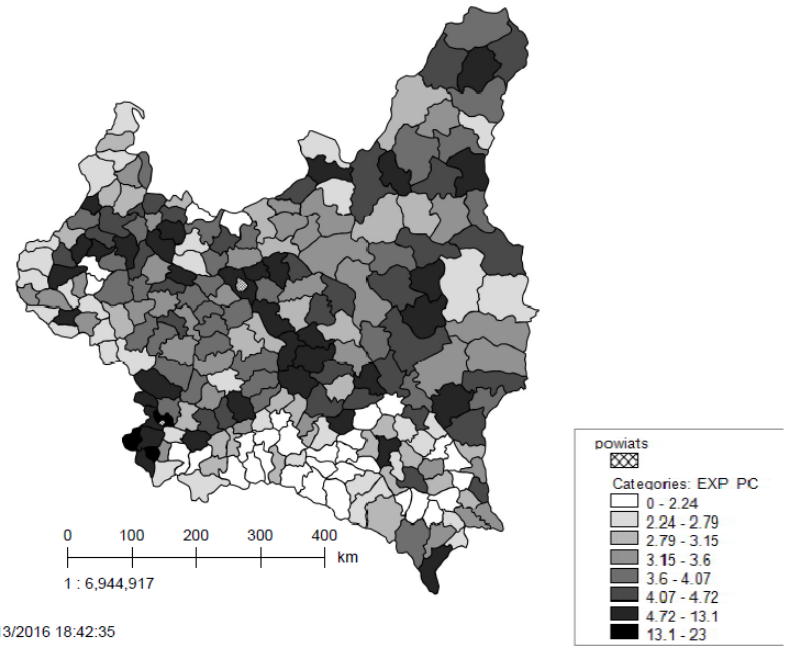
District expenditure per capita, districts, Poland 1931



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