Regional Poverty in Croatia

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Abstract

This paper investigates the regional variation in poverty measures in Croatia on the basis of the Household Budget Surveys 2002-2004. An absolute poverty line is estimated at the national level following the method introduced by Ravallion (1994). After defining five geographical regions, we estimate the class of Foster-Greere-Thorbecke (1984) poverty measures for each region, separately by urban and rural areas. Regional variation in poverty rates turns out to be substantial. The risk of poverty in rural areas is almost three times higher than in urban areas. Micro-simulations based on multivariate regression analysis show that regional disparities in poverty rates persist even after controlling for differences in education, labor market and other demographic factors.

Keywords: regional poverty, Croatia

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1 Introduction[1]

This paper presents the basic facts on poverty in Croatia based on the Household Budget Survey (HBS) data sets available annually for the triennium 2002-2004. Four central themes have been identified for this paper. First, the paper aims to illustrate the choice of the method used to estimate the incidence, depth and severity of poverty in Croatia. The difficulty associated with this choice arises from the fact that many contending methods are available (see Ravallion, 1994) and each is defensible, at least to some extent, on the basis of "technical" merit. Section 2 outlines our method of choice, providing the reader with the necessary tools to evaluate the findings discussed in subsequent sections.

Second, the paper outlines the essential facts on poverty in Croatia in 2004. The key question the paper aims to answer is: Who and where are the poor? Section 3 presents the main findings in the form of an eclectic mix of descriptive materials, including, but not limited to, standard contingency tables and graphs.

Third, the paper investigates the determinants of poverty in Croatia. Multivariate regression analysis and microsimulations are used to test for causality effects. The comparison between simulated and actual poverty rates provides useful information for assessing the relative importance of the individual determinants of poverty. We find that the region of residence, labor market status, and the educational attainment of the head of household are the salient independent determinants of poverty in Croatia.

Finally, the paper looks at regional variation in poverty rates. Regional poverty estimates presented in Section 4 are based on the pooled data sets from three Household Budget Surveys (HBS) undertaken between 2002 and 2004. Pooling was used in order to increase the sample size and enable us to derive representative statistics at a sub-national level. The gain in precision, fully attributable to sample pooling, enabled us to map poverty at an unprecedentedly fine geographical resolution for Croatia.

Conclusions drawn from the poverty analysis are summarized in Section 5.

[1] *The findings presented in this paper were reached as part of the authors' work within the World Bank project on Living Standard Assessment in Croatia. We would like to thank Nicola Amendola, Juan Muñoz and Salman Zaidi for their helpful comments. All remaining errors and omissions are the sole responsibility of the authors.*

2 On the Measurement of Poverty

In this section, we outline the main features of the method used to estimate the poverty line and poverty incidence in Croatia. In order to make our exposition self-contained, we first describe the HBS data, arguably the best source available for analyzing poverty in Croatia. Subsequently, we discuss the choices made in building the consumption aggregate, our preferred welfare measure for poverty estimation. Finally, we deal with the methodological issues related to the estimation of an absolute poverty line for Croatia.

2.1 The Data

The poverty analysis carried out in the paper relies on the HBS data. The survey is carried out by the Central Bureau of Statistics (CBS) and administered to a sample representative of the Croatian population. The survey is rich in information needed for poverty analysis, from detailed food consumption to comprehensive income and expenditures records, including a large selection of socio-economic features of the Croatian households.[2]

The poverty line used throughout this paper is estimated on the basis of the 2004 HBS, where the survey sample consist of 2,847 households (1,441,200 households being its population counterpart), corresponding to 8,222 individuals (4,227,000 individuals in the population).

While the first part of the paper uses the latest HBS data (year 2004), the regional analysis in Section 4 is based on a pooled sample including all three surveys from 2002-2004. The sampling procedure currently used for the HBS makes it legitimate to pool the data sets. The samples from consecutive rounds of the HBS are *(i)* independently drawn, and *(ii)* similar enough in many other aspects to be pooled together as if they were a single sample from a larger survey, fielded over a longer period. The pooled sample allows us to estimate regional poverty rates with standard errors small enough to investigate poverty at the county level, 21 being the total number of counties in the country.

[2] *For more information on the HBS see, for example, Central Bureau of Statistics (2005).*

2.2 The Welfare Measure

Total household expenditure on consumption is the measure of material well-being on which the estimation of poverty rates for Croatia is based. The authors chose expenditure over income for a number of reasons: *(i)* expenditure is less prone to underreporting than income, *(ii)* expenditure provides a better account of welfare in the presence of home-produced goods and other non-marketed transactions, *(iii)* expenditure is not prone to underestimation in an environment with a sizable grey economy, and *(iv)* expenditures vary less than income in the presence of seasonal effects.[3]

The definition of total household expenditure on final consumption employed in this paper is similar to that employed by the system of national accounts. However, in order to construct a more accurate measure of well-being, the definition of expenditure has been amended following the guidelines in Deaton and Zaidi (2002). The rest of this section provides a brief account of the building blocks of our consumption aggregate.[4]

Total food consumption includes actual spending on food, but also the estimated value of home-produced food and the estimated value of food gifts received. The value of food bought and given away as a private transfer is not included in this sub-aggregate. Consumption related to housing consists of two parts: *(i)* rental value of the main residence, and *(ii)* expenditures for utilities. The rental value of the main residence is either the self-reported rental value for owners and tenants with subsidized housing, or actual rent paid by tenants. Most information on rents is the self-reported rental value of owner-occupied dwellings, since about 86 percent of households live in their own dwellings, and an additional 11 percent of households fall into the category of tenants with subsidized housing costs.[5]

[3] *See Deaton and Grosch (2000).*

[4] *See Nestić and Vecchi (2006).*

[5] *In Croatia, the market for rentals is rather shallow, concentrated in large cities, and, thus, cannot guarantee a reliable estimation of the imputed rent. Evaluation of the expenses incurred in buying/building a rental unit is also made difficult due to very high inflation rates in the past, and the practice of continuous re-building of the unit with the help of family members and friends. Therefore, we argue that the self-reported rental value provides the best basis for estimating the rental value of owner-occupied dwellings.*

Durable goods require special treatment in the construction of the consumption aggregate. Unlike other categories, it is not the *purchase* of durable goods that contributes to welfare, but their *usage*, which might continue for years after the purchase. Thus, instead of using the actual expenditures on the purchase of durable goods, the service flows streaming from the goods' usage are estimated and counted as household consumption. The estimation procedure described in Nestić and Vecchi (2006) is applied here to a group of 15 durable goods.

Certain kinds of household expenditures are excluded from our consumption aggregate due to their weak or irregular relationship with the measure of well-being. Among the expenditures excluded from the consumption aggregate, the following are worth mentioning: *(i)* health and funeral expenditures (generally, a high expenditure on these services is not directly related to a high level of the standard of living), *(ii)* expenditures for kindergarten (which are means-tested in Croatia), *(iii)* family celebrations (their infrequent nature is often the cause of noise in the data), and *(iv)* expenditures for social protection services.

The main components of the resulting consumption aggregate, together with the *excluded* categories of expenditures (see above), are shown in Table 1. For 2004, average household consumption was HRK 77,597. Expenditures on food and beverages absorb 29 percent of the overall consumption. A rather large portion of consumption is devoted to housing rents (20 percent). This result relies heavily on the self-reported rental value of owner-occupied dwellings and could be challenged as lacking objective estimation criteria. However, since alternative methods used to calculate the welfare effect of housing conditions are flawed as well, we deem the method of subjective estimation as suitable enough for the purpose of inter-household comparisons and retain its use in this paper. The imputed consumption flows from durables with ownership information account for 5 percent of the total consumption. This figure is roughly comparable to the actual spending on their purchase, which is not included in the consumption aggregate. On average, around 8,400 HRK of actual household spending is excluded from the consumption aggregate due to their non-compliance with the chosen methodology for poverty analysis.

In order to compare levels of well-being among households of different size and composition, the consumption aggregate was deflated by the *equivalent size* of the household. Following de Vos and Zaidi's (1997) argument, we use the so-called OECD-II equivalence scale in determining the equivalent size of a household. The

equivalent size is calculated as the weighted sum of household members, where the first adult person in the household counts as 1 unit, any other adult counts as 0.5 units each, and each child under the age of 14 counts as 0.3 units. The same scale is applied by Eurostat and prevails in many Europe-wide welfare studies.

Table 1 **Composition of Household Consumption**

	Household consumption (HRK/year)	Percentage of total consumption (%)
Food & Beverages	22,515	29.1
Housing expenditures	22,522	29.1
o/w rents	15,361	19.9
o/w utilities	7,161	9.3
Other non-food expenditures	28,454	36.8
Imputed consumption flow from durables	3,839	5.0
Total household consumption	**77,330**	**100.0**
Durables included in imputed flow	4,157	5.4
Durables without ownership information	2,159	2.8
Health expenditures	1,642	2.1
Elderly care, kindergarten and funeral expenditures	428	0.6
Total excluded	**8,387**	**10.8**

Source: Authors' estimates based on 2004 data from HBS.

2.3 The Poverty Line

The derivation of the absolute poverty line follows Ravallion's (1994) recommendations. The main idea is to define the absolute poverty line as the level of total consumption at which households spend just enough on food to afford the cost of a required minimum energy intake plus an allowance to meet basic non-food needs.

The first step is to define the food energy requirements for individuals of different age and sex. Since there is no official nutritional standard for Croatia, we rely on the World Health Organization (1985) and FAO (2004) recommendations. A norm of 2,700 kcal per day *per equivalent* adult is adopted.[6]

[6] *According to FAO (2004), 2700 kcal/day is the minimum energy requirement after assuming a reference person with the following characteristics: male, aged 18-30, weighing between 65 to 70 kilograms, with a basal metabolic rate (BMR, that is the energy required for sustaining the basic functions of the body) equal to approx. 25.3, and enjoying a "lightly active lifestyle" (that is with "physical activity level" (PAL) set equal to 1.6).*

The second step is to define the minimum food basket applicable to the Croatian population. After identifying the bundle of food items (expressed in kilos, liters, or units) for each household in the sample, we calculate the average consumption for households in the *lowest per equivalent adult expenditure quintile*.[7] The resulting quantities are transformed into kilocalories by using conversion tables provided by the Croatian Institute for Public Health (Zavod za zaštitu zdravlja SR Hrvatske, 1990). The average calorie intake of the poorest quintile is 2,859 kcal/day/adult, which is higher than the norm. We, therefore, scale down the quantities of all food items to get a food basket that yields exactly 2,700 kcal per day per equivalent adult.

The cost of the minimum food basket is calculated using the price information from the HBS. More precisely, the median unit values for the food items consumed by the lowest quintile were used as reference prices. The resulting cost of the minimum food basket (*i.e.* the food poverty line) was HRK 529 per month, or HRK 6,348 per equivalent adult per year in 2004.

The final step consists of adding an allowance for non-food basic needs to the cost of the minimum food basket, *i.e.* estimating the overall poverty line. The estimation is accomplished by a two-step procedure. Step 1 identifies the households whose *food* consumption is approximately equal to the cost of the minimum food bundle. Step 2 estimates the poverty line by averaging total household consumption on the subset of households identified in step 1. Step 2 is carried out by applying a regression technique.[8]

The resulting poverty lines (the food poverty line and the absolute poverty line) for the year 2004 are shown in Table 2. The absolute poverty line is equal to HRK 22,145 per adult-equivalent per year (1,845 kuna/month/adult). A single adult falling below this threshold is classified as poor. The absolute poverty line equals circa 56 percent of the median equivalent consumption and 44 percent of the average wage paid for full-time employees. The poverty line amounted to EUR 250 per month if converted at the official rate. The absolute poverty line for a single adult is around 3.5 times higher than the food poverty line.

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[7] *The choice of the lowest quintile fits with the idea that the minimum food basket reflects the actual consumption pattern of those just around the poverty line, or more specific, of those who can just afford the minimum required calorie intake.*

[8] *See Nestić and Vecchi (2006).*

Table 2 **Poverty Lines for Croatia, 2004**				
				Poverty line (in HRK per year)
	Single adult	**Couple w/o kids**	**Single parent**	**Couple w/2 kids**
Food poverty line*	6,348	-	-	-
Absolute poverty line	22,145	33,217	28,788	46,504

Note: The food poverty line for households of different compositions is calculated by using the nutritional equivalence scale (FAO, 2004).
Source: Authors' estimates.

For a couple with two children, the poverty line is estimated at HRK 46,504 per year, or 2.1 times the line for a single adult. Comparison of the line for a single adult household and that of a couple with children illustrates the degree of economies of scale arising from living in a multi-person household, which is implicit in the use of the OECD-II equivalent scale. Rents, utilities, household amenities, and many other costs of living expressed in per capita terms are usually declining with household size.

It is worth mentioning that the poverty line presented in Table 2 is conceptually different from the poverty line currently calculated and published by the CBS. As expected, the resulting monetary values are also different. The CBS estimates a relative poverty line based on *income* (60 percent of median) at HRK 20,714 per year per equivalent adult in 2004.[9] In contrast, our estimates refer to per-equivalent-adult *consumption, including imputed housing rents*. Our poverty line is absolute. This implies that any comparison between the two is unwarranted.

3 A Poverty Profile for Croatia in 2004

In this section we present the main findings of our poverty profile for Croatia in 2004. We focus on three questions: *(i)* How many poor are there?, *(ii)* Who are the poor?, and *(iii)* Where do the poor live?

[9] *See the CBS First Releases on personal consumption and poverty indicators at http://www. dzs.hr/default_e.htm.*

3.1 How Many Poor are There?

In 2004, almost half a million people – representing about 11 percent of the Croatian population – lived in poverty (Table 3). By taking into account statistical errors associated with poverty estimates, the headcount poverty rate is in the range from 9.3 to 12.9 percent (the confidence level is 95 percent).

Table 3 **Estimates of Absolute Poverty for Croatia 2004**

	Croatia	Rural	Urban
National absolute poverty line = 22,145 HRK/year/equiv. adult			
Headcount ratio (%)	11.1	17.0	5.7
95% confidence interval	[9.4, 12.8]	[13.9, 20.2]	[4.1, 7.4]
Poverty gap (%)	2.6	4.2	1.2
Poverty gap squared (%)	1.0	1.6	0.4
Number of poor persons	468,170	340,355	127,715
Relative poverty risk	1.0	1.5	0.5
Background statistics			
Population share	100.0	47.2	52.8
Average expenditure	43,229	36,634	49,035
Average expenditure of the poor	16,864	16,641	17,453
Average poverty gap	5,281	5,504	4,692
Gini Index	25.3	24.2	24.1

Source: Authors' estimates.

The "depth" of poverty, as measured by the poverty gap index, amounts to 2.6 percent. This poverty indicator suggests that the average distance of the poor below the poverty line amounts to 2.6 percent of the poverty line itself. The value of this indicator points to shallow poverty on average. An alternative interpretation of the poverty gap index (see Ravallion 1994: 46) is that the gap measures the potential savings to the poverty alleviation budget attributed to targeting. According to this interpretation, the poverty gap index is equal to the ratio between the cost of eliminating poverty with perfect targeting (*i.e.* by giving each poor poverty gap) to the cost of no targeting (*i.e.* by transferring an amount equal to the poverty line to all individuals in the population).

Shallow poverty is, however, associated with substantial pockets of severe poverty. The "severity" of poverty (measured by the squared poverty gap) is about 1 percent. The severity of poverty also shows how far consumption of the poor is from the poverty

line, but it attaches higher importance to the poor that are deeper into poverty. This is one way to account for the extent of inequality among the poor when measuring poverty. If all inequality among the poor was removed (for instance by a mean-preserving redistribution) the squared poverty gap would *decrease* from 1 percent (actual) to 0.6 percent.

On average, the poor have an expenditure shortfall of circa 24 percent of the poverty line (HRK 16,864/equiv.adult/year compared to the poverty line of HRK 22,145). This indicator is sometimes referred to as *the average poverty deficit*.

The estimates from Table 3 point to the existence of a considerable gap between urban and rural areas, both in terms of the incidence of poverty (17 percent headcount rate in rural areas versus 5.7 percent in urban areas) and its depth (poverty gap of 4.2 percent versus 1.2 percent). Almost three-fourths of the Croatian poor live in rural areas. On average, the consumption of the rural poor is 25 percent below the poverty line, compared to 20 percent for the urban poor. Among the poor in rural areas there are far more households that are well below the poverty line than the poor in urban areas. The squared poverty gap is four times higher in rural areas (1.6 percent) than in urban counterparts (0.4 percent), pointing to relatively high severity of poverty in rural Croatia. This finding suggests that there are some groups in the population who are more likely to experience extreme poverty.

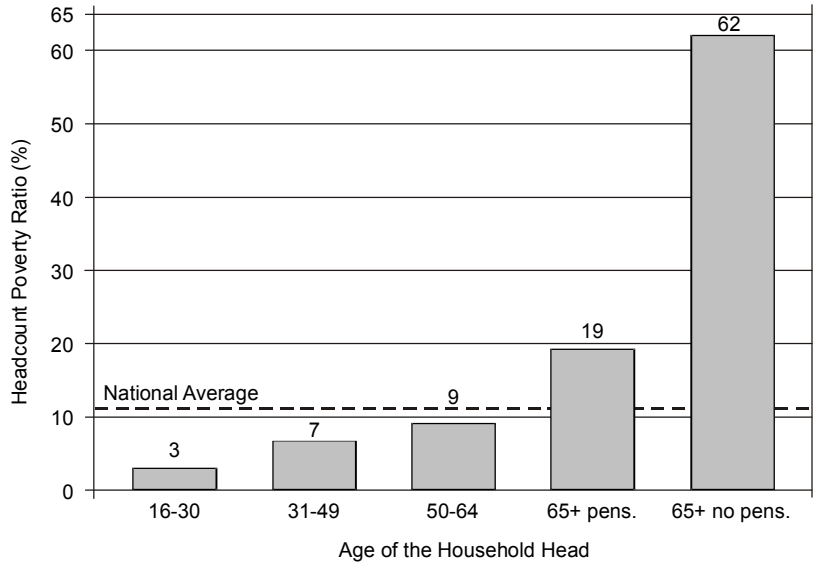
3.2 Who are the Poor?

The identification of the poor usually starts with the examination of simple links between poverty rates and a number of potentially correlated factors. One compares, for example, the proportion of poor individuals within groups of different ages, educational background, or employment status. In this section, we pursue this line by investigating poverty patterns mainly through the use of contingency tables and graphs, which are unsophisticated, yet effective instruments.

The incidence of poverty is related to age, more precisely, the risk of poverty increases with age. Households headed by individuals who are 65+ years of age face a poverty risk that is roughly twice the average (Figure 1). Since one-fourth of the population consists of households headed by the elderly, they account for almost 50 percent of the poor. Protection offered by pensions is not sufficient to help the elderly to

overcome the risk of poverty. Within the group of households headed by individuals 65+ years of age, those with a pension face a poverty risk that is around 1.7 time the national average. However, for households headed by the elderly without a pension, the poverty risk is more than five times the average. The relationship between age and poverty is confirmed by the fact that the average age of the head of household among the poor is 66 years, compared to 55 among the non-poor.

Figure 1 **Poverty Incidence by Age of the Household Head**



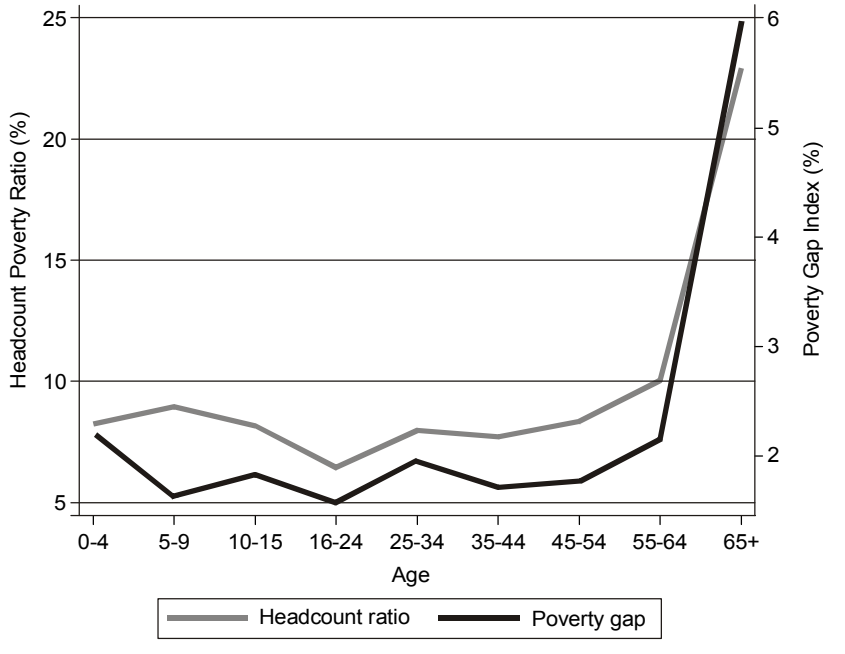
Source: Authors' estimates.

At the individual level (not that of the household head), Figure 2 shows that the incidence of poverty (left axis) is remarkably flat over the life cycle, but surges when it comes to the elderly. The pattern is by and large unaltered by the consideration of the poverty gap index (right axis). With regard to the depth of poverty, however, a peak is observed among the youngest children (aged 0-4), who score second highest in the poverty gap index. This suggests that households with babies stand out as a group deserving special attention: their risk of poverty is similar to households with older kids, but their hardship is significantly higher.

A comparison between the relative poverty risk of an elderly individual heading a household with the risk for an elderly person not heading a household, may be used

as a proxy, admittedly crude, of the extent to which households offer protection against poverty in the absence of a pension. We find that being elderly and not head of the household decreases the relative poverty risk by 40 percent compared to elderly heads of households. The protection offered by the household to its 65+ members without a pension is significant but is far from being able to fill the gap left by the social security system.

Figure 2 **Poverty Incidence over the Life Cycle**

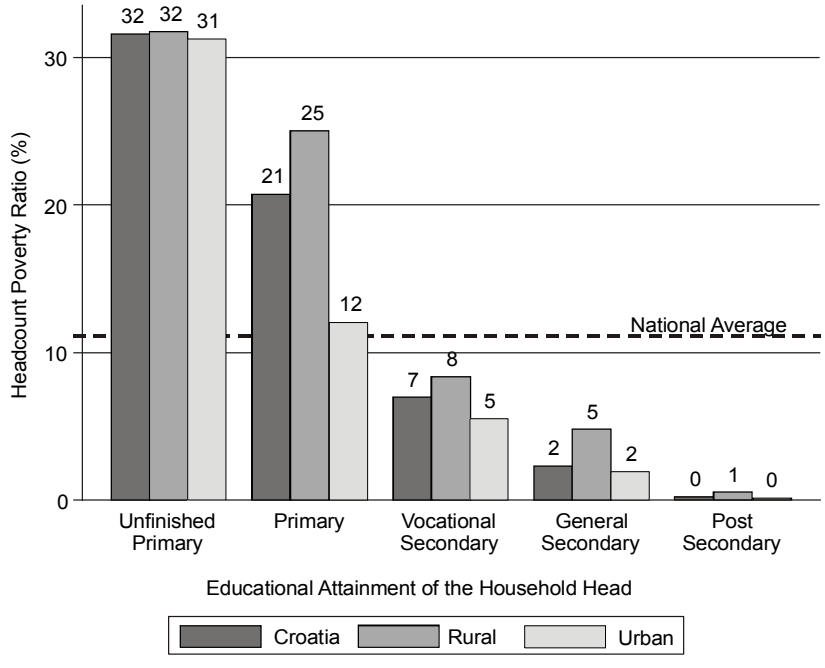


Source: Authors' estimates.

Like in most other countries across the world, Croatia shows a strong negative correlation between poverty risk and the level of education. Figure 3 shows the *pattern* of poverty risk by educational level of the household head. The covariation is clearly negative, but does not vary with the urban/rural location. Irrespective of the educational level, however, rural households face systematically greater poverty incidence rates than their urban counterparts. Secondary education stands out as a threshold above which the probability of being poor becomes lower than the national average. A comparison of poor and non-poor households reveals that around 75 percent among the poor live in households headed by individuals who attained at

most the primary level of education, compared to 30 percent among the non-poor. Only 5 percent of the poor live in households whose head has completed general secondary school.

Figure 3 **Incidence of Poverty by Educational Attainment of the Household Head**



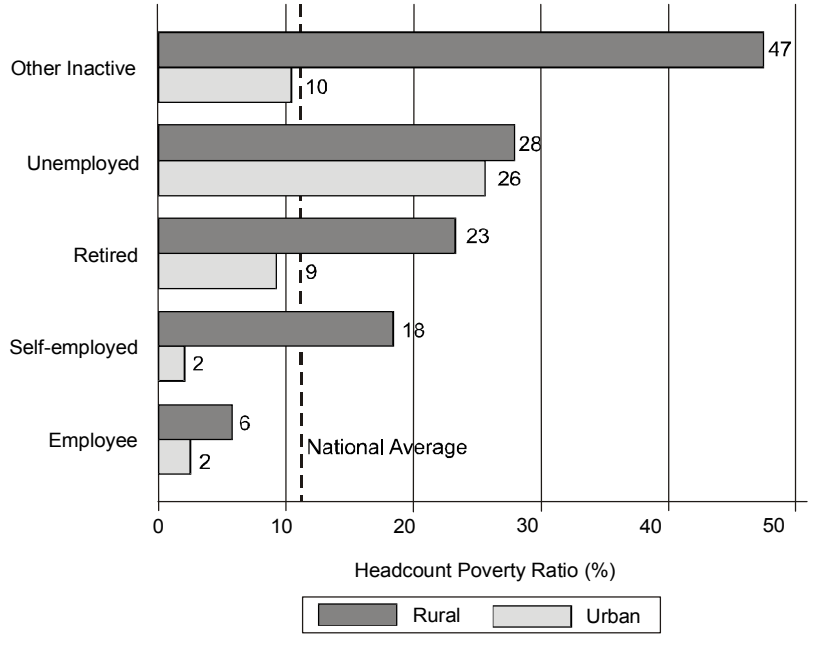
Source: Authors' estimates.

Poverty is tightly associated with the activity status of the main breadwinner (Figure 4). Labor force participation seems to offer relative protection against poverty. Households headed by a "retired", "unemployed", or "other inactive" person *(i)* show the highest rates of poverty incidence (the peak of 47 percent belongs to the *other inactive in the rural areas*), and *(ii)* represent a large share of the total poor (62 percent, while about one half of the total poor live in households headed by retired individuals).

Retirement doubles the risk of poverty in rural but not in urban areas. The incidence of poverty among households headed by a retired person is below the average in urban areas (9 percent) but close to twice the average in rural households. This can be

explained by the following three factors: *(i)* the proportion of the population living in households headed by 65+ individuals *without* pension is 2 percent in rural areas, compared to 0.3 percent in urban areas, *(ii)* individuals in urban areas benefit from a higher degree of protection from other household members than their rural counterparts (about 87 percent of households headed by 65+ individuals without a pension live in rural areas), and *(iii)* given the contributory pension system in Croatia, pensions in rural areas are significantly lower than in urban areas.

Figure 4 **Poverty Incidence by Employment Status of the Head of the Household**



Source: Authors' estimates.

Self-employment decreases dramatically the poverty risk in urban areas, while it increases the risk in rural areas. There is a wide gap in the headcount ratios between urban and rural areas (2 percent versus 18 percent, respectively) which can be explained by differences in the structure of self-employment. In rural areas, self-employed are mostly individual farmers, while in urban areas they are mostly small entrepreneurs.

The unemployed are a relatively small group (3 percent of households are headed by an unemployed person), but they face a considerably higher risk of poverty compared to the national average, both in rural and urban areas (28 and 26 percent, respectively).

3.3 Where do the Poor Live?

In addition to the urban/rural poverty divide documented above, the place of residence as a possible poverty correlate is studied by looking at the regional disparities in living standards. As for now, we apply a 5-way analytic regional classification of the country as used in World Bank (2000), where regions are defined as groups of counties (Table 4).

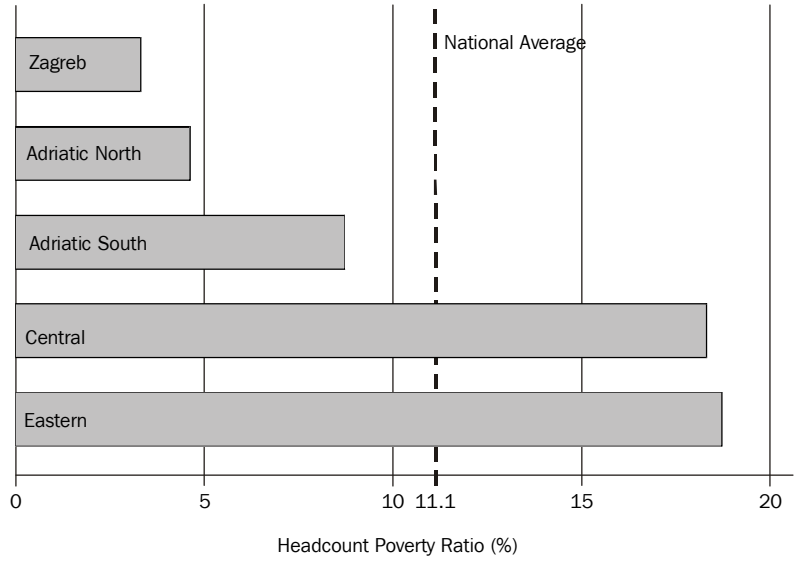
Table 4 **Definition of Analytical Regions**

Analytical Region	**County**
Central Croatia	Krapina-Zagorje, Sisak-Moslavina, Karlovac, Varaždin, Koprivnica-Križevci, Bjelovar-Bilogora, Međimurje
Eastern Croatia	Virovitica-Podravina, Požega-Slavonia, Slav. Brod-Posavina, Osijek-Baranja, Vukovar-Sirmium
Zagreb Region	Zagreb County, Zagreb City
Adriatic North	Primorje-Gorski kotar, Lika Senj, Istria
Adriatic South	Zadar, Šibenik-Knin, Split-Dalmatia, Dubrovnik-Neretva

There are large regional differences in the extent of poverty. As shown in Figure 5, the incidence of poverty ranges from circa 3 percent in the Zagreb region to 18 percent in the Eastern region. Even after accounting for the configuration of the Croatian territory, it is striking to observe a 1 to 6 differential in poverty rates between the poorest and richest regions.

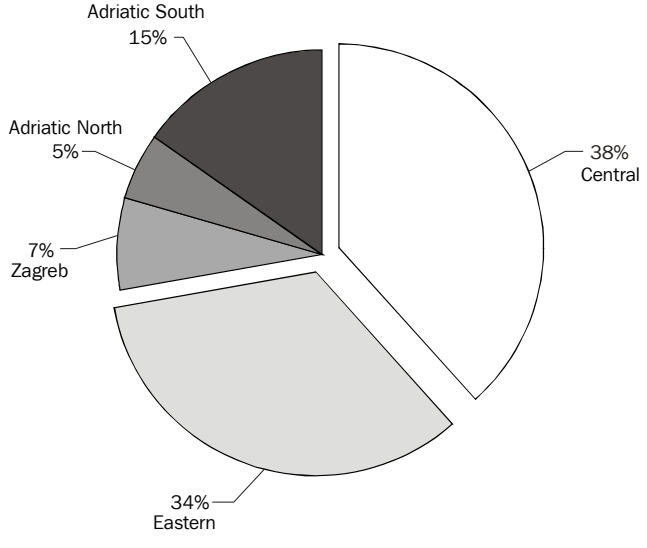
Figure 6 shows the distribution of the poor by region. More than 70 percent of all poor individuals are concentrated in the Central and Eastern regions, while they account for only 43 percent of the population.

Figure 5 **Poverty Incidence in Croatia by Region**



Source: Authors' estimates.

Figure 6 **Distribution of Poverty by Region**



Source: Authors' estimates.

3.4 Nature of the Relationship Between Poverty and Regions

The identification of the factors underlying the regional variation of poverty rates deserves a high priority in analyzing poverty in Croatia. The main limitation of the above analysis is that it relies on simple correlations between poverty incidence and region of residence. Simple correlations can be *spurious*, that is, driven by factors omitted from bivariate comparisons. The relationship between poverty and region may not be *direct* (regions matter because of differences in hydro-oro-graphic conditions, lack of infrastructure, poor access to basic services, etc.), but caused by a third variable such as, say, education. To the extent that educational attainment is unevenly distributed across regions, the relationship between poverty risk and region can be dubbed spurious: poverty risk is related to region *indirectly*, via education.

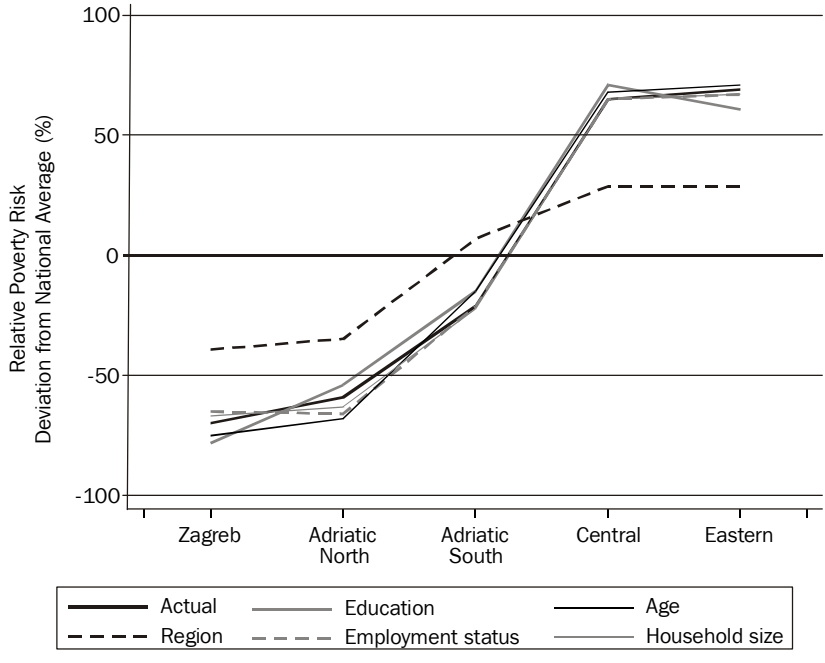
One way of identifying the nature of the relationship between poverty risk and regions is by purging the effect of a third variable from the *simple* correlation between poverty and region. This can be achieved by using partial correlations instead of simple correlations. Partial correlation between two variables (x and y, say) is defined as the correlation observed after holding constant (that is, eliminating the effects of) a third variable (say z). Partial correlations may differ substantially from *simple* correlations, and comparisons are often informative about the relationship between two variables.

Vecchi (2006) has carried out a partial correlation analysis by means of micro-simulations based on the HBS 2004 data set.[10] The relationship between poverty and region is controlled for five key sets of household characteristics: education, employment status, age, household size, and region. A three-step procedure was adopted to carry out the partial correlation analysis. For purposes of illustration only, let us illustrate the procedure when controlling for education. In step one, equivalent consumption is regressed on a set of household characteristics and poverty covariates in order to estimate the partial effect for each covariate. In step two, the predicted consumption level is generated after assigning the same education level to all individuals in the sample, i.e. assuming no differences in education levels across the population. Finally, in step three, the relative poverty risk by region is calculated using the counterfactual/simulated consumption level predicted in step two.

[10] *Simulated relative poverty risks were estimated by adapting Luttmer's (2000) procedure.*

Once the simulated relative poverty risk is obtained, it can be compared with the actual patterns of risk. If the comparison shows little difference, we conclude that education is *not* responsible for the regional variation in poverty. Hence, the correlation between poverty and region is *not* spurious. If after controlling for education the poverty risk pattern changes significantly, we conclude that the correlation between poverty and region is spurious (that is, driven by the uneven distribution of education across regions).

Figure 7 **Standardized Simulated Relative Poverty Risks by Region**



Applying the method outlined above, Vecchi (2006) finds that regional variation of poverty cannot be accounted for by differences in the distribution of education, labor market status, and other demographic factors. This finding is summarized in Figure 7. The figure shows the patterns of percentage deviation of the *actual* and *simulated* relative poverty risk from the national average. If the pattern simulated for factor *j* (say education) remains close to the actual pattern (the thick solid line), we infer that factor *j* plays an insignificant role in the explanation of the correlation between poverty and region. If, on the other hand, the simulated pattern flattens towards the

zero horizontal axis, we infer that factor *j* plays a significant role in explaining the relationship between poverty and educational attainment. In other words, the correlation between poverty and region is mediated by factor *j*. In Figure 7, only the curve simulated for the factor *region* (dashed line) flattens significantly, which suggests that the relationship between poverty and region is *not* spurious. Controlling for education does not affect the regional variation of relative poverty risks: the odds ratios (regional headcount rate over national rate) of simulated poverty risks hardly change.[11] Employment status, age, and household size do not account for regional variation of poverty either.

4 Regional Poverty

Since the region of residence was shown to be an important poverty covariate, we would now like to map poverty with as much geographical detail and precision as possible. However, this is not a straightforward exercise in Croatia. The difficulty arises from the sample size of the HBS: for a typical year, sample size turns out to be too small to deliver county level estimates with reasonable statistical precision. The strategy pursued in this section consists of pooling the HBS samples for 2002, 2003, and 2004 and estimating poverty on the basis of the pooled sample. The pooled sample allows us to estimate poverty measures at the *county* level with acceptable precision. Nevertheless, we believe that the estimates for the five analytical regions defined in Table 4 above provide a safer benchmark for regional poverty estimates than our county level estimates.

A glance at basic county-level development indicators provides us with some useful insights for later discussions (Table 5). The variation in average per capita consumption (consumption definition was explained above) across counties seems modest: the average consumption level in the City of Zagreb, the richest part of Croatia, is around 30 percent above the national average, and nearly two times higher than the poorest county (Karlovac).[12] Variation is milder if we compare wider regions:

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[11] *Education is, however, a powerful independent micro-determinant of poverty. After controlling for education, the overall headcount ratio decreases from 11 percent (actual) to 9 percent (simulated). Similarly to simulations in the case of regional poverty, controlling for employment status, region, age, and household size does not explain the relationship between poverty and education. See Vecchi (2006).*

[12] *Point estimates must not be taken strictly at their face value, but assessed jointly with their estimated standard errors. Particular caution is needed in dealing with results for Požega-Slavonia County where standard errors are relatively large, due to small sample size problems.*

the richest region (Zagreb) shows an income level of 25 percent above the national average and 50 percent above the lowest income level region, Eastern Croatia.

Table 5 **Main Development Indicators by County, 2002-2004**

	Consumption per capita		Inequality in consumption per capita		Unemployment rate	Schooling	GDP per capita
County /Region	Index (Croatia =100)	(s.e.)	Gini coeff. (%)	(s.e.)	(%)	Years	Index (Croatia =100)
Krapina-Zagorje	81.2	(2.5)	23.9	(3.9)	4.9	8.7	72.6
Sisak-Moslavina	79.4	(4.1)	30.5	(4.6)	19.0	9.1	77.0
Karlovac	76.1	(6.0)	32.5	(6.8)	15.5	9.1	77.7
Varaždin	84.5	(2.9)	25.7	(4.0)	8.2	9.6	94.2
Koprivnica-Križevci	82.5	(4.8)	28.8	(5.7)	10.2	8.8	95.8
Bjelovar-Bilogora	84.4	(4.7)	29.9	(5.0)	10.9	8.7	74.5
Međimurje	99.8	(4.2)	26.5	(4.6)	12.3	9.6	80.2
Central Croatia	**83.7**	**(1.6)**	**28.5**	**(1.8)**	**11.5**	**n.a.**	**81.9**
Virovitica-Podravina	77.9	(4.7)	25.4	(6.4)	14.0	8.6	75.4
Požega-Slavonia	108.7	(19.4)	35.7	(12.5)	13.9	8.5	72.2
Slav. Brod-Posavina	83.1	(3.0)	25.6	(4.1)	15.7	8.8	57.5
Osijek-Baranja	81.3	(2.5)	27.3	(3.4)	22.9	9.6	75.3
Vukovar-Sirmium	86.9	(2.8)	24.9	(4.3)	24.0	8.7	57.5
Eastern Croatia	**85.0**	**(2.2)**	**27.4**	**(2.4)**	**19.9**	**n.a.**	**67.4**
Zagreb County	100.5	(2.7)	28.5	(1.8)	14.8	9.6	74.1
Zagreb City	130.9	(2.3)	26.5	(2.0)	10.7	11.5	179.2
Zagreb Region	**122.1**	**(1.8)**	**26.4**	**(1.7)**	**11.8**	**n.a.**	**148.9**
Primorje-Gorski kotar	122.1	(2.7)	23.7	(2.9)	11.2	10.6	118.1
Lika-Senj	115.1	(4.4)	19.1	(6.2)	8.7	8.5	103.4
Istria	103.3	(3.4)	22.9	(4.7)	8.4	9.9	137.5
Adriatic North	**114.4**	**(2.0)**	**23.4**	**(2.4)**	**9.9**	**n.a.**	**123.8**
Zadar	93.7	(3.0)	25.3	(4.0)	18.9	9.8	80.1
Šibenik-Knin	93.4	(4.0)	24	(5.7)	28.2	9.0	69.7
Split-Dalmatia	97.9	(2.2)	25.2	(2.6)	19.6	10.2	75.3
Dubrovnik-Neretva	102.6	(3.7)	23	(5.0)	17.4	10.2	88.4
Adriatic South	**97.1**	**(1.5)**	**24.9**	**(1.9)**	**20.2**	**n.a.**	**77.3**

Note: Gini coefficient and associated standard errors are computed with the Stata statistical software using svygini add-on command written by Juan Muñoz.
Sources: Authors' estimates based on HBS 2002-2004 for consumption and inequality (incl. associated standard errors), Lovrinčević and Mikulić (2006) for GDP in 2003, and Luo's (2006) estimates based on LFS 2002-2004 for unemployment and schooling.

The pattern emerging from the distribution of consumption by county is broadly consistent with the documented development figures from other independent sources,

such as GDP per capita from national accounts statistics or unemployment and schooling data from the Labor Force Survey.

Table 6 **Poverty Risk by County, 2002-2004**

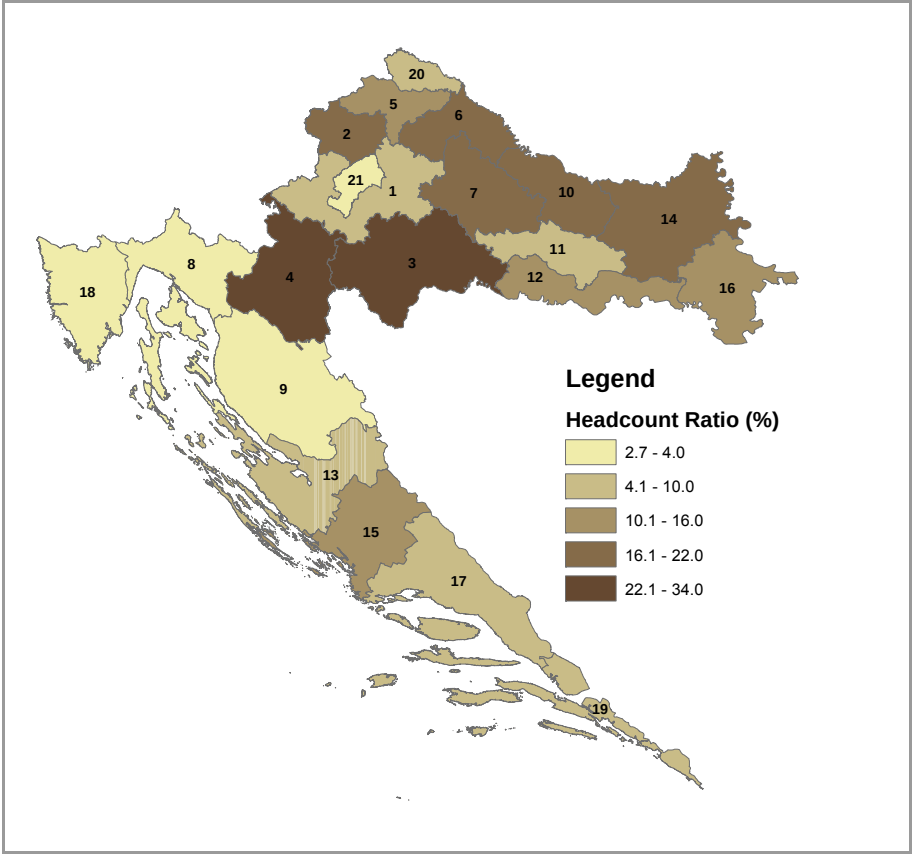
	Headcount poverty rate		Population share		Proportion of the poor	
County /Region	(%)	s.e.	(%)	s.e.	(%)	s.e.
Krapina-Zagorje	19.2	(2.8)	3.1	(0.1)	5.2	(0.7)
Sisak-Moslavina	28.3	(3.6)	4.2	(0.2)	10.3	(1.3)
Karlovac	33.8	(5.9)	2.9	(0.2)	8.6	(1.5)
Varaždin	15.6	(2.4)	4.3	(0.1)	5.8	(0.9)
Koprivnica-Križevci	20.8	(4.3)	2.8	(0.1)	5.0	(1.1)
Bjelovar-Bilogora	21.7	(4.3)	3.0	(0.1)	5.7	(1.2)
Međimurje	8.0	(1.9)	2.8	(0.1)	2.0	(0.5)
Central Croatia	***21.2***	***(1.4)***	***23.2***	***(0.4)***	***42.5***	***(2.2)***
Virovitica-Podravina	19.8	(2.2)	2.1	(0.2)	3.6	(0.5)
Požega-Slavonia	10.2	(3.0)	1.7	(0.2)	1.5	(0.4)
Slav. Brod-Posavina	16.4	(3.3)	3.9	(0.1)	5.5	(1.1)
Osijek-Baranja	19.9	(2.3)	7.7	(0.3)	13.2	(1.5)
Vukovar-Sirmium	16.3	(2.2)	4.4	(0.2)	6.2	(0.8)
Eastern Croatia	***17.5***	***(1.3)***	***19.8***	***(0.4)***	***30.0***	***(1.9)***
Zagreb County	6.6	(1.3)	7.2	(0.3)	4.1	(0.8)
Zagreb City	2.7	(0.4)	17.7	(0.4)	4.1	(0.7)
Zagreb Region	***3.8***	***(0.5)***	***24.9***	***(0.5)***	***8.2***	***(1.0)***
Primorje-Gorski kotar	3.4	(0.8)	6.7	(0.2)	2.0	(0.5)
Lika-Senj	2.5	(1.1)	1.3	(0.1)	0.3	(0.1)
Istria	4.4	(1.2)	4.7	(0.2)	1.8	(0.5)
Adriatic North	***3.7***	***(0.6)***	***12.7***	***(0.3)***	***4.0***	***(0.7)***
Zadar	8.2	(1.6)	3.7	(0.2)	2.6	(0.5)
Šibenik-Knin	13.6	(3.4)	2.7	(0.2)	3.1	(0.8)
Split-Dalmatia	8.9	(1.5)	10.4	(0.3)	8.0	(1.3)
Dubrovnik-Neretva	6.2	(2.0)	2.6	(0.1)	1.4	(0.4)
Adriatic South	***9.1***	***(1.0)***	***19.4***	***(0.4)***	***15.2***	***(1.6)***

Note: Linearized standard errors based on sample specification are reported in parentheses. Poverty calculations are based on the baseline equivalent consumption using the modified OECD scale (1; 0.7; 0.3).

There are, however, counties for which the relative ranking tends to vary depending on the indicator of living standards chosen. Counties with the lowest per capita consumption levels (as measured by its average) are not those with the lowest GDP per capita. Unemployment rates are, in general, inversely related to consumption, although with some notable exceptions (Krapina-Zagorje). Inequality is somewhat higher in regions with lower average consumption. Relative ranking of development

indicators at the level of the five analytical regions is much more consistent. The Zagreb and the North Adriatic regions share the most favorable values of the development indicators.

Figure 8 **Poverty Map for Croatia Based on County-Level Poverty Estimates, 2002-2004**



Notes: 1 Zagreb County; 2 Krapina-Zagorje; 3 Sisak-Moslavina; 4 Karlovac; 5 Varaždin; 6 Koprivnica-Križevci; 7 Bjelovar-Bilogora; 8 Primorje-Gorski kotar; 9 Lika-Senj; 10 Virovitica-Podravina; 11 Požega-Slavonia; 12 Sl. Brod-Posavina; 13 Zadar; 14 Osijek-Baranja; 15 Šibenik-Knin; 16 Vukovar-Sirmium; 17 Split-Dalmatia; 18 Istria; 19 Dubrovnik-Neretva; 20 Medimurje; 21 City of Zagreb.
Source: Authors' estimates.

Poverty estimates by county and region are presented in Table 6. The variation in the incidence of poverty is striking. Headcount poverty rates vary from 4 percent to more than 20 percent. Accordingly, individuals living in the City of Zagreb or counties of the North Adriatic Region face a risk of falling into poverty that is 20-60 percent of

average national risk, while living in the counties of Karlovac and Sisak-Moslavina raises the poverty risk to levels 2-3 times the national average. Nearly 25 percent of population lives in Central Croatia, but this region accounts for more than 40 percent of the Croatian poor.

Figure 8 shows the poverty map of Croatia based on county-level poverty estimates. This is a useful device for identifying poverty differentials across areas in the country, and at present, it represents the highest geographical resolution attainable given the available data.

Not only do poverty rates vary substantially across regions and counties, but so does vulnerability to poverty (loosely defined). This question is investigated in Table 7. The table presents the results after slicing the distribution of per equivalent adult consumption into intervals centered around the poverty line (z), and counting how many individuals fall within each interval. By reading Table 7 top to bottom, we obtain an account of how rapidly the count of the poor changes in response to changes in the poverty line.

Table 7 **Regional Headcount Rates by Poverty Bands, 2002-2004**

	Consumption level (multiples of poverty line)	Central Croatia	Eastern Croatia	Zagreb Region	Adriatic North	Adriatic South	Overall
Extremely poor	PEA < 0.5z	3.7	1.2	0.1	0.1	0.4	1.2
Chronically poor	0.5z < PEA < 0.75z	7.6	5.2	1.1	0.2	2.3	3.5
Poor	0.75z < PEA < z	9.9	11.2	2.6	3.4	6.3	6.8
Vulnerable	z < PEA < 1.25z	14.5	15.2	5.6	7.5	9.7	10.6
Transient non poor	1.25z < PEA < 2z	37.6	42.3	32.2	38.9	42.9	38.4
Non poor	PEA > 2z	26.7	24.9	58.3	49.9	38.3	39.4
TOTAL		100.0	100.0	100.0	100.0	100.0	100.0

Notes: PEA is per equivalent adult expenditure, z is the absolute poverty line, equal to HRK 22,145/equivalent adult/year.
Source: Author's estimates.

At the national level, in addition to the share of the population classified as poor (11 percent), there is an additional 10 percent of the population that could be considered vulnerable to poverty due to their consumption level, which is slightly higher than the poverty line.

At the regional level, a comparison between the Central and Eastern regions reveals a notable difference in the nature of poverty in these two regions. In the Central region, almost 4 percent of the population lives with an exceedingly low level of resources (less than half the poverty line), while in Eastern Croatia, a region with a similar headcount poverty rate, only 1 percent of the population is exposed to such extreme poverty. On the other hand, the Eastern region has a higher fraction of the population than the Center with consumption levels close to the poverty line. A relatively high inequality in the Central region, as measured by the Gini coefficient and presented in Table 5, contributes to its high exposure to harsh poverty.

5 Summary and Concluding Remarks

This paper presented the major findings of the poverty estimates for Croatia. It has shown that geography is one of the key factors driving poverty in Croatia. Regional disparities in poverty rates are large, substantially larger than variations in other development indicators such as per capita consumption or per capita GDP. Poverty incidence ranges from close to 3 percent in the Zagreb region to 18-19 percent among households in the Eastern and Central regions. Even more pronounced is the variation among poverty gaps and the squared poverty gaps. Poverty is deeper, more severe, and widespread in rural areas than in urban areas.

An in-depth analysis based on micro-simulations provides strong support for the claim that the link between poverty and region is firm and direct. Differences in education, labor market, and other demographic factors cannot account for the observed regional variations. This result suggests that a focus on regional development makes sense for Croatia, and this paper is a step in this direction.

By mapping poor households at the county level, we have investigated poverty with a geographical resolution higher than any previous study in Croatia that we are aware of. This is an important achievement, which will help develop tools for effective geographic targeting. However, the finding that the relative rankings of Croatia's counties are not robust to the choice of the living standards indicator, raises the issue of which territorial unit is most appropriate for optimal regional development planning. It is possible that counties in Croatia are too small a unit for this purpose. Other possibilities cannot be ruled out at this stage, and further analysis is needed.

While the focus of this paper was on the geographic variation of living standards, other dimensions of poverty were investigated as well. We find that the risk of poverty decreases sharply with the level of educational attainment of the head of household. Households headed by individuals with primary or lower education are associated with a poverty risk two times the average, while attainment of secondary education reduces the risk to one-third of the average risk. Poverty risk literally collapses when calculated over population groups with relatively high educational attainment levels

Inactivity is clearly mirrored in the structure of poverty rates. The single most important group is the pensioners. Apart from being associated with poverty risk twice the average, they are shown to account for 46 percent of the total poor. Households headed by unemployed and other inactive persons are also subject to an above-average poverty risk, but together they make up 16 percent of the poor.

Poverty rates increase over the life cycle of the head of household. While cohorts below 65 years of age have a below-average risk of poverty, households headed by 65+ persons face a poverty risk that is two times the national average. Within the 65+ group, those without pensions are at risk more than five times the national average. The largest fraction of the elderly classified as poor is concentrated in rural areas.

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