EXPLANATORY NOTE ON THE CALCULATION OF AN INDEX OF RELATIVE OBLAST EXPENDITURE NEEDS

This note outlines a conventional and convenient methodology for estimating the relative expenditure needs of Ukrainian oblasts. The procedure that is proposed is fundamentally different from the approach that has been traditionally followed in Ukraine, one that has emphasized the absolute, rather than the relative, expenditure needs of oblasts. Absolute expenditure needs are impossible to measure on a scientific basis and also impossible to satisfy, if for no other reason than that, whether for individuals or oblasts, needs always exceed the capacity of the economy to meet them.

Traditional budgeting practices in Ukraine have been based on the application of expenditure norms to different functional areas. This exercise yields calculations of the budgetary cost required to operate the existing set of public sector facilities and programs. For example, as a component of the health care budget, the cost of maintaining a hospital would be calculated in part as the norm based cost of a hospital bed times the number of beds.

It is clear that the use of current expenditure norms to estimate oblast expenditure needs is no longer workable in Ukraine. When expenditure needs are calculated on that basis they typically yield expenditure estimates that are two or, in some cases, three times greater than the budgetary resources that are available to oblasts. Given the limited opportunities to increase available resources, different budgetary procedures will have to be developed in allocating resources to oblast budgets in a transparent, objective and equitable manner.

One promising option is to start with the amount of resources available to oblasts and then allocate this amount according to the relative expenditure needs of each oblast. An identity can help to illustrate how this alternative procedure would work:

$$E_i = B \quad (P_i/P^*) \quad (E_i^*/E^*) \text{ where}$$

E_i = total expenditure of the i'th oblast;
B = total amount of resources for all oblast budgets;
P_i/P^* = population of the i'th oblast as a share of total population (P*);
E_i^*/E^* = per capita expenditure need of the i'th oblast relative to average per capita need in all oblasts (E*).

If all oblasts had the same expenditure needs, per capita expenditures would be the same in all oblasts, and an oblast's total spending would be determined as the product of the resources available (B) and the oblast's population share (P_i/P^*). In Ukraine, however, there are at least two good reasons to believe that the expenditure needs of different oblasts are not uniform. First, different oblasts may not have the same service responsibilities. An oblast, for example, with relatively more students to educate, or more hospital facilities, or more poor residents will have greater than average service responsibilities and higher than average expenditure needs. Secondly, different oblasts face different per capita costs in supplying a standard or average level of public services because of their varying physical and economic characteristics.

In the remainder of this note, a methodology for measuring these dual sources of disparate expenditure need is described and applied. This approach requires the construction of two indices of differential expenditure need, an index of relative service responsibility (IRSR), and an index

of relative service cost (IRSC). Conceptually, the per capita expenditure need of a particular oblast can be expressed in terms of these two indices:

$$E_i^* = (B/P^*) \times IRSR \times IRSC$$

If an oblast had average service responsibilities (IRSR=1) and average costs of public service provision (IRSC=1), its per capita expenditure needs would be equal to average per capita oblast expenditures (B/P*). However, higher than average values for each of the indices would mean that an oblast government, for reasons beyond its own control, must spend more per capita than other oblasts to achieve any given quality standard of public services. How, then, can these indices be empirically applied in Ukraine?

THE INDEX OF RELATIVE SERVICE RESPONSIBILITY (IRSR)

Service responsibilities reflect the current pattern of expenditure assignments among different levels of government. In Ukraine the major expenditure tasks assigned to subnational governments are primary-secondary education, most forms of basic health care and important aspects of social protection including payments for war and labor veterans, aid to mothers with children and subsidies for communal services to poor households. Together, these expenditure items on different functions account for nearly 70 per cent of total subnational government spending.

Table I provides some indicators of how different oblasts in Ukraine have different degrees of service responsibility and, therefore, expenditure need. Each indicator is a demand-driven measure of expenditure need. Education need is indicated by the number of weighted students as a fraction of total population. Because the per student cost of kindergarten appears to be about twice as high as that for other kinds of schooling, the number of kindergarten students was assigned a weight of two in measuring the expenditure need for education.

The demand for health care is indicated by the number of medical personnel in each oblast as a proportion of the total population. This is an indirect measure of demand based on the plausible assumption that the supply of health care services generates its own demand and is likely to be a better demand indicator than other alternatives such as mortality or morbidity rates. It also clearly dominates other possible supply based measures such as hospital beds which give no information about utilization rates.

Social protection needs are approximated by a measure of the number of poor households, relative to population, in each oblast. The number of poor households, in turn, is measured by the number of households eligible to receive the targeted subsidy for the payment of communal services. This subsidy is paid to households in the event that charges for communal services exceed 20 per cent of household income. Payments of this nature account for nearly half of all social protection expenditures by oblasts.

From Table I it is apparent that, while there are differences among oblasts in education and health needs, they are not large. Much larger inter-oblast differences are observed for social protection needs where a few oblasts exceed the average by a factor of nearly two and others have needs of less than half the average.

The constructed index of relative service responsibility translates the inter-oblast differences presented in Table I into a measure of how much an oblast's per capita expenditure

level will deviate from the average amount if it has either above-average or below-average service responsibilities in different functional areas. Expenditure needs in other functional areas besides education, health and social protection are assumed to be uniform across oblasts.

TABLE I
VARIATION AMONG OBLASTS IN SERVICE RESPONSIBILITIES

Oblasts	*(Kindergarden attendees*2 plus Students) as a share of population*	*Medical personnal as a share of population*	*Number of poor households as a share of population*
Aut.Rep. of Crimea	0.1721	0.0220	0.0714
VINNYTSKA	0.1573	0.0206	0.1435
VOLYNSKA	0.1853	0.0228	0.0658
DNIPROPETROVSKA	0.1623	0.0207	0.0995
DONETSKA	0.1504	0.0232	0.0697
ZHYTOMYRSKA	0.1766	0.0211	0.1420
ZAKARPATSKA	0.1934	0.0176	0.1222
ZAPORIZKA	0.1654	0.0256	0.0498
IVANO-FRANKIVSKA	0.1640	0.0206	0.0724
KYIVSKA	0.1764	0.0222	0.1298
KIROVOHRADSKA	0.1679	0.0230	0.1083
LUHANSKA	0.1465	0.0212	0.0722
LVIVSKA	0.1613	0.0198	0.0861
MYKOLAIVSKA	0.1728	0.0198	0.0698
ODESKA	0.1556	0.0185	0.0398
POLTAVSKA	0.1652	0.0229	0.0878
RIVNENSKA	0.1851	0.0224	0.0563
SUMSKA	0.1535	0.0204	0.0741
TERNOPILSKA	0.1655	0.0228	0.0982
KHARKIVSKA	0.1581	0.0208	0.0973
KHERSONSKA	0.1817	0.0215	0.0982
KHMELNYTSKA	0.1733	0.0187	0.0576
CHERKASKA	0.1744	0.0212	0.0582
CHERNIVETSKA	0.1732	0.0202	0.0540
CHERNIHIVSKA	0.1601	0.0242	0.1620
CITY OF KYIV	0.1779	0.0215	0.0795
CITY OF SEVASTOPOL	0.1742	0.0268	0.0409
Average	0.1653	0.0214	0.0851
Coefficient of variation	0.0688	0.0948	0.3802

To illustrate how the index is calculated, suppose an oblast had service responsibilities in education that exceeded the average by ten per cent. If education expenditures accounted for thirty per cent of total oblast expenditures, the oblast in question would experience a need for higher per capita expenditures of 3.33 per cent compared to the average amount of per capita spending. Similar calculations would apply for other functional areas and their sum would provide an index of how much total per capita expenditure needs deviated from the average for a particular oblast.

A more complete explanation of the methodology for calculating the index is found in part A of the accompanying appendix. The results of applying this methodology are shown in the first column of Table II. Oblasts such as Zhytomyrska and Kyivska have expenditure needs that are slightly greater than ten per cent of the average while, by contrast, the Odeska oblast has expenditure needs that are only eighty-four per cent of the average.

An interesting, though perhaps not obvious, property of the index is that it implicitly takes into account the presence of differing amounts of social assets in various oblasts. Social assets represent the education, health and housing services provided by State owned enterprises which are close, if not perfect, substitutes for similar kinds of services delivered by the local public sector. To the extent an oblast is well endowed with social assets, its observed service responsibilities will be below average and its index value of expenditure needs will be less than one.

THE INDEX OF RELATIVE SERVICE COSTS (IRSC)

In Ukraine, as in other countries, the relative costs of providing public services differs noticeably between urban and rural areas and, to a lesser extent, among different sized communities within these areas. Just as service responsibilities differ to some extent among oblasts, they also vary within an oblast. Large urban areas, for example, have greater service responsibilities than smaller urban and rural areas and typically require greater per capita fire fighting capacity, social protection, transportation and trash removal services. Moreover, the inputs, and therefore the input costs, needed to satisfy these needs also vary on a per capita basis as between rural and urban areas and among communities of different size and population density. Large cities, for example, ordinarily require more sophisticated and expensive refuse removal and fire protection equipment than either smaller cities or rural areas.

These generalizations about relative cost patterns are supported by the available expenditure data in Ukraine. The data reveal that per capita education spending is higher in rural than in urban areas. However, per capita health and social protection spending are consistently higher in urban areas and, considering all types of spending, average per capita spending in cities exceeds that in rural areas by 30-40 per cent as can be seen in Charts I and II which include all oblasts except the cities of Kiev and Sevastopol. These charts also indicate that per capita spending is consistently higher than average in smaller rural communities and that per capita spending among cities is positively related to city size.

Building on these observed cost relationships, it is possible to construct an index of the relative cost of public service provision for different oblasts in Ukraine. An oblast's expenditure needs is viewed as the collection of the separate expenditure needs of its constituent rayons and cities and is expressed as the differential cost of supplying an average level of public services. If the value of the index is for a particular oblast were 1.2, for example, this oblast would have a

demographic structure requiring a level of per capita expenditure that is 20 per cent higher than the average per capita expenditure in order to provide an average level of public services. Over all oblasts, the average value for this index is one since, if some oblasts exhibit above-average expenditure needs, others, necessarily, must have below-average expenditure needs.

TABLE II
INDEX OF OBLAST EXEPNDITURE NEEDS

Oblasts	*Service Index (IRSR)*	*Cost Index (IRSC)*	*Index of Expenditure Needs (IRSC*IRSR)*
Aut.Rep. of Crimea	0.988	0.972	0.960
VINNYTSKA	1.096	0.924	1.013
VOLYNSKA	1.004	0.951	0.955
DNIPROPETROVSKA	1.017	1.091	1.110
DONETSKA	0.968	1.097	1.062
ZHYTOMYRSKA	1.127	0.945	1.065
ZAKARPATSKA	1.075	0.858	0.922
ZAPORIZKA	0.972	1.034	1.005
IVANO-FRANKIVSKA	0.962	0.905	0.871
KYIVSKA	1.114	0.924	1.029
KIROVOHRADSKA	1.067	0.983	1.049
LUHANSKA	0.946	1.028	0.972
LVIVSKA	0.981	0.952	0.934
MYKOLAIVSKA	0.949	1.028	0.976
ODESKA	0.864	1.028	0.888
POLTAVSKA	1.020	0.984	1.004
RIVNENSKA	0.990	0.917	0.908
SUMSKA	0.952	0.986	0.939
TERNOPILSKA	1.037	0.897	0.930
KHARKIVSKA	0.990	1.071	1.060
KHERSONSKA	1.048	0.981	1.028
KHMELNYTSKA	0.928	0.930	0.863
CHERKASKA	0.955	0.951	0.908
CHERNIVETSKA	0.936	0.919	0.860
CHERNIHIVSKA	1.188	0.955	1.135
CITY OF KYIV	1.009	1.511	1.525
CITY OF SEVASTOPOL	0.979	1.160	1.136
			Average = 1

Because average per capita expenditure in cities is observed to be significantly higher than that for rural rayons, the most important property of this index is that, if an oblast has an urban population that is proportionately higher than that for the whole country, its per capita expenditure needs will be higher than average and its index value will be greater than one. Conversely, predominantly rural oblasts will have below-average expenditure needs and an index value of less than one. Moreover, an oblast will also have higher than average costs of service provision if its size composition is such that it contains a higher than average proportion of relatively high cost communities such as large urban areas or small rural localities. If, on the

other hand, an oblast's size composition exactly mirrored that of the entire country, this factor would have no influence on the value of its cost index.

Based on the data presented in Charts I and II, and supplemented by expenditure data for the cities of Kiev and Sevastopol, the relative cost index for different oblasts in Ukraine is given in the second column of Table II. The values for the index confirm the preceding statements about the properties of the index. Heavily urbanized oblasts have index values exceeding one while rural oblasts have values less than one. Most oblasts have index values that fall within the range of plus and minus ten per cent of the average value of one. Zakarpatska has the lowest index value, .86, while the city of Kiev has the highest value of 1.51. The city of Kiev has a relatively high index value because it is by far the largest city in Ukraine and it carries special expenditure burdens because of its status as the country's capital city.

For those wishing more details, an appendix is attached to this note showing the exact form of this cost index, the structure of oblast populations, the costs differentials that were used in constructing the index values, and a small numerical illustration of how the index is to be calculated.

THE INDEX OF RELATIVE EXPENDITURE NEEDS

An oblast's per capita expenditure needs, relative to the average, reflect the interaction of the oblast's values for the indices of relative service responsibility and relative service cost. The product of these two indices determines the index of relative expenditure needs, as shown in the final column of Table II. An index value greater than one indicates above average expenditure needs. Conversely, an index value less than one signal below average expenditure needs.

The index ranges in value between 1.51 in the city of Kiev and .86 in the Khmelnytska oblast. Most oblasts, however, fall within the range of .9 and 1.1. In a number of cases, a relatively high value for one index is offset by a relatively low value of the other index. In Zhytomyrska, for example, higher than average service responsibilities sufficiently outweigh a below average cost structure to give the oblast higher than average expenditure needs.

TABLE III
POPULATION STRUCTURE OF OBLASTS

	Oblast	Population			Total share of population	
		by rayons	by cities	total	Rayons	Cities
1	**CRIMEAN REPUBLIC**	972.2	1162.5	2134.7	0.455	0.545
2	**VINNYTSKA**	1333.7	497.8	1831.5	0.728	0.272
3	**VOLYNSKA**	674.9	389	1063.9	0.634	0.366
4	**DNIPROPETROVSKA**	941.4	2803.6	3745	0.251	0.749
5	**DONETSKA**	752.3	4255.6	5007.9	0.150	0.850
6	**ZHYTOMYRSKA**	934.8	510.7	1445.5	0.647	0.353
7	**ZAKARPATSKA**	1071.7	215.7	1287.4	0.832	0.168
8	**ZAPORIZKA**	760.2	1263.6	2023.8	0.376	0.624
9	**IVANO-FRANKIVSKA**	1022	438.6	1460.6	0.700	0.300
10	**KYIVSKA**	1222	627.6	1849.6	0.661	0.339
11	**KIROVOHRADSKA**	698.1	485.7	1183.8	0.590	0.410
12	**LUHANSKA**	761.3	1912.5	2673.8	0.285	0.715
13	**LVIVSKA**	1532.3	1196.3	2728.6	0.562	0.438
14	**MYKOLAYIVSKA**	611.4	698.5	1309.9	0.467	0.533
15	**ODESKA**	1209.4	1319.2	2528.6	0.478	0.522
16	**POLTAVSKA**	974.5	718.6	1693.1	0.576	0.424
17	**RIVNENSKA**	850.5	339.8	1190.3	0.715	0.285
18	**SUMSKA**	685.8	668.7	1354.5	0.506	0.494
19	**TERNOPILSKA**	928.6	235.3	1163.9	0.798	0.202
20	**KHARKIVSKA**	1174	1823.9	2997.9	0.392	0.608
21	**KHERSONSKA**	717.7	519.4	1237.1	0.580	0.420
22	**KHMELNYTSKA**	979.3	494.7	1474	0.664	0.336
23	**CHERKASKA**	904.5	559.2	1463.7	0.618	0.382
24	**CHERNIVETSKA**	677.2	258.2	935.4	0.724	0.276
25	**CHERNIHIVSKA**	841.4	461.5	1302.9	0.646	0.354
26	**KYIV**		2626.5	2626.5		1.000
27	**SEVASTOPOL**		391.7	391.7		1.000
	Total	23231	26874	50106	0.464	0.536

CHART I

Data Rayon

Population strata	less than 30 thou	30-55 thou	55-75 thou	over 75 thou
Per capita expenditure1997	199	174	167	162
Average per capita expenditure 1997	172	172	172	172
Per capita expenditure 1998	176	162	154	151
Average per capita expenditure 1998	159	159	159	159
Population share 1998	***0.10***	***0.41***	***0.26***	***0.23***

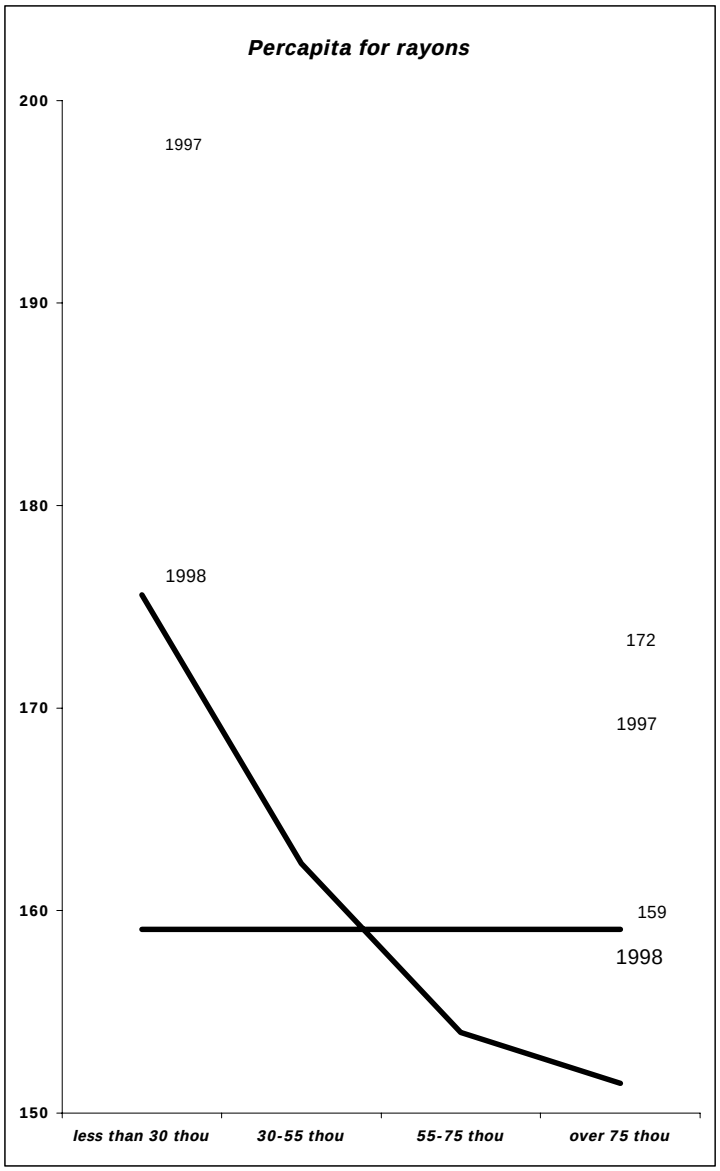
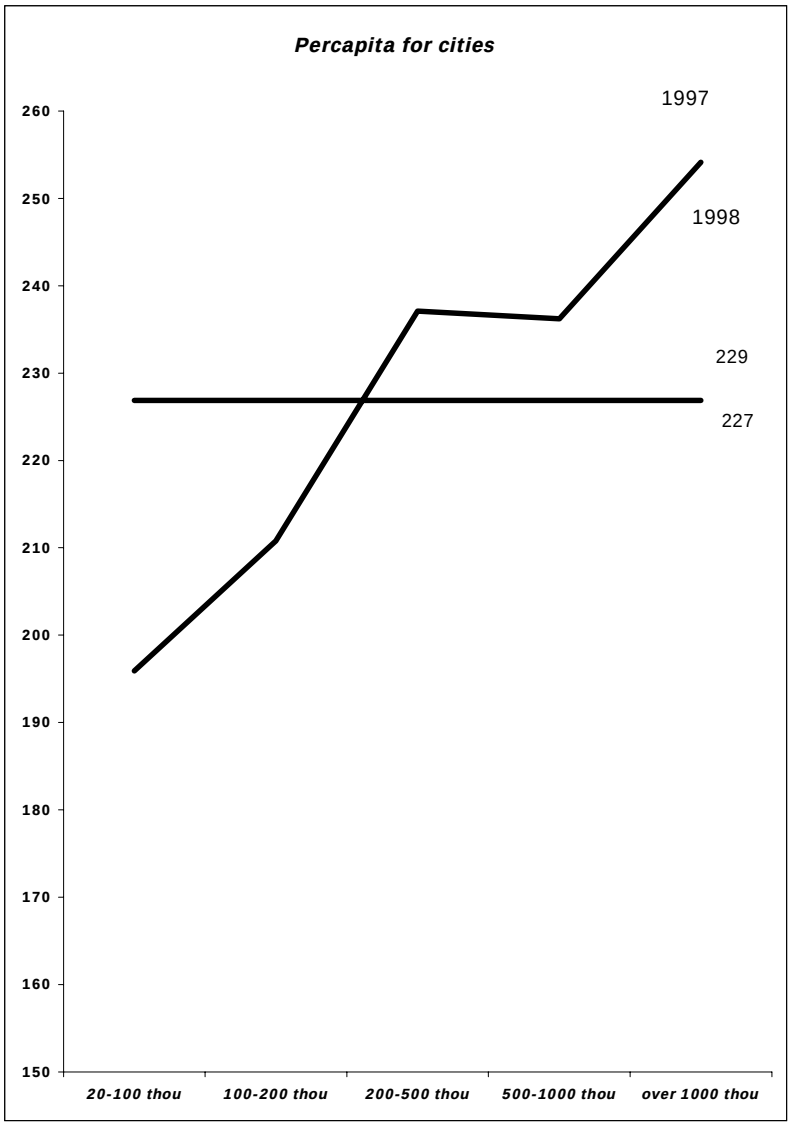


CHART II

Data City

Population strata	less than 20 thou	20-100 thou	100-200 thou	200-500 thou	500-1000 thou	over 1000 thou
Per capita expenditure1997	179	205	211	236	235	259
Average per capita expenditure 1997	229	229	229	229	229	229
Per capita expenditure 1998	206	196	211	237	236	254
Average per capita expenditure 1998	227	227	227	227	227	227
Population share 1998	***0.01***	***0.23***	***0.14***	***0.26***	***0.17***	***0.20***



APPENDIX

A. Mathematical Form of the Service Responsibility Index (IRSR)

$$\text{IRSR} = \sum_{j=1}^{j=4} \Phi j(Xj / X^*) = 1 + \sum_{j=1}^{j=4} \Phi j(Xj - X^*)/ X^* \quad \text{where}$$

Xj = value of the j'th expenditure need indicator in a particular oblast; j=1..4,
X* = average value of the j'th expenditure need indicator in all oblasts;

$\Phi j =$ expenditure share of the j'th expenditure category in total oblast expenditures; $\sum_{j=1}^{j=4} \Phi j = 1.$

Expenditure needs indicators were defined for the expenditure categories of education, health, social protection and "other". Oblast indicators of these expenditure needs are those shown in Table I except for "other" expenditures which are assumed to be uniform across oblasts. Expenditure shares were derived from executed budget data for 1998. In that year the shares for education, health, and social protection were .23,.22 and .17 respectively.

Because the expenditure shares sum to one, if an oblast has average values for all of the expenditure need indicators the value of its index will also be one, indicating that the oblast has average expenditure needs. On the other hand, if the expenditure need indicators differ from the average for an oblast, the index will be either greater or lesser than unity by an amount that reflects the extent of the departure from the average and the value of the expenditure share for the indicator. However, for all oblasts the average value of the index is unity since the index is a weighted sum of the deviations from the mean where the weights themselves also sum to one.

B. Mathematical Form of the Cost Index (IRSC)

$$IRSC = \frac{E_i}{E^*} = \frac{1 + v(P_{ui} / P_i) + \sum_j f_{uj} g_{uj}(P_{ui} / P_i) + \sum_j f_{rj} g_{rj}(P_{ri} / P_i)}{1 + v(P_u^* / P^*)}$$

In this index, the important cost parameter "v" measures the relative difference between average city and average rayon per capita expenditure: $E_u^*/E_r^* = (1 + v)$. Charts I and II suggest that the value for "v" is on the order of 30-40 per cent. Other variables included in this index are defined in the following way:

P_{ui}/P_i = proportion of the i'th oblast's population residing in cities;
P_{ri}/P_i = proportion of the i'th oblast's population residing in rural communities;
P_u^*/P^* = proportion of the urban population in Ukraine;
f_{ui} = proportion of an oblast's urban population living in different size strata;
f_{ri} = proportion of an oblast's rayon population living in different size strata;
g_{uji} = per cent deviation of the j'th urban stratum from average per capita urban spending;

g_{rj} = per cent deviation of the j'th rayon stratum from average per capita rayon spending.

If the last two terms in the numerator of this index are, for the moment, ignored, the index states that, if an oblast has an urban population that is proportionately higher than that for the whole country, its per capita expenditure needs will be higher than average and the value of its index will exceed unity. Conversely, predominantly rural oblasts will have expenditure needs that are below average and an index value of less than one.

A simplified index that ignored the last two terms, however, would fail to distinguish among the different per capita cost structures that characterize different sized urban and rural communities. In this case, the index would assign identical values to two oblasts with the same degree of urbanization even though one of them might have only one large city and predominantly small rural communities. Charts I and II indicate that such an oblast would have higher relative expenditure needs than the other. The last two terms in this index, therefore, attempt to correct for this potential distortion by taking into account the size composition of rural and urban communities in a particular oblast compared to the average size composition of these communities for the whole country. Each of these terms, when summed over all oblasts, will add to zero.

C. Numerical Example of the Cost Index

Table I provides a numerical example of how the relative cost index is to be calculated. In this example, there are three oblasts, A, B, and C, each with a different population profile spread among three population strata. Oblast A is relatively rural in character while oblast B has a relatively strong urban orientation. Oblast C, on the other hand, has a relatively balanced mixture of population residing in cities and rural rayons but a preponderance who live in relatively low cost cities and rayons.

The standard or average cost curves for rayons and cities are constructed from the information shown in part (b) of this table, where the middle population stratum is assumed to have average costs for both rayons and cities. Given this assumption, the sum of the cost deviations from the average for the other two strata in each group, weighted by each strata's population share, must necessarily add to zero. Thus, with equal population shares in each stratum, if the third rayon stratum is assumed to have average per capita costs 20 per cent below average, the first stratum must have average per capita costs 20 per cent above average. Similarly, if the third city stratum has per capita costs that are 30 per cent above average, the first stratum must have weighted average per capita costs that are 19 per cent below average (.47x (-.19) + .27x (.3) = 0)

Table I

Numerical Example of Relative Cost Index Calculation

(a) Population Structure

Oblast	Rayons				Cities			
	Population Strata			Sum	Population Strata			Sum
	1	2	3		1	2	3	
A	50	30	10	90	10	-	-	10
B	-	10	-	10	20	30	40	90
C	--	10	40	50	40	10	--	50
	50	50	50	150	70	40	40	150

(b) Population and Cost Parameters of the Standard or Average Cost Curve (f_j, population shares by strata; g_j, proportional cost deviations from the average cost by strata)

	Rayons			Cities		
Strata	1	2	3	1	2	3
f_j (all oblasts)	.33 (50/150)	.33 (50/150)	.33 (50/150)	.47 (70/150)	.27 (40/150)	.27 (40/150)
g_j (all oblasts)	.20	0	-.20	-.19	0	.30

(c) Index of Relative Service Costs (assuming 'v', average city to rayon per capita costs, is .5)

Oblast	City Population Share	Relative Cost Index
A	10%	.89
B	90%	1.24
C	50%	.87

If the ratio of average city to average rayon service cost is assumed to be one and a half, the relative cost index can be determined for each oblast, using each oblast's unique population structure and the information about how each strata's average costs of service provision vary around the average. The exact procedure for calculating the index in the case of oblast A is shown below:

Oblast A's cost index:

$$1 + .5\,(.1) + (.56\,(.2) + .11\,(-.2))\,(.9) + (1\,(-.19))\,(.1)/\,(1+.5\,(.5)) / 1.25 = 1.12 / 1.25 = .89$$

The results of applying the formula for the index of relative service cost for the other oblasts is shown in part (c) of the preceding table. Oblasts A and C have below average costs of service provision, oblast A because it has a predominantly rural population and oblast C because both its city and rural populations have below average costs in terms of size structure. Oblast B, by comparison, has above average costs of service provision because of its urban nature and the

concentration of its urban population in large cities. Note, furthermore, that the average of the sum of these indices is unity.

This example also illustrates the potential importance of taking the size composition of different communities into consideration. If, for example, that dimension of expenditure need were ignored in the calculation, the index values for oblasts A, B and C would become, respectively, .84, 1.16 and 1. Clearly, omission of this factor would seriously exaggerate the expenditure needs of oblast C and understate those of oblast B.

D. Splicing the cities of Kiev and Sevastopol to Charts I and II

To obtain a comprehensive profile of oblast expenditure needs, it is necessary to graft expenditure data for the cities of Kiev and Sevastopol onto the data displayed in charts I and II for the other 25 oblasts. In 1997 Kiev city, for example, had per capita expenditures that were 69 per cent higher than the average amount of spending in all other Ukrainian cities.

This figure is somewhat misleading, however, because the city of Kiev carries out a number of expenditure duties that are the responsibility of oblast level administrations in other oblasts. In order to make the city of Kiev comparable to other cities, the per capita spending of Kiev should be purged of its oblast level functions. Other data suggest that oblast level administrations, on average, account for about 25 per cent of oblast consolidated expenditures. Because of its spatially compact nature, a value of less than 25 per cent may be more appropriate for Kiev. A figure of 19 per cent may be a more accurate reflection of Kiev's oblast level expenditure and, on that assumption, the per capita spending of Kiev was reduced from 415 to 336 Hryvnia.

With this adjustment for Kiev, and a similar one for Sevastopol, the revised amount of average per capita spending in all cities becomes 239.6 Hryvnia. Per capita expenditure in Kiev then becomes forty per cent higher than this average (336/239.6=1.4). This value is incorporated in the measurement of cost differentials discussed in the next part of this appendix.

E. Cost Differentials Used to Construct the Cost Index

If data on per capita spending in the cities of Kiev and Sevastopol are used to supplement the information on per capita spending shown in charts I and II, the following expenditure profiles are obtained:

	1997	**1998**
Average per capita city expenditure:	239.6	250
Average per capita rayon expenditure:	172	159
Average per capita city relative to average per capita rayon expenditure: (cost parameter "v")	.39	.57

For purposes of calculating the cost index, the 1997 value of the cost parameter "v" of .39 was chosen because it is less extreme than that observed in 1998. Cost differentials for different sized rayons and cities are based on charts I and II where the city costs have been revised to include Kiev and Sevastopol:

Percentage Deviation from the average cost for rayons (cost parameter "g")

Stratum (1000's)	**less than 30**	**30-54**	**55-75**	**more than 75**
Per cent cost differential	17	0	-3	-5

Percentage Deviation from the average cost for cities (cost parameter "g")

Stratum (1000's)	**less than 20**	**20-99**	**100-199**	**200-499**	**500-1000**	**1001-2000**	**more than 2000**
Per cent cost factor	-18	-16	-11	-1.5	-1.5	7	40

Note that there is only one city in the last cell of this table, Kiev, which has a population of 2.6 million, nearly twice as much as the next largest city, Kharkiv.

D. Population Structure of Ukrainian Oblasts

TABLE D-1
POPULATION STRUCTURE OF OBLASTS: RAYONS

	Oblast	Populations by rayons					Share of population by rayons				
		< 30	30-54	55-75	>75	Total	< 30	30-54	55-75	>75	Total
1	CRIMEAN REPUBLIC		189.2	189.8	593.2	972.2	0.00	0.19	0.20	0.61	1.00
2	VINNYTSKA	112.8	548.8	594.4	77.7	1333.7	0.08	0.41	0.45	0.06	1.00
3	VOLYNSKA	100.3	333.9	240.7		674.9	0.15	0.49	0.36	0.00	1.00
4	DNIPROPETROVSKA	129.1	526.9	128.8	156.6	941.4	0.14	0.56	0.14	0.17	1.00
5	DONETSKA	120.7	268.9	172.4	190.3	752.3	0.16	0.36	0.23	0.25	1.00
6	ZHYTOMYRSKA	77.6	662	195.2		934.8	0.08	0.71	0.21	0.00	1.00
7	ZAKARPATSKA	27.2	113.4	131.4	799.7	1071.7	0.03	0.11	0.12	0.75	1.00
8	ZAPORIZKA	149	362	169.1	80.1	760.2	0.20	0.48	0.22	0.11	1.00
9	IVANO-FRANKIVSKA		85	460.9	476.1	1022	0.00	0.08	0.45	0.47	1.00
10	KYIVSKA	85.1	572.7	334.8	229.4	1222	0.07	0.47	0.27	0.19	1.00
11	KIROVOHRADSKA	200.6	443.1	54.4		698.1	0.29	0.63	0.08	0.00	1.00
12	LUHANSKA	145.2	267	179.3	169.8	761.3	0.19	0.35	0.24	0.22	1.00
13	LVIVSKA		203.1	390.6	938.6	1532.3	0.00	0.13	0.25	0.61	1.00
14	MYKOLAYIVSKA	242.8	311.9	56.7		611.4	0.40	0.51	0.09	0.00	1.00
15	ODESKA	92.3	516.4	424.7	176	1209.4	0.08	0.43	0.35	0.15	1.00
16	POLTAVSKA	223.8	443.2	307.5		974.5	0.23	0.45	0.32	0.00	1.00
17	RIVNENSKA	16.9	386.9	258.3	188.4	850.5	0.02	0.45	0.30	0.22	1.00
18	SUMSKA	130.7	427.7	127.4		685.8	0.19	0.62	0.19	0.00	1.00
19	TERNOPILSKA	23.7	287.3	383.4	234.2	928.6	0.03	0.31	0.41	0.25	1.00
20	KHARKIVSKA	257.1	345.1	111.9	459.9	1174	0.22	0.29	0.10	0.39	1.00
21	KHERSONSKA	169.4	216.3	332		717.7	0.24	0.30	0.46	0.00	1.00
22	KHMELNYTSKA	26.5	433	443	76.8	979.3	0.03	0.44	0.45	0.08	1.00
23	CHERKASKA	85.9	571.6	166.4	80.6	904.5	0.09	0.63	0.18	0.09	1.00
24	CHERNIVETSKA	24.9	79.4	390.7	182.2	677.2	0.04	0.12	0.58	0.27	1.00
25	CHERNIHIVSKA	127	522.6	191.8		841.4	0.15	0.62	0.23	0.00	1.00
	Total	2568.6	9117.4	6435.6	5109.6	23231.2	0.11	0.39	0.28	0.22	1.00

TABLE D-2
POPULATION STRUCTURE OF OBLASTS: CITIES

	Oblast	Populations by cities								Share of population by cities							
		<20	20-99	100-200	200-500	500-1000	>1000	>2000	Total	<20	20-99	100-200	200-500	500-1000	>1000	>2000	Total
1	CRIMEAN REPUBLIC		234.1	566.6	361.8				1162.5	0.00	0.20	0.49	0.31	0.00	0.00		1.00
2	VINNYTSKA		108.3		389.5				497.8	0.00	0.22	0.00	0.78	0.00	0.00		1.00
3	VOLYNSKA		171.1		217.9				389	0.00	0.44	0.00	0.56	0.00	0.00		1.00
4	DNIPROPETROVSKA		361.5	279.1	279	756.9	1127.1		2803.6	0.00	0.13	0.10	0.10	0.27	0.40		1.00
5	DONETSKA	52.6	963	662.1	986.1	516.5	1075.3		4255.6	0.01	0.23	0.16	0.23	0.12	0.25		1.00
6	ZHYTOMYRSKA		213.2		297.5				510.7	0.00	0.42	0.00	0.58	0.00	0.00		1.00
7	ZAKARPATSKA		89.1	126.6					215.7	0.00	0.41	0.59	0.00	0.00	0.00		1.00
8	ZAPORIZKA		100.6	304.7		858.3			1263.6	0.00	0.08	0.24	0.00	0.68	0.00		1.00
9	IVANO-FRANKIVSKA		186.4		252.2				438.6	0.00	0.42	0.00	0.58	0.00	0.00		1.00
10	KYIVSKA	24.4	388.3		214.9				627.6	0.04	0.62	0.00	0.34	0.00	0.00		1.00
11	KIROVOHRADSKA		97.6	111.1	277				485.7	0.00	0.20	0.23	0.57	0.00	0.00		1.00
12	LUHANSKA		465.2	933.9		513.4			1912.5	0.00	0.24	0.49	0.00	0.27	0.00		1.00
13	LVIVSKA		278.3	102.5		815.5			1196.3	0.00	0.23	0.09	0.00	0.68	0.00		1.00
14	MYKOLAYIVSKA	18.8	167.3			512.4			698.5	0.03	0.24	0.00	0.00	0.73	0.00		1.00
15	ODESKA	10.2	288.8				1020.2		1319.2	0.01	0.22	0.00	0.00	0.00	0.77		1.00
16	POLTAVSKA		164.4		554.2				718.6	0.00	0.23	0.00	0.77	0.00	0.00		1.00
17	RIVNENSKA	14	81.1		244.7				339.8	0.04	0.24	0.00	0.72	0.00	0.00		1.00
18	SUMSKA		267.1	101.5	300.1				668.7	0.00	0.40	0.15	0.45	0.00	0.00		1.00
19	TERNOPILSKA				235.3				235.3	0.00	0.00	0.00	1.00	0.00	0.00		1.00
20	KHARKIVSKA		313.7				1510.2		1823.9	0.00	0.17	0.00	0.00	0.00	0.83		1.00
21	KHERSONSKA		123		396.4				519.4	0.00	0.24	0.00	0.76	0.00	0.00		1.00
22	KHMELNYTSKA		125.4	108.3	261				494.7	0.00	0.25	0.22	0.53	0.00	0.00		1.00
23	CHERKASKA		249.8		309.4				559.2	0.00	0.45	0.00	0.55	0.00	0.00		1.00
24	CHERNIVETSKA				258.2				258.2	0.00	0.00	0.00	1.00	0.00	0.00		1.00
25	CHERNIHIVSKA		151.6		309.9				461.5	0.00	0.33	0.00	0.67	0.00	0.00		1.00
26	KYIV							2626.5	2626.5								
27	SEVASTOPOL				391.7				391.7								
	Total	120.0	5588.9	3296.4	6536.8	3973.0	4732.8	2626.5	26874.4	0.00	0.21	0.12	0.24	0.15	0.18	0.10	1.00