Conflict Between Horizontal Equity and Maximum Poverty Reduction, How Best to Allocate Funds to Regions:

An Empirical Analysis

BRANKO MILANOVIC

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I. Introduction: Setting the Problem

One of the problems often encountered in poverty alleviation is the disjunction between the extent of poverty (measured for example by the headcount ratio) and the ability to alleviate poverty, which depends on the amounts of available funds and the efficiency of their use. While the problem is a common one at the level of countries (poor countries obviously lack resources to "solve" their poverty problems), it has recently attracted greater attention at the subnational level where in principle it should be solvable. [1]

In practice, the allocation of funds is often made by the central government to the regional governments as a function of their estimated "needs" (number of the poor in a given region). The allocations can, for example, take the form of block grants. If the ability to target were equal across the regions such an allocation would make sense: it would ensure horizontal equity (poor in different regions are treated equally), and the overall reduction in nationwide poverty would be the largest possible given the funds and the efficiency of targeting. The problems arise however when the efficiency of targeting varies between regions. We can illustrate the problem very simply if take the extreme case of two regions, one very poor (A), another relatively rich (B), having each, for simplicity, the same total population. Horizontal equity requires that the poor region get more funds than the rich, in exact proportion in which their headcounts differ. But, let us suppose that all the funds given to A "leak": none is paid to the poor, while the funds given to B are used with some reasonable efficiency. Then clearly, from the nationwide point of view, poverty alleviation can be improved if fewer funds are given to the poor region and more funds to the rich.

However, having the allocation of funds depend on efficiency only will not be optimal either. To see why, consider the following example using again our two regions A and B. The only difference from the previous example is that B is populationwise a very small region. Its poverty efficiency is excellent (targeting is, say, 100 percent). But allocating all the money to B alone may not make sense if the funds are more than sufficient to alleviate all poverty in B. Region B would then either have to spend it on the nonpoor (thus intentionally reducing its efficiency) or to remit the funds back

1. The reason why even in principle it is not solvable at the global level, is that there is no agency (world government) whose objective function would be to reduce world poverty and which would have taxation power.

to the center. Therefore, the correct allocation formula must take into account both factors: the regional poverty measures, and the efficiency of fund use. If efficiency were to increase with poverty rates, then both factors would "push" us toward greater allocation of funds to the poorer regions. But, more often, we may find that leakage of funds is greater in poorer regions, and thus there is a tradeoff between the two factors: greater poverty in poor regions, and lower efficiency of fund use there. In other words, we have a conflict between (the narrowly defined) horizontal equity, [2] and the objective of maximum poverty reduction. [3]

II. The Model

Consider the following problem. There are central funds (transfers) that have to be allocated between different provinces so that the poor provinces (with higher poverty headcounts) receive more.[4] But assume too that efficiency in the use of money (targeting of the poor) is weaker in poor provinces.[5] There is then a clear tradeoff. If the objective of the central government is minimization of poverty (or maximization of the disbursement to the poor), then the two effects pull in different directions. It is no longer optimal to distribute the funds in relation to the number of poor people per province only.

Let the center's objective function be to maximize the number of the poor who are helped. This can be written as:

$$\max \sum_i e_i \Pi_i \qquad (1)$$

where ; • i=number of the poor in region *i*, and e_i=percentage of the poor in region *i* who are reached by transfers. Obviously, other objective functions can be considered, e.g., total disbursement to the poor. Then, • i would be the poverty gap, and e_i would be the percentage of transfers which reduce the poverty gap.[6] The formulation with the poverty headcount, which we use here, is the simplest.

2. The qualifier "narrowly defined" is needed because at the *optimum* the probability that a poor person will be helped will have to be the same across all regions—after taking into account differential targeting efficiency. The fact the poor in poorer regions will be "penalized" is thus, as it were, "endogenized."

3. In a seminal paper, Ravallion (1998) defines precisely the same problem and applies the methodology to estimate the results of Argentina's *Trabajar* program. In Ravallion (1999), in contrast to our assumption here, the performance of the regions in reaching the poor is also unobserved; hence, the need to use proxies in order to gauge the performance.

4. Terms "province" and "region" are used interchangeably.

5. This may be because poorer provinces have weaker information on who is poor, or because high incidence of poverty alone makes targeting less precise (Ravallion 1999a, 374).

6. This is the standard (Beckermann's) definition of targeting efficiency.

The percentage of poor who are reached by transfers depends, in turn, on (1) the amount of transfers T_i relative to the needs, that is on relative transfers $t_i=T_i/ \bullet_i$, and (2) the efficiency of their use ($\bullet_i$) where $\bullet_{is}$ the percentage of total transfers is received by the poor. Thus (1) becomes

$$\max_{Ti} \sum_i f(\frac{T_i}{P_i}, ei) P_i \qquad (2)$$

subject to total amounts of funds (T) being given: $T = \sum_i T_i$.

The efficiency ε that we have assumed to be province-specific may vary in function of certain characteristics of the region (e.g., be better in regions with a lower poverty headcount), and even in function of relative transfers, i.e., marginal efficiency of fund use may decline with the amount of transfers. We thus obtain the final expression:

$$\max \sum_i f\left[\frac{T_i}{P_i}, ei(\frac{Pi}{P_i}, \frac{T_i}{P_i})\right] P_i \qquad (3)$$

where $\bullet_i / P_i$ = regional poverty headcount,

subject to the same condition as above.

Writing relative regional spending as $t_i=T_i/ \bullet_i$, and regional headcount $hi= \bullet_i/P_i$, the last equation and the fund-exhaustion condition simplify

$$\max_{ti} \sum_i f[t_i, ei(h_i, t_i)] P_i + (T - \sum_i t_i P_i) \qquad (4)$$

where all the variables except t_i are given.

The conditions for maximization then become

$$\frac{dL}{dt_i} = [f'_{ti} + f'_{ei} ei'_{ti}] P_i - \bullet \bullet_i = 0 \qquad (5)$$

$$\frac{dL}{dl} = T - \sum_i t_i P_i = 0 \qquad (6)$$

At the optimum,

$$f'_{ti} + f'_{ei} e_i'_{ti} = l \qquad (7)$$

that is, the number of poor who are reached out of *marginal* dollar spent on social assistance must be equal across the provinces and in turn equal to the tightness of the budget constraint ($\bullet$). [7]

7. In other words, the marginal return (number of poor people helped) per last dollar spent on social assistance in each province is equal.

In equation (7), the first term on the left-hand side or LHS (f'_{ti}) shows the change in the number of poor who are helped as the relative amount of funds increases infinitesimally, while the second term shows the change in the number of poor who are helped as efficiency itself changes (due to an increase in transfers). We may expect efficiency to decrease with the amount of transfers. This is, as Ravallion (1999a, 375) writes, an empirical question. Lanjouw and Ravallion (1999), for example, find for several social programs in India that the nonpoor tend to capture the early benefits, and thus that targeting improves with higher spending. Differently, we may expect that if funds were limited they would be more likely used to help the very poor first. As the funds become more abundant, social assistance can be used to help both the poor and near-poor, and the efficiency of fund use decreases. Finally, if we assume that efficiency does not change with the amount of relative transfers but simply differs between the poor and the rich regions (see Figure 1), then the second term in equation (7) disappears.[8] If that is the case, then equation (7) cannot be satisfied for the obvious reason that the regional f'_{ti} will be throughout the relevant range different. It is then optimal to keep the disbursements on to the region that is more efficient in terms of targeting until the last poor person there has been reached. Only after that point should one start with disbursement to the less efficient region.

In the example given in Figure 1, the rich region will receive transfers until all of its poor people have been helped. Only after that point (and if any transfers remain, that is, if T is not exhausted) would it make sense to transfer funds to the poor region. This outcome is simply the product of the fact that, if efficiency in one region is permanently higher than in another, the "bang for the buck" from the national perspective will always be greater in a more efficient region. If each dollar spent reaches five poor people in the rich region and four in the poor region, it is optimal to give money to the rich region until all of its poor have been helped.

But if efficiency ($\bullet$) varies in function of relative transfers (t), a more general and probably realistic assumption, the optimum, which involves positive transfers to both regions, will obtain at the point where the value of the efficiency function is the same for both regions *and* is consistent with

8. The first term however would be high in a rich region, which is by assumption efficient in assistance delivery, and low in a poor region.

the fund exhaustion rule. For example, in Figure 2, that point will be reached at $\bullet = \bullet_1$, which yields regional spending per poor person of t_1 in poor region and t_2 in rich region.

Figure 1. **Constant Efficiency (•)**

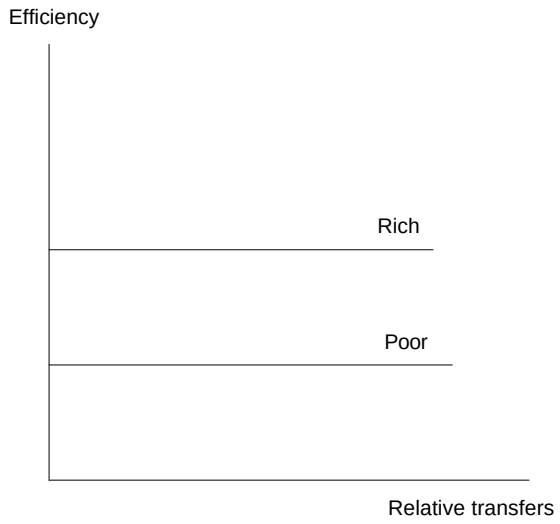
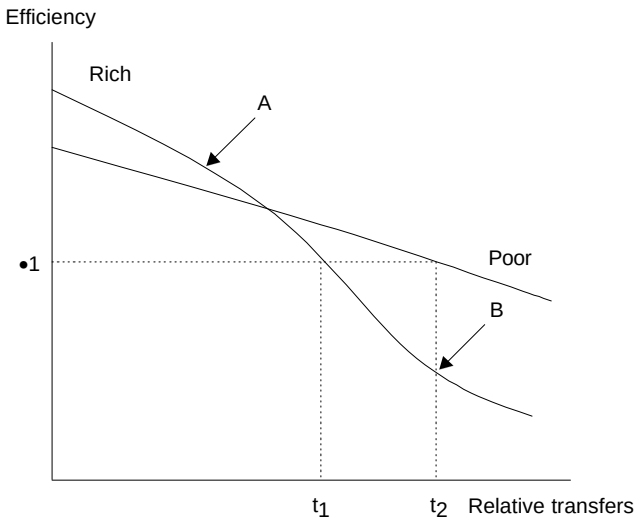


Figure 1. **Efficiency as a Function of Rleative Transers**



III. Moving from the Model to Empirical Analysis

In the empirical analysis where we have survey data for one year per country, we can observe only one point on the efficiency function (like point A in Figure 2) for each region. We cannot observe how efficiency varies with the amount of relative transfers, because the transfers by region are given. This means that we do not observe the true marginal effects of transfers on poverty alleviation by region (the derivative of *f* with respect to t_i), but the average effect. Of course, if we had data for several years, we could observe (keeping the poverty line constant), how efficiency varies as relative transfers change. We would then observe different points such as A which would—if their number is sufficiently large—enable us to chart out the efficiency function for a region. If we then had such efficiency functions for all regions we could easily determine the optimal allocation of funds.

But we can, with some ingenuity, chart out the efficiency curve even when we have one-shot data. We do that by "bootstrapping" our data. The level of transfers to each region is, of course, given, and we cannot change it. But if we cannot change transfers while keeping the poverty line fixed, we can do the reverse: vary the poverty line and thus change the denominator $t=T/\Pi$ on the horizontal axis. With a given poverty line, we obtain a certain number of the poor, a certain amount

of transfers per poor person (value on the horizontal axis), and a certain value for the percentage of funds that are distributed to the poor • on the vertical axis. We thus obtain a point such as A. Let us now lower the poverty line. There are fewer poor people, transfers per poor person are greater (we move rightward on the horizontal axis),[9] and we can calculate what percentage of the funds have been used to help the poor—that is, we obtain both a new *t* and a new • (point B in Figure 2). By varying the poverty line, we thus "bootstrap" our information, and can see how the percentage of the poor who are assisted (efficiency) varies in function of relative transfers. We chart out the efficiency function for each individual region.

This is what we shall do in the next section using household survey data from six countries.

IV. What Explains Regional Efficiency in Allocation of Welfare?

We do this exercise using household survey data from six East European countries. The HEIDE database created in the World Bank Development Research Department has already been used in a study of poverty and social assistance efficiency (Braithwaite, Grootaert, and B. Milanovic 1999). The database contains standardized household-level and individual-level data in STATA format, for nine transition economies for the years 1993-1995 (except for Latvia, which is 1997-1998). We use data from Bulgaria, Poland, Hungary, and Slovakia in Eastern Europe, and Estonia and Latvia from the former Soviet Union.[10] In all cases the regional dimension essential for this type of work is sufficiently disaggregated. For example, the Polish and Bulgarian data are available for nine regions each. For Latvia and Estonia we have data for five regions. The list of regions for each country is given in Annex 1.

We illustrate our calculations in some detail on the example of Poland. The same calculations are done for the other five countries; for them we present the results only.

As explained, in order to "bootstrap" our results, we take the five poverty lines that yield the overall population headcounts of, respectively, 5 percent, 10 percent, 15 percent, 20 percent, and 25 percent. Obviously, for a poverty line that yields a nationwide headcount of 5 percent different regions will have different *regional* poverty headcounts. For any such poverty line, and the regional

9. t_i must be greater because the amount of funds per region is unchanged while the number of poor is less.

10. The data can be downloaded from http://www.worldbank.org/research/transition/. For more information see also Braithwaite, Grootaert, and Milanovic (1999).

headcount, we then calculate (i) how much money was potentially available to help the poor (Ti/ • i), and (ii) how much of that money was in effect disbursed to the poor. These two values yield respectively a value *t* on the horizontal axis, and a value • on the vertical axis. By varying the poverty line, we do the same calculations again and trace the entire curve. In our case we have, of course, only six such points (five poverty lines that give the national headcounts of 5-25 percent, and the actual, official, poverty line), but the number of points could be multiplied and the curve fully traced out. Both • and t are normalized by the mean country values, so that an efficiency over 100 means that a given region disbursed funds with above countrywide efficiency, and a value of *t* above 100 means that the region's funds per poor person were in excess of the countrywide average. Figures 3 and 4 illustrate the results for four regions in Estonia and Poland. It can be seen that, as expected, in six cases out of eight efficiency decreases with higher (relative) transfers.

Figure 3. **Relative Transfers and Relative Efificiency of Social Assistance in Poland**

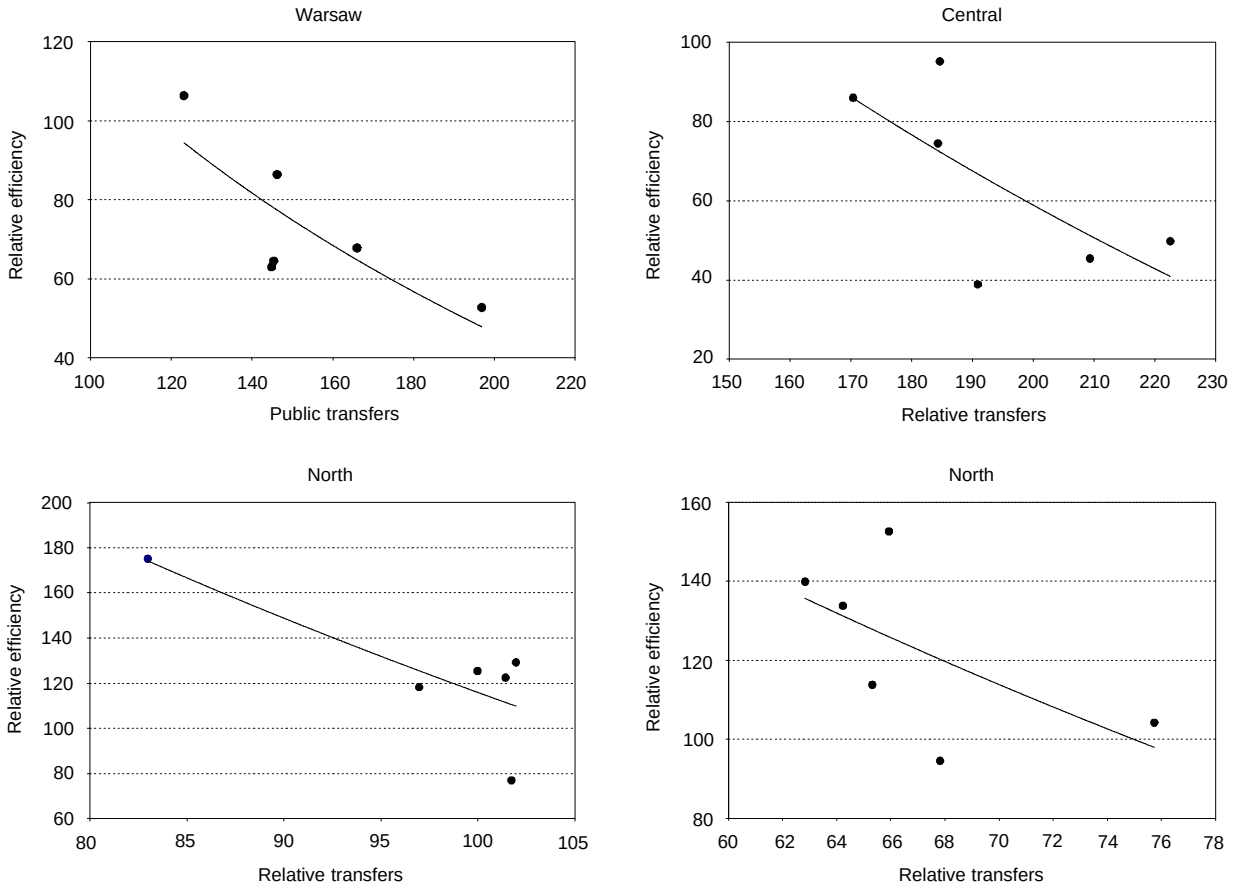
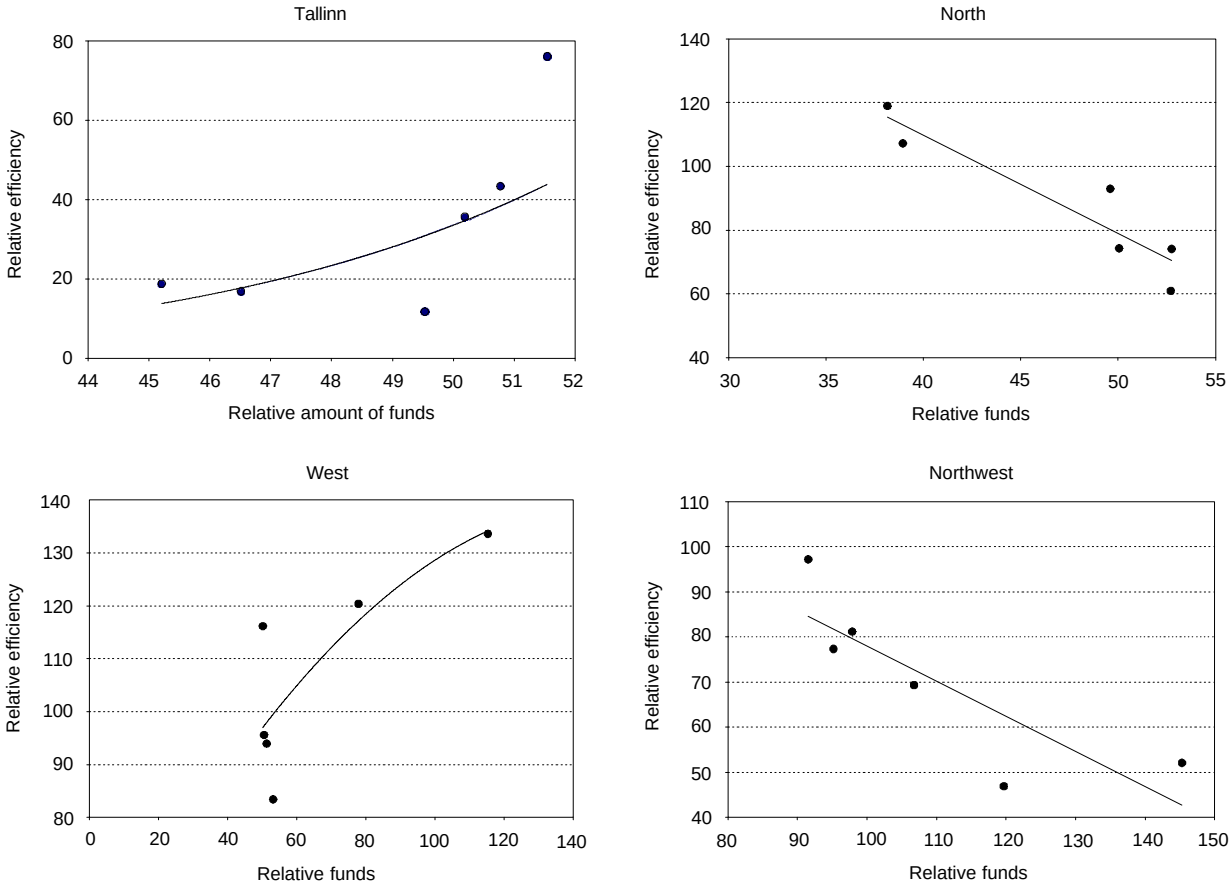


Figure 4. **Relative Transfers and Relative Efificiency of Social Assistance in Estonia**



The same analysis is conducted for all other regions, in Poland and the other five countries. Looking at the annex tables on Annex 2, we derive the efficiency-transfer curves for regions in Poland, Hungary, Bulgaria, Estonia, Slovakia, and Latvia.

We then use thus calculated regional efficiency curve data for each country to explain determinants of efficiency as in equation (8)

$$e_i = b_0 + b_1 t_i + b_2 \bar{y}_i + b_3 REGDUMMY \qquad (8)$$

where $\bullet_i$ = relative efficiency in disbursement of transfers in region *i*, t_i = relative available funds per poor person in region *i*, $\bar{y}$ =relative mean per capita income of region *i*, [11] and

11. Calculated from HEIDE data.

REGDUMMY=regional dummy variables. For example for Poland, where we have nine regions and six different poverty lines, we obtain 54 data points for • and *t* which we use to estimate regression (8).

As explained in section 1, we expect $\beta 1<0$ and $\beta 2>0$, respectively, average efficiency to decline with increased relative abundance of funds, and richer regions to be more efficient in disbursement of money, while the REGDUMMY variables capture some unobserved regional characteristics that make them more or less efficient than the rest of the country.

Table 1 gives the results for the six countries. We observe that $\beta 1$ is negative in all equations, and statistically significant for two countries (Poland and Slovakia). For these two countries and Latvia, each percentage point increase in relative transfers reduces relative transfer efficiency by between 0.67 and 0.78 points (all other factors being the same). For Hungary and Bulgaria, the coefficients are between –0.23 and 0.3. For Estonia, a more comfortable budget constraint does not translate into a reduction in targeting efficiency (the coefficient is barely less than 0, and is not statistically significant).

Relative wealth (income) of regions is, except in Estonia, always positively associated with targeting efficiency. As stated in our hypothesis, richer provinces seem better in targeting the poor. For Hungary and Slovakia, the coefficient is highly significant, and each percent increase in relative regional per capita income is associated with about 1.3 percentage points improvement in efficiency. The fact that efficiency is positively related to income, and thus negatively to regional headcounts, means that our initial hypothesis of a conflict between the objective of national poverty reduction and the objective of horizontal equity is justified.

In addition to these general effects, there are, in all the countries, idiosyncratic regional effects reflected in the statistically significant regional dummies. For example, in Poland, the Northern region is significantly more efficient in targeting than others. In Hungary, this is the case with Northern Hungary and North Transdanubia, while social assistance targeting is significantly less efficient in West Transdanubia. In Bulgaria, the regions of Varna, Sofia, and Haskovo are more efficient than others.

The overall adjusted R^2 range from 0.3 for Latvia to 0.97 for Slovakia, implying that with a relatively parsimonious formulation we are able to explain a large percentage of variation in regional

targeting efficiency. Of course, we do not know what lies behind the idiosyncratic regional effects, but we find a rather strong evidence, first, that a more generous fiscal envelope is associated with less efficient delivery, and second, that richer regions are better at targeting. We can thus turn to the question that motivates this paper: if richer regions are better at targeting, what is the optimal distribution of social assistance such that nationwide assistance to the poor is maximized?

Table 1. **Efficiency in Allocation of Social Assistance**
(dependent variable: relative regional efficiency)

	Poland	Hungary	Bulgaria	Estonia	Slovakia	Latvia
Relative regional transfers	-0.667 (0.02)	-0.303 (0.16)	-0.233 (0.42)	-0.039 (0.88)	-0.783 (0.00)	-0.863 (0.48)
Relative regional mean income	0.731 (0.46)	1.334 (0.01)	0.506 (0.70)	-3.234 (0.00)	1.308 (0.00)	3.699 (0.53)
Dummy variables: Region 2	18.79 (0.13)	9.209 (0.21)	43.149 (0.18)	-11.231 (0.61)	95.954 (0.00)	104.767 (0.10)
Region 3	28.12 (0.27)	31.03 (0.00)	168.04 (0.00)	14.829 (0.37)	75.237 (0.00)	Dropped
Region 4	30.93 (0.01)	Dropped	Dropped	-63.479 (0.002)	Dropped	133.652 (0.55)
Region 5	2.04 (0.88)	-6.95 (0.50)	-53.274 (0.14)			69.453 (0.50)
Region 6	10.20 (0.41)	-21.63 (0.02)	78.190 (0.22)			
Region 7	9.84 (0.42)	46.16 (0.00)	-21.330 (0.54)			
Region 8	Dropped	-9.04 (0.34)	239.421 (0.00)			
Region 9	-20.03 (0.08)		119.523 (0.001)			
Constant	90.72 (0.23)	-11.16 (0.79)	8.99 (0.94)	416.03 (0.003)	-13.535 (0.53)	-209.955 (0.67)
Adjusted R^2 (F)	0.49 (6.6)	0.66 (12.6)	0.67 (12.9)	0.70 (14.4)	0.97 (152.4)	0.30 (2.0)
Number of observations	54	48	54	30	20	30

Note: For definition of regions by country, see Annex 1. Region 1 dummy is always omitted. Relative regional efficiency, ε, is defined as percentage of regional social assistance received by the poor divided by percentage of countrywide assistance received by the poor. Relative regional spending, t, per poor person is defined as (total regional spending/number of the poor) divided by (total countrywide spending/total number of the poor in the country).

V. How Far from Optimal is the Current allocation of Funds?

We turn to finding the optimal distribution of transfers under the assumption of a given: (i) amount of total national spending, (ii) official poverty line and thus the regional headcounts, and (iii) efficiency with which different regions use the funds (that is, the nature of the efficiency-transfers relationship). We estimate a fuller regional efficiency regression where, in addition to regions' differing in their intercepts (regional dummies), we allow for the differentiation in regional slopes by letting marginal change in efficiency due to an increase in transfers vary with region. To do this we interact transfers and regional dummies. The equation is:

$$e_i = b_0 + b_1 t_i + b_2 t_i^2 + b_3 \bar{y}_i + b_4 REGDUMMY + b_5 (t_i * REGDUMMY) \quad (9)$$

From equation (9), we retrieve the marginal *regional* changes in efficiency caused by an infinitesimal increase in funds (equal to $\bullet_1 + 2 \bullet_2 + \bullet_3 * t_i$*REGDUMMY). Equation (9) for all countries is given in Annex 3. We then find the vector of regional transfers such that the marginal efficiency of the use of funds is the same across regions. This gives the optimal regional allocation of funds.

Table 2 contrasts the optimal and the actual allocation for Poland, and shows the overall increase in the funds disbursed to the poor that could be achieved by reallocation of social assistance between the regions.

The point we raised in section I—the possibility of a negative correlation between extent of poverty in a region and efficiency of social assistance—is validated. If a richer region is more efficient in disbursement of social assistance, it may be optimal to allocate a disproportionate amount of funds to it. For example, we see in Table 2 that Warsaw receives 23 percentage points more funds per poor person than the Polish average (column 1), and that per capita welfare there is 16 percent above the Polish average (column 7). Looking at these numbers alone, one could argue that Warsaw seems already over-privileged on both accounts.

However, this does not take into account efficiency with which social assistance is disbursed in Warsaw. Indeed Warsaw region's efficiency is, at the point of the official poverty line, 6 points above the country mean (see Annex 2, Table 1, last column), and under the optimal scenario, there would an *increase* in the allocation of social assistance to the Warsaw region. Table 2 shows that, at the optimum, social assistance given to the Warsaw region would be 16 percent greater than it is in now

(thus making social assistance per poor person exceed the national average by 42 percent. The disbursements to the poor in the Warsaw region would increase by 30 percent

The situation in the Central East region is the opposite. The Central East region is poorer than the country average and already receives less than its "needs" (24 percent per poor person less than the country average). However, improvement in overall targeting would require a further *decrease* in the allocated social assistance. Overall, Table 2 shows that by reallocating social assistance between the nine Polish regions, one could—within the existing financial envelope—increase transfers to the poor by 19 percent. The latter number is a summary indicator of the overall inefficiency entailed by the existing interregional allocation.

Table 2. **Actual and Optimal Regional Allocation of Social Assistance Funds, Poland, January-June 1993**

	(1) Current Allocation of social assistance per poor person (transfers-to-needs)	(2) Optimal allocation of social assistance per poor person	(3) Increase in allocation, percent (2) (1)	(4) Current assistance disbursed to the poor[1]	(5) Disbursement to the poor under the optimal scenario	(6) Improvement in disbursement: in percent (5): (4)	(7) Memo: Relative per capita regional welfare
Warsaw	123	142	16	42672	55335	30	116.3
Central	170	138	-19	39595	44508	12	102.7
Central East	76	71	-5	18224	19458	7	89.1
Central West	102	90	-11	57407	60127	5	93.8
North	102	88	-13	36214	34716	-4	99.6
Northeast	107	93	-14	23283	25266	9	93.0
South	94	81	-13	45318	47126	4	107.9
Southeast	76	119	57	48562	87143	79	92.2
Southwest	84	76	-9	30186	33529	11	97.2
Total	100	100	0	341463	65744	19	100.0

1. Data in columns 4 and 5 are in June 1993 thousands of old zloty per month.

We perform the same calculation for other countries (see Annex 4). Table 3 summarizes the results. For Hungary and Latvia, the regional reallocations needed to conform to the optimal regional distribution of funds are minimal: the average change in allocation is between 1 percent and 3 percent. However, even with such minimal reallocation, there would be still significant gains to be

realized in Latvia where disbursement to the poor would increase by 11 percent. Hungary's regional distribution of funds is closest to the optimal so the gains from reallocation are minimal. In Bulgaria, the regional reallocation would be significant, with an average gain or loss of 28 percent even after excluding a huge percentage increase in allocation to the region of Montana (which in 1993 received almost no funds at all). The overall improvement in disbursement to the poor would be, however, a modest 11 percent. Similar is the conclusion for Slovakia, where even with substantial interregional reallocations the gain would be 17 percent. In conclusion, we see that—with the exception of Hungary—in all other countries regional reallocation of funds would result in nonnegligible, double-digit percentage improvements in the delivery of social assistance to the poor.

Table 3. **Actual and Optimal Regional Allocation of Social Assistance**

	Mean absolute percentage change in allocation	Overall improvement in disbursement to the poor (in percent)	Largest increases in allocation (in percent)	Largest decreases in allocation (in percent)
Poland	17	19	South-East (+57)	Central (-19)
			Warsaw (+16)	Northeast (-14)
Hungary	3	2	South Transdan. (+3)	South Plain (-10)
				West Transdan. (-3)
Bulgaria	28[a]	11	Montana (27 times)	Sofia region (-82)
			Haskova (+34)	Russé (-46)
Latvia	1	11		Kurzeme (-2)
				Latgale (-2)
Slovakia	91	17	Eastern (+243)	Western (-73)
			Bratislava (+29)	Central (-19)

a Excluding the large change in Montana.

VI. Conclusion

This paper had three aims. First, to propose a model within which one can study the tradeoff between the objective of maximum poverty reduction from a nationwide perspective, and maintenance of horizontal equity. The two conflict when regions' ability to target the poor is not proportionate to its poverty rate—for example, when rich regions are more efficient in targeting of social assistance. As part of the model, we posit that regional targeting will be positively related to regional mean income level, and negatively related to the laxness of the budget constraint—that is,

that the marginal efficiency of targeting will be a decreasing function of relative abundance of funds. Second, we test this model using the household level data from income surveys conducted in six East European countries in the 1990s. We find strong evidence that the marginal efficiency of social assistance declines with the amount of funds, and almost equally strong evidence that rich regions target better. This last finding justifies therefore our initial view regarding the existence of the tradeoff between overall poverty reduction and horizontal equity. We thus move to our third aim: calculate the optimal interregional distribution of social assistance and see how far is the current regional distribution removed from the optimal. We find that Hungary's interregional allocation is very close to the optimal, while for other countries, the gain in the amount of funds that could be disbursed to the poor ranges between 11 and 19 percent. Consequently, a regional reallocation of funds might, even without any change in the overall fiscal expenditure or in regional targeting efficiencies, produce substantial improvements in assistance to the poor.

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ANNEX 1. **Regional Codes by Country**

	Poland	Hungary	Bulgaria	Estonia	Slovakia	Latvia
Region 1	Warsaw	Budapest	Sofia	Tallinn	Bratislava	Kurzeme
Region 2	Central	Pest county	Bourgas	North	Central	Latgale
Region 3	Central East	North Hungary	Varna	West	Eastern	Riga region
Region 4	Central West	North Plain	Lovech	Northeast	Western	Vidzeme
Region 5	North	South Plain	Montana	South		Zemgale
Region 6	Northeast	West Transdanubia	Plodviv			
Region 7	South	North Transdanubia	Russé			
Region 8	Southeast	South Transdanubia	Sofia region			
Region 9	Southwest		Haskovo			

ANNEX 2. **Regional Efficiency Curves by Country**

Annex Table 1. **Poland**

Poverty headcount (nationwide)	5	10	15	20	25	Actual (47)
Regions						
Warsaw	197	166	145	145	146	123
	53	68	63	64	60	106
Central	223	209	191	184	185	170
	50	45	39	74	95	86
Central East	68	65	65	67	69	76
	131	110	105	115	95	106
Central West	88	94	96	101	99	102
	82	120	136	122	121	101
North	83	97	102	100	101	102
	175	118	129	125	122	77
Northeast	111	110	108	107	106	107
	95	84	84	89	85	95
South	110	112	114	108	104	94
	158	117	94	94	89	99
Southeast	66	63	64	65	68	76
	153	140	134	114	95	104
Southwest	83	85	86	84	83	84
	12	89	109	55	101	98
Poland total	100	100	100	100	100	100
	100	100	100	56	100	100
Memo: Inter-regional Coefficient of variation of efficiency	53	28	31	20	13	6

Note: The first line always gives the relative regional spending per poor person, defined as (total regional spending/number of the poor) divided by (total countrywide spending/total number of the poor in the country). The second line gives relative efficiency, defined as (percentage of regional social assistance received by the poor divided by percentage of countrywide assistance received by the poor.

Annex Table 2. **Hungary**

Poverty headcount (nationwide)	5	10	15	20	25	Actual (10)
Budapest	153	116	119	124	126	115
	108	111	83	85	85	105
Pest County	70	72	77	81	82	69
	55	52	110	96	106	98
North Hungary	89	110	110	111	113	113
	129	92	103	102	99	90
North Pl	79	93	91	92	92	91
	136	123	118	117	122	125
South Pl	86	89	86	84	79	89
	63	76	84	75	78	71
West Tra	108	95	86	81	83	97
	74	92	100	100	99	88
North Tr	97	103	114	108	109	104
	63	76	71	91	89	73
South Tr	154	118	111	110	110	122
	114	138	138	138	125	131
Hungary total	100	100	100	100	100	100
	100	100	100	100	100	100
Memo: Inter-regional coefficient of variation of efficiency	30	26	20	18	16	20

Note: The first line always gives the relative regional spending per poor person, defined as (total regional spending/number of the poor) divided by (total countrywide spending/total number of the poor in the country). The second line gives relative efficiency defined as (percentage of regional social assistance received by the poor divided by percentage of countrywide assistance received by the poor.

Annex Table 3. **Bulgaria**

Poverty headcount (nationwide)	5	10	15	20	25	Actual (3)
Sofia	204	222	201	210	215	183
	0	0	62	57	43	0
Bourgas	116	114	102	108	109	187
	0	140	124	113	85	0
Varna	149	111	136	146	144	144
	252	212	188	205	154	150
Lovech	10	11	11	12	13	9
	0	0	0	0	277	0
Montana	0	0	0	0	0	0
Plodviv	253	426	343	328	294	186
	72	61	59	54	62	112
Russe	92	120	152	135	134	126
	0	0	0	10	34	0
Sofia Region	33	28	30	28	28	36
	324	273	242	220	166	505
Haskovo	135	87	72	62	60	112
	127	152	135	55	196	198
Bulgaria total	100	100	100	100	100	100
	100	100	100	100	100	100
Memo: Inter-regional coefficient of variation of efficiency	120	99	81	78	80	163

Note: The first line always gives the relative regional spending per poor person, defined as (total regional spending/number of the poor) divided by (total countrywide spending/total number of the poor in the country). The second line gives relative efficiency defined as (percentage of regional social assistance received by the poor divided by percentage of countrywide assistance received by the poor.

Annex Table 4. **Estonia**

Poverty headcount (nationwide)	5	10	15	20	25	Actual (3.7)
Tallinn	47	50	50	51	52	45
	17	12	36	43	76	19
North	39	50	50	53	53	38
	107	74	93	74	61	119
West	78	53	51	50	51	115
	120	83	94	116	96	134
Northeast	120	107	98	95	92	145
	47	69	81	77	97	52
South	149	153	159	158	160	136
	127	128	118	117	109	72
Estonia total	100	100	100	100	100	100
	100	100	100	100	100	100
Memo: Inter-regional coefficient of variation of efficiency	44	39	28	29	18	46

Note: The first line always gives the relative regional spending per poor person, defined as (total regional spending/number of the poor) divided by (total countrywide spending/total number of the poor in the country). The second line gives relative efficiency defined as (percentage of regional social assistance received by the poor divided by percentage of countrywide assistance received by the poor.

Annex Table 5. **Slovakia**

Poverty headcount (nationwide)	5	10	15	20	25	Actual
Bratislava	135	60	70	68	65	
	26	87	82	76	93	
Western	147	137	145	142	145	
	103	104	103	82	98	
Central	71	86	93	99	98	
	130	114	117	113	116	
Eastern	92	77	62	58	57	
	43	61	60	69	73	
Slovakia total	100	100	100	100	100	
	100	100	100	100	100	
Memo: Inter-regional coefficient of variation of efficiency	49	23	25	21	18	

Note: The first line always gives the relative regional spending per poor person, defined as (total regional spending/number of the poor) divided by (total countrywide spending/total number of the poor in the country). The second line gives relative efficiency defined as (percentage of regional social assistance received by the poor divided by percentage of countrywide assistance received by the poor.

Annex Table 6. **Latvia**

Poverty headcount (nationwide)	5	10	15	20	25	Actual (19.4)
Riga	165	140	141	140	135	140
	138	98	72	81	79	81
Kurzeme	59	62	73	72	72	74
	287	215	158	116	109	116
Vidzeme	23	24	22	23	23	23
	0	185	136	100	79	100
Zemgale	235	245	230	211	207	209
	0	65	116	96	76	96
Latgale	55	60	56	59	62	57
	49	42	70	137	199	72
Latvia total	100	100	100	100	100	100
	100	100	100	100	100	100
Memo: Inter-regional coefficient of variation of efficiency	137	71	37	14	16	14

Note: The first line always gives the relative regional spending per poor person, defined as (total regional spending/number of the poor) divided by (total countrywide spending/total number of the poor in the country). The second line gives relative efficiency defined as percentage of regional social assistance received by the poor divided by percentage of countrywide assistance received by the poor.

ANNEX 3. **Efficiency of Social Assistance Spending Equations**

$$e_i = b_0 + b_1 t_i + b_2 t_i^2 + b_3 \bar{y}_i + b_4 HC_{all} + b_5 REGDUMMY + b_6 (ti * REGDUMMY)$$

where • =efficiency of spending (percentage of social assistance disbursed to the poor), t=relative transfers per poor person ("transfers per needs"), y=relative regional income, HC_{all}=HC for the county as a whole.

	Poland	Hungary	Bulgaria	Estonia	Slovakia	Latvia
Relative regional transfers	-0.58 (0.22)	-2.48 (0.08)	-0.30 (0.61)	-1.13 (0.15)	-0.25 (0.80)	3.74 (0.50)
Relative regional transfers squared	0.01 (0.02)	0.01 (0.08)	0.00 (0.63)	0.00 (0.93)	0.00 (0.89)	-0.01 (0.53)
Headcount (countrywide)	1.34 (0.000)	1.40 (0.000)	0.77 (0.02)	1.44 (0.00)	1.14 (0.00)	1.18 (0.00)
Relative regional mean income	4.92 (0.03)	3.62 (0.12)	3.97 (0.07)	0.98 (0.75)	0.64 (0.53)	-3.26 (0.76)
Dummy variables: Region 2	-21.40 (0.53)	-38.02 (0.26)	102.32 (0.12)	19.56 (0.72)	56.30 (0.50)	221.67 (0.03)
Region 3	121.82 (0.05)	-75.72 (0.08)	147.57 (0.06)	-27.10 (0.46)	Dropped	146.44 (0.41)
Region 4	-13.04 (0.63)	Dropped	Dropped	-11.78 (0.80)	-12.03 (0.56)	-357.67 (0.62)
Region 5	-42.59 (0.66)	-105.88 (0.02)	117.83 (0.02)	Dropped		Dropped
Region 6	-54.92 (0.08)	-111.15 (0.04)	106.75 (0.20)			
Region 7	18.05 (0.55)	69.19 (0.003)	105.70 (0.08)			
Region 8	-114.07 (0.29)	-55.02 (0.20)	107.97 (0.20)			
Region 9	Dropped		152.26 (0.01)			
Interaction (region*transfers) Region 2	-0.10 (0.83)	0.53 (0.17)	-0.04 (0.94)	0.15 (0.83)	-0.06 (0.92)	-2.87 (0.37)
Region 3	-1.61 (0.04)	1.18 (0.04)	0.11 (0.87)	1.18 (0.24)	0.42 (0.08)	-0.27 (0.97)
Region 4	-0.46 (0.30)	0.55 (0.15)	15.78 (0.00)	1.06 (0.38)	0.14 (0.62)	1.44 (0.57)
Region 5	0.02 (0.99)	1.65 (0.015)	Dropped	1.02 (0.41)		0.27 (0.94)
Region 6	-0.52 (0.34)	1.39 (0.03)	0.01 (0.99)			
Region 7	-0.47 (0.32)	-0.20 (0.08)	0.07 (0.91)			
Region 8	0.79 (0.55)	0.58 (0.19)	1.88 (0.37)			
Region 9	-1.31 (0.04)		0.03 (0.96)			
Constant	-421.75 (0.05)	-222.93 (0.23)	-475.85 (0.02)	-69.06 (0.84)	-20.33 (0.84)	68.67 (0.93)
Adjusted R^2 (F)	0.98 (98.2)	0.95 (52.6)	0.71 (8.2)	0.91 (29.1)	0.99 (77.3)	0.66 (6.2)

ANNEX 4. **Targeting of Social Assistance under Actual and Optimal Scenario, Hungary, 1993**

	(1) Current allocation of social assistance per poor person (transfers-to-needs)	(2) Optimal allocation of social assistance per poor person	(3) Change in allocation, percent (2): (1)	(4) Current assistance disbursed to the poor[1]	(5) Disburse-ment to the poor under the optimal scenario	(6) Change in disburse-ments: In percent (5): (4)	(7) Memo: Relative per capita regional welfare
Budapest	115	116	0	155608	153087	-2	108.9
Pest Coun	69	68	-1	49233	51177	4	102.7
North Hu	113	111	-2	89626	100221	12	98.0
North Pl	91	94	3	160997	136298	-15	90.2
South Pl	89	80	-10	57497	74589	30	95.2
West Tra	97	93	-3	48514	54953	13	99.8
North Tr	104	101	-2	57308	78511	37	99.1
South Tr	122	125	3	96903	78328	-19	105.0
Total	100	100	0	715686	727165	2	100.0

1. Data in columns 4 and 5 are in nominal forints per month.

Bulgaria, January-June 1995

	(1) Current allocation of social assistance per poor person (transfers-to-needs)	(2) Optimal allocation of social assistance per poor person	(3) Change in allocation, percent (2) : (1)	(4) Current assistance disbursed to the poor[1]	(5) Disburse-ment to the poor under the optimal scenario	(6) Change in disburse-ment: in percent (5): (4)	(7) Memo: Relative per capita regional welfare
Sofia	183	214	10	0	996		130.3
Bourgas	187	166	-21	0	387		105.6
Varna	144	154	17	1625	1290	-21	96.2
Lovech	9	9	10	0	139		78.6
Montana	0	31	28700	0	28		87.6
Plodviv	186	187	0	1400	1392	-1	106.3
Russe	126	99	-46	0	440		97.1
Sofia Region	36	0	-82	833	1	-100	93.0
Haskovo	112	131	34	833	549	-34	93.2
Total	100	100	0	4692	5222	11	100.0

1. Data in columns 4 and 5 are in nominal levs per month.

Latvia, October 1997-September 1998

	(1) Current allocation of social assistance per poor person (transfers-to-needs)	(2) Optimal allocation of social assistance per poor person	(3) Change in allocation, percent (2) (1)	(4) Current assistance disbursed to the poor[1]	(5) Disburse-ment to the poor under the optimal scenario	(6) Change in disburse-ments: In percent (5): (4)	(7) Memo: Relative per capita regional welfare
Riga	140	141	1	80	108	36	115.0
Kurzeme	74	72	-2	38	35	-8	89.6
Vidzeme	23	24	2	8	9	13	89.2
Zemgale	209	209	0	73	83	14	92.9
Latgale	57	56	-2	47	37	-22	80.1
Total	100	100	0	245	272	11	100.0

1. Data in columns 4 and 5 are in nominal lats per month.

Slovakia, 1993

	(1) Current allocation of social assistance per poor person (transfers-to-needs)	(2) Optimal allocation of social assistance per poor person	(3) Change in allocation, percent (2): (1)	(4) Current assistance disbursed to the poor[1]	(5) Disburse-ment to the poor under the optimal scenario	(6) Change in disburse-ment: in percent (5): (4)	(7) Memo: Relative per capita regional welfare
Bratislava	135	174	29	384	2200	473	113.7
Western	147	40	-73	21385	6624	-69	100.9
Central	71	58	-19	20638	15017	-27	96.6
Eastern	92	316	243	3133	29384	838	98.6
Total	100	100	0	45540	53224	17	100.0

1. Data in columns 4 and 5 are in nominal crowns per month.