# EVALUATING THE CURRENT EQUALIZATION GRANT TO COUNTIES IN CROATIA

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Article**
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*Abstract*

*This paper assesses the design of the 2005 equalization grant to the counties in Croatia. Since no allocation formula for this grant has ever been publicly disclosed, this paper provides an analysis and explanation of the aforesaid formula. At the time of its introduction, the objective of the equalization grant was to mitigate differences in fiscal capacities among counties, so our work is focused on fiscal capacities and on whether the new formal allocation rule set by the central government follows the predetermined objective in the grant allocation. This article proves our hypothesis that the new equalization grant does not adequately mitigate the differences in fiscal capacities across Croatian counties.*

*Key words: counties, fiscal capacity, equalization grant, Croatia*

## 1 Introduction

The Croatian administration consists of the central government and local units. The higher level of local government comprises 21 counties, which include the City of Zagreb.[1] The lower level of local government comprises 430 municipalities and 126 cities. Unfortunately, 180 cities and municipalities are within the areas of special national concern (areas damaged by war or areas stipulated as lagging behind in terms of development)

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[1] The City of Zagreb has the special status of both county and city.

and 45 cities and municipalities in the hill and mountain area.[2] The central government provides the following six types of current grants to counties, municipalities and cities:

- equalization grant for decentralized functions only;
- current general-purpose equalization grant provided by the Ministry of Finance (MF) to municipalities and cities in the areas of special national concern (ASNC), Group I and II;
- current general-purpose equalization grant provided by the Ministry of Finance to counties;
- current grants provided by other ministries and central government institutions;
- budgetary reserves and compensation for damage caused by natural disasters;
- current grant as a substitute for corporate income tax revenues.[3]

This paper focuses on the third type of current general-purpose equalization grant provided to counties by the Ministry of Finance. As the allocation formula for this grant has never been disclosed to the public, but has been made available to us, we will present and evaluate it in this paper.

The first part of the work gives an overview of the relevant literature, mostly relating to the factors that affect the distribution of central government grants across local units. The second part provides a historical overview of the manner of and reasons for providing current general-purpose equalization grant to counties by the Ministry of Finance in Croatia since 1994. The third part analyzes the currently used 2005 allocation formula, i.e. the manner of providing the grant. The fourth part examines to what extent the 2005 formal allocation rule set by the central government follows the predetermined objective (mitigating differences in fiscal capacities), and since this grant does not mitigate the differences, it examines some of the possible reasons why.

## 2 Literature

The essence of the general-purpose equalization grant is to compensate for horizontal fiscal disparities across local government units (local units) which occur when some local units of the same level of government cannot provide a standard level of public services (Martinez-Vazquez, 2004), for example, when some counties cannot provide the same level of public goods as other more developed counties. Fiscal disparities in the provision of public services among different local units arise from differences in fiscal capacities and/or expenditure needs of local units. The fiscal capacity of a local government unit can be defined as the ability of the local government unit to raise a particular amount of

[2] Two groups of areas of special national concern (ASCN) were established in 1996 and a third one in 2002. These groups comprise a total of 180 (Group I comprises 50, Group II 61 and Group III 69) municipalities and cities. Groups I and II were set according to the degree of economic damage caused by the war. The third group consists of areas evaluated as lagging behind in terms of development according to four criteria: economic development, structural difficulties, demography and special criteria. As the areas of special interest to the government, the hill and mountain areas (HMA) were defined in 2002. There are 45 municipalities and cities that need assistance from the central government in the resolution of demographic problems (depopulation) and in creating the conditions for progress to be made in the use of natural and other resources for economic development.

[3] See Appendix 2 for the more detailed description of grants.

revenues at standard rates and administrative efforts (Boex and Martinez-Vazquez, 2004). Expenditure needs of local units can be defined as the costs they incur in providing a standardized basket of public services due to differences in their needs arising from different demographic profiles (e.g. the percent of the school age population), geographical conditions, etc. (Boex and Martinez-Vazquez, 2004). Thus since the essence of the general-purpose equalization grant is to compensate for horizontal fiscal disparities across local units arising from differences in fiscal capacities and/or expenditure needs of local units, there are, generally speaking, four types of formula for equalization grants (Jun, 1997). Some formulas for equalization use only the fiscal capacity measures (Canada) or only fiscal needs measures (India, Spain); whereas others use both measures of fiscal needs and fiscal capacities (Australia, Germany). Finally, there are formulas that distribute equalization grants just on an equal per capita basis (Canada's EPF). In practice, it is very often hard to understand what fiscal instruments are used for equalization as well as the scope of the equalization itself (Ahmad and Craig, 1997), and what is more, there is no consensus on the optimal design of intergovernmental grants (Boadway, 2006).

There are three main reasons for the lack of consensus on the optimal design of intergovernmental transfers – grants (Boadway, 2006). Firstly, redistributive objectives necessarily entail value judgements, over which even rational people can disagree. The value judgements involve the usual equity criteria involved in redistribution. Equity arguments become more clouded in a federal context to the extent that different subnational governments pursue different redistributive policies within their own units. Secondly, disagreement arises because the effect of intergovernmental transfers on resource allocation is not readily predicted as an empirical matter, which means that we do not know how responsive labour and capital are to changes in intergovernmental transfers. A third reason for disagreement is the fact that economic decision makers in the federation include subnational governments themselves, and we still do not understand their behaviour. For example, are subnational governments benevolent and acting faithfully in the interests of their constituents? Thus, those who put more weight on equity, who are more optimistic about the reductions in efficiency costs of redistribution and who take a more benevolent view of government, will take a more positive view of the role of intergovernmental transfers as a means of achieving national equity and efficiency objectives. But still there is no consensus, which implies that the role and design of intergovernmental transfers is as much an art as it is a science, although principles from theoretical models can be informative.

Although intergovernmental grants are usually formula-based, this does not ensure that the allocation of resources is objective, fair or efficient. According to Boex and Martinez-Vazquez (2005) the final incidence of grants depends on different determinants such as normative policy issues, voter choice arguments and political considerations. According to the same authors three strands of the economic literature consider these three factors that affect the distribution of central government grants across local units.[4]

Firstly, public finance literature provides normative guidance on how intergovernmental grants should be distributed in order to improve efficient and equitable allocation of resources in a country. If the central government is trying to achieve efficient allocation

[4] The rest of this section draws heavily on Boex and Martinez-Vazquez (2005).

of resources among local units, the intergovernmental grant system may seek to correct inter-jurisdictional externalities in provision of certain local public services. Thus, it can be expected that greater per capita intergovernmental grants would have to be focused on local units with a greater number of school-aged children, or those that have a low own revenue base. If the central government is trying to achieve a more equitable distribution of national resources, again we would expect to see greater intergovernmental grants flow to local units with greater (social) expenditure needs and lower own revenue bases. But tensions may arise between these two objectives. For instance, excessive equalization in pursuit of equity could reduce economic efficiency by reducing economic growth in wealthier, more productive regions. Such a trade-off made by policy makers will impact the ultimate allocation of public resources across national territory.

A variety of voter-choice models in the public choice literature provide an understanding of how electoral mechanisms could influence the fiscal choices of central government politicians in distributing resources across local units in response to voters' demands for public services. The most widely used is a median voter hypothesis which suggests that under certain basic assumptions about the electoral system, democratically elected politicians tend to maximise their probability of being (re-)elected to office, generally by adopting the fiscal preferences of the nation's median voter. For example, since the median voter often lives in a local unit with a below-average own local revenue base (result of the fact that local tax bases are usually concentrated in a relatively small number of high-income units) we would expect to see greater intergovernmental grants flow to local units with greater (social) expenditure needs and lower own revenue bases. But the problem with electoral choice models is that they oversimplify the allocation process if they do not take into account the political mechanism that converts the public demand for government services into policy decisions.

Finally, political economy arguments – based on non-electoral concerns – also contribute to explaining the incidence of intergovernmental grants. The public choice models that incorporate political economy considerations into local government finance argue that political decision-making processes can be "captured" by powerful interest groups or that local units with powerful political interests can be expected to receive larger intergovernmental grants. Local units that are able to exert greater political pressure on the centre may receive greater transfers. Theoretically, elected officials with smaller constituencies have a greater incentive to lobby for greater intergovernmental resources, as the pay-off per vote is greater. Or further, we might expect that local units that are governed by the same political party as the central government receive a disproportionate share of intergovernmental grants. In addition it is still not clear why in practice less populated local units usually receive greater intergovernmental grants. Some argue that it is due to characteristics of less populated local units (such as the presence of economies of scale), but much of the existing empirical literature also finds that political overrepresentation and local units lobbying activities result in higher per capita grants.

An international comparison based on twelve empirical studies suggests that normative considerations and voter choice mechanisms are significant forces, but political factors are consistently a major driving force in determining the incidence of intergovernmental grants in fiscally decentralized systems around the world (Boex and Martinez-Vazquez, 2005). When all else is held equal, although intergovernmental grants tend to be needs-equalizing, these systems are generally counter-equalizing when it comes to fiscal capacity, so that local units with a smaller own tax base tend to receive fewer intergovernmental grants. In addition, their findings also consistently indicate that smaller local units receive larger per capita grants.

The objective of this paper is to find out how the 2005 equalization grant to the counties works in Croatia and whether it equalises fiscal capacities of counties after the change of design in 2005. We want to understand how the formal grant allocation rule set by the central government follows the predetermined objective (mitigating differences in fiscal capacities), and if it does not, why?

## 3 The history and purpose of the Ministry of Finance's equalization grant to counties

*History.* When did this grant to counties in Croatia first appear? According to the Act on the Financing of Local and Regional Self-government Units[5], in the period from 1994 to 2001, a current general-purpose equalization grant was provided to each county from the MF. In that period, grants were allocated to counties whose per capita budget revenues (including the revenues of municipalities and cities in their territories) were less than 75% of the national per capita budget revenue (excluding the City of Zagreb). The grant was provided from the MF and was equal to the difference between the per capita budget revenues of the county concerned and 75% of the national average per capita budget revenue.[6] The counties re-allocated resources received from the grant to municipalities and cities in their respective territories in a similar way.[7]

While the above criteria have never been removed from the Act, the government has implemented new criteria since 2001, defined in its annual Budget Execution Act, for the allocation of MF current general purpose equalization grants to:

- counties; and
- municipalities and cities in the ASNC, Group I and II.

In this work, we will analyze the former category, i.e. the MF's general purpose equalization grant to counties. From 2002 to 2009, the criteria for the allocation of this grant were frequently modified in accordance with the provisions of the annual Budget Execution Act. The allocation criteria for the Ministry of Finance's grant to counties included the population size, county budget revenues and county budget expenditures for capital

[5] In Croatian *Zakon o financiranju jedinica lokalne samouprave i uprave*.

[6] According to the Act the grant could not be allocated to a county in whose territory the rate of surtax on personal income tax was lower than 1% and in which the tax rates and tax amounts were lower than the legally prescribed maximum rates and amounts.

[7] Municipalities and cities, excluding cities with more than 40,000 inhabitants, were allocated grants from the county budgets. The amount of the grant was equal to the difference between the collected per capita revenue of the municipality/city concerned and 75% of the county average per capita budget revenue. The grant could not be provided to a municipality or city implementing a rate of surtax on personal income tax lower than 1%, and municipality/city tax rates and amounts lower than the legally prescribed maximum rates and amounts.

programmes. Since 2005, the county budget expenditures for capital projects have been replaced by the population density criterion.[8]

Counties are obliged to re-allocate a certain percentage of the received grant to their municipalities and cities outside the ASNC, Groups I and II. This percentage has undergone some changes: in 2003, it stood at a minimum of 30%, in 2004 – at a minimum of 50% and since 2005 it has not been permitted to go below 75%. Consequently, since 2005, the maximum share of the general-purpose equalization grant retained by the counties has been 25%, whereas the remainder has been allocated to municipalities and cities in the territory of a county outside the ASNC, Groups I and II.

The problem inheres in the counties independently defining the criteria for the re-allocation of the above-mentioned percentage of the general-purpose equalization grant without disclosing these criteria to the public.[9] Moreover, no analysis of the quality of grant allocation criteria defined by the counties has ever been carried out, or of the impact of these grants on municipalities and cities. Therefore, there is an urgent need for such analyses for the sake of determining the impact of the grants independently re-allocated by counties to the cities and municipalities in their territories outside the ASNC, Groups I and II.

*Tax refund as a part of the equalization grant.* Additional confusion is caused by the provisions of the Budget Execution Act for 2004. The amount of the grant to a county is supposed to be equal to the difference between the assessed personal income tax refunds based on annual tax returns for the previous year (applicable only for the municipalities and cities in the territory of an ASNC or of a HMA belonging to the county), and the amount of the current grant to the county calculated according to the criteria specified in the Budget Execution Act. More specifically, since personal income tax refunds are paid out of the central government budget to taxpayers in the ASNC and HMA and not by the county concerned, the grant to the county is reduced by an equivalent amount.

*Purpose.* From 2002 to 2005, the grant to counties was intended to correct for differences in fiscal capacities, and for investment in development programmes of the counties as well as their municipalities and cities. However, without any explanation or publicly available analysis, since 2005, one of the grant's criteria, that is, the county budget expenditures for capital projects has been replaced by the population density criterion. In addition it is stated by the Budget Execution Act that this grant is provided for investment only in the development programmes of the counties, including those of their municipalities and cities.[10] Might it be that since 2005 this grant has become a capital grant, although it is still booked as "current grant" and although in the formula for allocation the fiscal capacity criterion is used? Therefore, it is reasonable to ask about the purpose of this grant after 2005 and whether in practice it is still aimed at alleviating fiscal capacity differences. For simplicity, we will call this grant the "new equalization grant".

[8] Consequently, the following criteria for the allocation of grants to counties are applied in 2009: population size according to the 2001 census, average per capita budget revenue of a county in 2007 at the national level (national average), and per capita budget revenue of a county in 2007, population number of the Republic of Croatia (excluding the City of Zagreb) per km$^2$ (national average) and the population number of a county per km$^2$.

[9] Certain data about that can be found in the Ministry of Finance. Since 2003, counties have been obliged to prepare plans for the allocation of funds to their municipalities and cities outside the ASNC, Groups I and II by 30 March, and to notify the Ministry of Finance within 15 days. However, this regulation has not been applied for some time. The relevant Ministry of Finance data are still not available to the public.

[10] Excluding the purchase of passenger cars.

The practice of other countries shows that general-purpose equalization grants are commonly used for current purposes and that most countries use this grant only for current expenditures (including current maintenance of capital objects) but not the expenditures for new capital projects (Shah, 2007).[11] Before analysing whether the grant mitigates differences in fiscal capacities of the counties, and if not, why not, we will perform a detailed analysis of the currently used formula for allocation of this grant on the basis of data from 2005.[12]

## 4 Formula analysis

As already mentioned, since 2001 the grant allocation formula has been determined by the annual Budget Execution Acts. The MF has no discretionary power over the formula, which means that the formula is strictly implemented without any exceptions. Since 2005 the formula has included the following parameters:[13]

- fiscal capacities of the narrowly defined counties;[14]
- population density by county; and
- estimated personal income tax refunds (only to the taxpayers on the ASCN and HMA belonging to the county) payable by the central government instead of a narrowly defined county.

The calculation procedure for the new equalization grant provided by the MF can be summarized in five steps, and we will demonstrate the calculation for 2005.

1) *Calculation of the necessary amount of the new equalization grant on the basis of a county's fiscal capacity*

The first step covers the identification of the counties with inadequate fiscal capacities and determination of the amounts of grant they need. The fiscal capacity of a county is calculated by reducing the county's current per capita revenues by all grants[15] and decentralised funds.[16] In this matter, budget data on current revenues actually received two years earlier are used. Thus, the calculation of the grant for 2005 was based on the data on current revenues from 2003 (Appendix 4, Table D, column 1). A county is eligible for

[11] There are three main reasons why most countries only take into account current expenditures (including current maintenance of capital objects) but not the expenditures for new capital projects. First, the financing of new capital projects usually requires substantial funds, which is why fiscal needs for new capital projects vary considerably from year to year. Second, it is difficult to establish adequate indicators of the need for new capital projects. Third, most capital projects are used for many years – frequently to the benefit of several generations. Requiring current taxpayers to fully finance new capital projects (by means of fiscal transfers), which would be of benefit to future generations as well, would be contrary to the principle of utility in taxation (Jun, 1997).

[12] The last year for which the calculation was possible on the basis of available data.

[13] The data for the City of Zagreb (because of its dual status as a county and city) is not included in the calculation of the grant.

[14] The term "narrowly defined county" means that the budget data for municipalities and cities in the territory of the county are not included in the calculation.

[15] Account No. 63 in the Statement of Revenues and Expenses (REV-EXP Form) – current and capital grants from abroad and general government entities.

[16] Revenues from an additional share in personal income tax earmarked for decentralised functions and revenues from equalisation grants for decentralised functions. For short description of Croatian Tax Sharing System see Appendix 1.

a grant if 75% of its fiscal capacity per capita is less than 75% of average per capita fiscal capacity of all counties (column 4). In 2003, the national average per capita fiscal capacity of counties was 239 kuna. Consequently, the counties whose 75% of fiscal capacity was less than 179.46[17] kuna per capita were eligible for grant.[18]

The amount of the new equalization grant expressed in points (column 6) receivable by a county *x* on account of its inadequate fiscal capacity is calculated as:

[(per capita fiscal capacity of all the counties[19] × 0.75) – (per capita fiscal capacity of a county *x*[20] × 0.75)]

The total amount of grant receivable by all the counties with inadequate fiscal capacities was about 87 million kuna in 2005. For example, the calculation of the *2005 equalization grant on the basis of fiscal capacity* for the Dubrovnik-Neretva County for 2005 would be as follows: (179.46 – 178) × 122,870 = 178,717 kuna.

2) *Calculation of the necessary amount of new equalization grant on the basis of insufficient population density of counties*

The next step is identifying the counties with insufficient population densities and determining the amount of grant they should receive according to this criterion. The counties with population densities below the average for all the counties (columns 8 and 9) are eligible for a grant.

The amount of the new equalization grant receivable by a county *x* on account of its insufficient population density is calculated as:

$$\frac{\text{population density of all the counties}^{21}}{\text{population density of a county } x^{22}} \times 1{,}000{,}000$$

Based on this formula, in 2005 eight counties that needed the grant on account of insufficient population density were identified.[23] In 2005, all these counties were entitled to a total of about 17 million kuna (column 10). By contrast, the Dubrovnik-Neretva County, for example, was not entitled to a *new equalization grant on account of insufficient population density*, because its population density exceeded the national average.

[17] 239.27 x 0.75.

[18] In 2003, the following thirteen counties reported inadequate fiscal capacities: Krapina-Zagorje, Sisak-Moslavina, Koprivnica-Križevci, Bjelovar-Bilogora, Virovitica-Podravina, Požega-Slavonia, Brod-Posavina, Zadar, Osijek-Baranja, Šibenik-Knin, Vukovar-Srijem, Dubrovnik-Neretva and Međimurje.

[19] Per capita fiscal capacities of all the counties = (current revenues – grants – decentralised funds of all the counties) / population of all the counties.

[20] Per capita fiscal capacity of the county *x* = (current revenue – grants – decentralised funds of a county *x*) / population of the county *x*.

[21] Population density of all the counties = population of all the counties / area of all the counties in km².

[22] Population density of a county *x* = population of county *x* / area of county *x* in km².

[23] These were the counties of: Sisak-Moslavina, Karlovac, Bjelovar-Bilogora, Lika-Senj, Virovitica-Podravina, Požega-Slavonia, Zadar and Šibenik-Knin.

*3) Calculation of the total necessary amount of new equalization grant*

The third step includes summing up the amount of the grant a county needs on account of its inadequate fiscal capacity and insufficient population density (column 11). For 2005, for all counties the amount was about 105 million kuna.[24] This amount is reduced by estimated personal income tax refunds payable only to taxpayers on the ASCN and HMA belonging to the county by the central government instead of the counties (column 12). In 2005, personal income tax refunds paid only to taxpayers in the ASCN and HMA by the central government instead of all counties amounted to roughly 44 million kuna. The result is the final amount of the new equalization grant needed by each county, also called "final points" (column 14). The total amount of the grant needed in all counties (the total amount of final points) in 2005 was about 76 million kuna.[25]

The final amount of the new equalization grant needed, e.g. for the Dubrovnik-Neretva County would be: (178,717 + 0) – 4,725,246 = 0 kuna. As the amount that the Dubrovnik-Neretva County taxpayers on the ASCN and HMA received as personal income tax refund by the central government exceeded the amount of the grant the Dubrovnik-Neretva County was entitled to on account of its inadequate fiscal capacity, the Dubrovnik-Neretva County was not eligible for any additional amount of the new equalization grant from the MF.

*4) Matching the needs for new equalization grant with available central government budget funds*

The fourth step includes dividing the budgetary funds available for this grant to counties by the final number of points for the counties in order to obtain the point value (column 15).

$$\text{Point value} = \frac{\text{total available funds for new equalization grant to counties}}{\text{total final number of points}^{26}}$$

As the available funds for new equalization grant to counties totalled 40 million kuna in 2005, the point value was 0.5227.[27] This means that the available funds were enough to finance roughly 52% of the additionally needed new equalization grant (column 15).

*5) Calculation of the amount of new equalization grant to an individual county*

The point value is multiplied by the final number of points for a particular county in order to obtain the actual amount of the grant (column 16). Thus, for example, the Dubrovnik-Neretva County was entitled to a zero amount from the central government budget. As previously stated, the amount of the personal income tax refunds paid to this county's taxpayers in the ASCN and HMA by the central government instead of by the county itself exceeded the calculated amount of the grant the county would have received on account of its inadequate fiscal capacity.

[24] There is a possibility of a minor error, as the author uses the publicly available data from the REV-EXP Form, which may differ from the internal MF data used in this calculation.

[25] 104.8 – 44.0 = 76.5

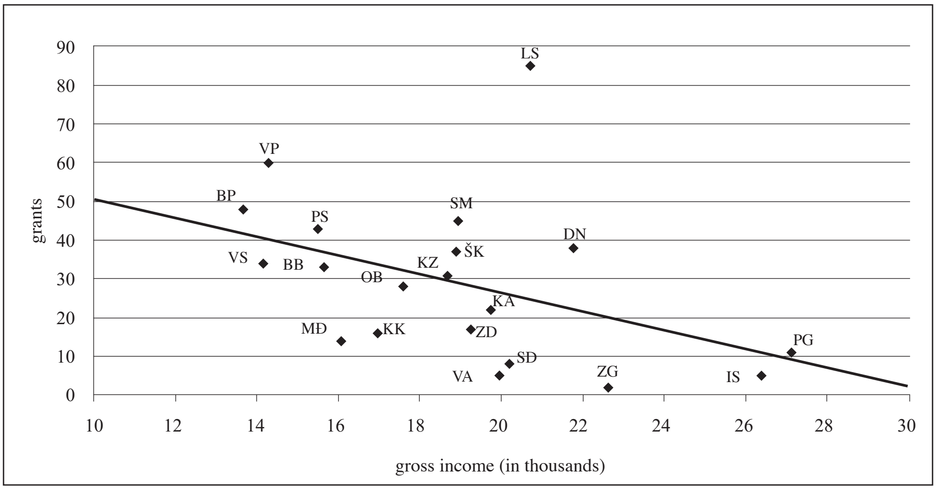
[26] The final amount of the necessary equalisation grant based on the inadequate fiscal capacities and insufficient population density.

[27] 0.5227 = 40.0 / 76.5.

## 5 Discussion

On the basis of the 2005 data and by computing Pearson's correlation coefficient we compared the amounts granted to counties and their fiscal capacities. The results show that the observed grant does not equalize differences in fiscal capacities between counties. Figure 1 shows the relation between a county's fiscal capacity per capita and the per capita amount of the grant the county received in 2005.[28] The relationship between the observed variables is negative and statistically insignificant (Pearson's r = - 0.42, p > .05).

*Figure 1: Ministry of Finance's new equalization grant paid to counties and gross income (both in kuna per capita, 2005)*




*Krapina-Zagorje (KZ), Sisak-Moslavina (SM), Koprivnica-Križevci (KK), Bjelovar-Bilogora (BB), Virovitica-Podravina (VP), Požega-Slavonia (PS), Brod-Posavina (BP), Zadar (ZD), Osijek-Baranja (OB), Šibenik-Knin (ŠK), Vukovar-Srijem (VS), Dubrovnik-Neretva (DN), Međimurje (MĐ), Lika-Senj (LS), Zagreb (ZG), Varaždin (VŽ), Primorje-Gorski Kotar (PG), Split-Dalmatia (SD), Istria (IS) and Karlovac (KA).*

*We have made calculations for the relation between a county's fiscal capacity per capita and per capita amount of the new equalization grant the county received in 2005, but without Lika-Senj County. The relationship between two variables is negative and statistically significant. (Pearson's r = - 0.64, p <.01).*

*Additional calculations have been made for the relation between a county's fiscal capacity per capita and the per capita amount of the new equalization grant the county should have received from the MF according only to the fiscal capacity and population density criteria (excluding personal income tax refunds paid to each counties' taxpayers on the ASCN and HMA) in 2005. The relationship between the observed variables is negative and statistically significant (Pearson's r = - 0.58, p <.01).*

*Source: Calculation based on the MF data (excluding the City of Zagreb).*

[28] The per capita gross personal income of a county in 2004 is used as its fiscal capacity indicator. The figures concerning per capita gross personal income were obtained from the Tax Administration on the basis of a sample covering 5% of the population (about 120,000) of cities and municipalities that earned their taxable personal incomes in accordance with the provisions of the Personal Income Tax Act.

By using different measures of the Gini coefficient[29] for 2005, we also want to establish whether the allocation of new equalization grant intensifies or reduces fiscal capacity differences among counties. Using different measures of the Gini coefficient we want to get a broader picture of the situation. Thus we will also analyze whether the personal income tax sharing and allocation of different other types of current grants from the central government to counties result in an increase or a decrease in fiscal capacity differences among counties. We have analyzed five variables:

$X^1$ = total personal income tax collected in a county (before tax sharing)

$X^2$ = the county's personal income tax after tax sharing

$X^3 = X^2$ + other current grants to a county[30]

$X^4 = X^3$ + equalization grants to a county for decentralized functions

$X^5 = X^4$ + new equalization grant given to a county by the MF.

On the basis of the available variables (fiscal capacity measures[31] – data on revenues from personal income tax received by a county and different types of current grants allocated to counties) for 2005, we have calculated the measures of inequality of distribution of those variables between counties. The results are presented in Table 1.

All three types of the Gini coefficient gave similar results. Personal income tax sharing increased inequalities among counties compared to the inequalities in the distribution of total collected revenues from personal income tax among counties (before tax sharing). The values of different types of the Gini coefficient after personal income tax sharing increased from 0.17/0.18 to 0.19/0.20 (Table 1, the first and the second row). The allocation of other current grants reduces inequalities among counties, as do the grants for equalization of decentralized functions. The values of the Gini coefficient after the allocation of the aforesaid grants declined from 0.20/0.19 to 0.7/0.6 (rows two, three and four). By contrast, the allocation of new equalization grant to counties by the MF increased the inequalities in the distribution of current revenues among counties (rows four and five). For example, after the allocation of the new equalization grant to counties by the MF the non-weighted Gini coefficient rose from 0.0711 to 0.0722 (rows four and five).

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[29] The explanation of the Gini coefficient is adapted from Duclos and Araar (2006). For details about the calculation of the Gini coefficient see Appendix 3.

[30] Other current grants to a county include: current grants provided by other ministries (excluding MF) and central government institutions, budgetary reserves and compensation for damage caused by natural disasters. These grants were analyzed together because it is impossible to determine single amounts for each county.

[31] The most important revenue of counties' budgets is personal income tax. In 2007-2008 taxes represented 80% of total current revenue and the rest of counties' sources mainly came in a form of grants from the central government budget. Counties' own tax revenues and non-tax revenue are marginal. Tax bases and tax rates of county taxes and personal income tax are completely defined by the central government. In a situation like this, since most of the revenues come from personal income tax – shared tax (although counties cannot change its tax base or/and tax rates – meaning that it is not their properly "own-source" revenues), we decided to use the personal income tax as a measure of fiscal capacity.

*Table 1: Inequalities in the distribution of current revenues among counties measured by the Gini coefficient, 2005 (excluding the City of Zagreb)*

| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Gini coefficient | Total collected personal income tax* | Counties' personal income tax after tax sharing | Counties' personal income tax after tax sharing + other current grants | Counties' personal income tax after tax sharing + other current grants to counties + equalization grants to counties for decentralized functions | Counties' personal income tax after tax sharing + other current grants to counties + equalization grants for decentralized functions + new equalization grant |
| Non-weighted (unit-based weight) | 0.1895 | 0.2084 | 0.1713 | 0.0711 | 0.0722 |
| Weighted by the population of the county | 0.1856 | 0.1982 | 0.1649 | 0.0643 | 0.0633 |
| Weighted by the area of the county | 0.1773 | 0.2091 | 0.1740 | 0.0766 | 0.0808 |

*All variables are analyzed per capita.*
**In the territory of the cities and municipalities of counties.*
*Source: The author's calculation based on the MF data.*

By calculating the Pearson's correlation coefficient and the Gini coefficients of concentrations we came to the conclusion that the new equalization grant does not equalise fiscal capacities among countries. Our results are comparable with those of Boex and Martinez-Vazquez, 2005. In their study, the analyzed intergovernmental grants in twelve countries were generally counter-equalizing when it comes to fiscal capacity, so that local units with a smaller own tax base tended to receive fewer intergovernmental grants. In addition, their findings also consistently indicated that smaller local units receive larger per capita grants.[32] Now we pose the question why the new equalization grant does not equalise fiscal capacities among countries.

In the first place, it might be that the new equalization grant to the counties is not meant to mitigate differences in fiscal capacities among countries any more. It is said, without any explanation or publicly available analysis of the formula for allocation of this grant, that since 2005, the criterion of county budget expenditures for capital projects has been replaced by the population density criterion. At the same time it is stated in the Budget Execution Act that this grant is provided only for investment in the development programmes of the counties, including those of their municipalities and cities. That means that, since 2005, this grant might have become an effective capital grant although it is still booked as "current grant" and the fiscal capacity criteria is still used in the formula for al-

[32] Although we did not enter into a deeper analysis, it is also obvious from our simple analysis that Lika-Senj County, a less populated county, is entitled to the highest amount of equalisation grant per capita (Figure 1). The reason for such a high amount of grant to the Lika-Senj County according to the formula is its low population density (six times lower than the average) and the high weight used in the calculation of grant on the basis of population density (Appendix 4, Table D, columns 8 and 10). Further research on this topic is needed, especially to find out more about the relationship between counties' population density (as indicator of fiscal needs) and grants given to the counties.

location of this grant. Perhaps the MF believes that equalization grants for decentralized functions and other current grants adequately mitigate the differences in fiscal capacities among counties. Or maybe the MF thinks that differences in fiscal needs among counties are more important than differences in fiscal capacities and that the design of this grant is good as it is because the grant effectively mitigates differences in fiscal needs. It would be good if the MF explained the change in the formula, and the reasons for the change. Much more research is clearly needed to determine fiscal needs among counties.

Secondly, maybe the new grant is meant to mitigate differences in fiscal capacities but political considerations outweigh the impact of normative considerations and the voter choice model.[33] For example, it is possible that policy makers prefer the new equalization grant formula because they commonly perceive that the resulting incidence pattern is generally fair. That is, maybe they want to provide as many resources as possible to the local units in the ASNC and HMA since they perceive these local units as needing more help from the central government. Or maybe the lobbing from ASNC and HMA is too strong. Thus, perhaps due to some political reasons, this MF grant is helping local units in ASNC and HMA more than others. We have seen that in the third step of the grant calculation procedure that after assessment of the amount of the new equalization grant payable to each county on the basis of its fiscal capacity and population density (Appendix 4, column 11), this amount is reduced by personal income tax refunds to taxpayers within the ASNC and HMA already paid from the central budget (column 12). It seems that this criteria (personal income tax refunds to taxpayers within the ASNC and HMA) has priority over other two criteria (fiscal capacity and population density). According to the fiscal capacity and population density criteria, only 15 counties were eligible for current grant (column 11). However, the personal income tax refunds from the central government budget were paid to taxpayers in the ASNC and HMA in all counties. Thus, the MF paid personal income tax refunds of about 15.7 million kuna even to those counties that were not entitled to the grant according to the fiscal capacity and population density criteria (column 13).[34] Furthermore, after the payment of personal income tax refunds to taxpayers in the ASNC or HMA, the MF was supposed to allocate an additional amount of 76 million kuna on account of the grant based on the fiscal capacity and population density criteria (column 14). However, owing to financial constraints of the central government budget, the amount available for the grant was only 40 million kuna (column 16). This was enough to cover only 52% of the amount actually needed for the new equalization grant. It is therefore possible that the amount of 15.7 million kuna paid on account of personal income tax refunds to taxpayers in the ASNC or HMA that did not qualify for the grant according to fiscal capacity and population density criteria (column 13) could have been used more efficiently by being allocated to the counties that really needed them (according to the fiscal capacity and population density).[35]

[33] For more see Boex and Martinez-Vazquez (2005).

[34] These are the counties of: Zagreb, Varaždin, Primorje-Gorski Kotar, Split-Dalmatia and Istria. Also, in some counties, the amount of personal income tax refunds exceeded the amount of the equalization grant they were supposed to receive according to the fiscal capacity and population density criteria (e.g. the counties of: Karlovac, Zadar and Dubrovnik-Neretva).

[35] For example, owing to the budgetary constraints, the Sisak-Moslavina County and Koprivnica-Križevci County received less than they were entitled to according to the formula.

The problem might be that the areas subject to special financial arrangements (ASNC and HMA) might not have been determined correctly. The situation has changed since the end of the war. For example ECORYS together with the Croatian Ministry of the Sea, Tourism, Transportation and Development in 2005 finished a project relating to the new approach as to how the less developed local units should be identified (ECORYS, 2004). They argued that the current system of categorisation of disadvantaged local units in Croatia is too fragmentary, since the designation of local units receiving special state support is separately regulated by four Acts. It was stated that the Act on Areas of Special National Concern[36], uses two different approaches for the designation of local units. In addition, important aspects that had to be taken into consideration are the European Union Guidelines on National Regional Aid. Thus, ECORYS together with the Croatian Ministry of the Sea, Tourism, Transportation and Development has proposed the new approach to identify the less developed local units that need additional help from central government but, for some reason, there is a problem with its implementation.

Thirdly, perhaps this grant is meant to mitigate the differences in fiscal capacities but the allocation mechanism fails to perform as intended. Or we can say that the current situation can be an outcome of a learning process of the government during the period of transition, since any economic transition is to a certain extent a "trial and error" process. Therefore, the Government and the MF will at some point decide to change and improve this grant. In fact, there was talk that it should be changed, but no consensus on how it should be changed has yet been reached. In their work for the Croatian Government, Consortium Human Dynamics KG, CIPFA International and VNG International (2006) argued that all grants to counties[37] in Croatia are too small and thus their impact is also too small. The problem is that there are big differences in wealth and income of counties (measured in GDP per capita). Since current and capital expenditures per capita in counties are closely related to the GDP, there are also big differences in expenditure per capita in the counties. Given a wide variation in per capita local revenue capacity, allocating increased expenditure responsibility to local units (during the current process of fiscal decentralization) makes the mismatch between local revenue capacity and expenditure needs larger. So they argued that there is a problem with system of current grants to the counties. The problem is that not only the total grants are too small but there are also several different types of grants from the central government to counties, and the formula of the new equalization grant to counties is not targeted well. The indicators used are deviations from per capita revenues from national per capita values, but the different needs for expenditures are not properly taken into account. They also argued that the effect of one grant may offset the effect of the other, and thus a new and integrated approach is needed. So, as an option for redesigning the system of intergovernmental transfers in Croatia, they proposed a major new, formula-based equalization grant system, including unrestricted and sector block grants. The rationale for this option is that a well-designed equalization grant system is an essential element of a balanced revenue structure in a decentralized fiscal system. In spite of this, for some reason, since 2005 there has been no change in the structure of grants from the central government to counties.

[36] In Croatian *Zakon o područjima posebne državne skrbi*.

[37] This research analyzed country budgets including budgets of the municipalities and cites in their area.

## 6 Conclusion

We have analyzed whether the new equalization grant provided by the MF in Croatia in 2005 reduces fiscal capacity differences among counties. In this simple analysis we ignore the differences in fiscal needs among counties. Nevertheless, they should be analyzed in the future. By calculating Pearson's correlation coefficient and the Gini coefficients of concentrations we proved our hypothesis that the fiscal capacity inequalities among counties are not adequately mitigated by the new equalization grant to counties.

The conclusion is that firstly, perhaps this new grant is not meant to mitigate differences in fiscal capacities at all; secondly, maybe it is meant to mitigate the differences but political considerations outweigh the impact of normative considerations and the voter choice model; or thirdly, it is meant to mitigate the differences but the allocation mechanism fails to perform as intended. Finally, maybe the reason why this grant does not mitigate differences in fiscal capacities among counties is some combination of these three reasons.

Much more research is needed to provide detailed recommendations concerning the analyzed grant. Firstly, the MF should explain the change in the formula in 2005, and explain in general what this grant is meant for. Secondly, more research is needed to define if there are some political reasons why this grant does not mitigate differences in fiscal capacities and to find out if there is any relationship between these two variables. Thirdly, if this grant is meant for mitigating differences in fiscal capacities among counties but it is not designed properly, simulations should be used to determine how the criteria for the allocation formula (fiscal capacity and population density) should be modified. For that the MF needs to define how much fiscal equalization among counties it wants taking into account equalization already done by other transfers (e.g. fiscal decentralization grants and other current grants to the counties). Then on the basis of simulations it should be decided whether new criteria for fiscal capacity and fiscal needs should be introduced or the weights changed in order to help the counties that are unable to provide adequate public services.

## APPENDIX 1: A short description of the Croatian tax sharing system

### *Tax sharing*

The financing system of local and regional units (counties, municipalities and cities) in the Republic of Croatia is largely based on sharing tax revenues (in particular, the personal income tax revenues) between the central government and the local and regional units (LRUs). At the moment, the personal income tax and the real estate transfer tax are shared between the central government and LRUs. Personal income tax is the chief source of revenue for most of the LRUs. Croatian governments to date have used personal income tax sharing as an instrument for: (a) reducing vertical fiscal inequalities that arise from the assumption by the LRUs of the financing of their basic or additional (decentralised) functions, and (b) horizontal fiscal equalization for the purpose of softening fiscal inequalities in certain LRUs created by differences in the fiscal capacities and needs of the LRUs.

*Tax sharing for vertical fiscal equalization.* The percentages of the distribution of personal income tax between the central government and counties, municipalities and cities have changed a number of times since 1994. However, it is important to point out that vertical fiscal equalization is linked to the usual or standard sharing of personal income tax. Thus, in the case of the standard tax sharing in 2009, of the total personal income tax collected, the county received 15.5%, the cities and municipalities 55%, 17.5% went to the Equalization Fund, and 12% was allocated to the level of government that had assumed decentralised functions (Table A). For the performance of its basic functions a county usually obtains 15.5% and a city or municipality 55% of the personal income tax collected in their respective areas.

An additional share of personal income tax goes only to counties, cities and municipalities that have taken on the obligation to finance decentralised functions. The LRUs with more decentralised functions also obtain larger shares of personal income tax. Since 2001, the central government has provided 53 LRUs (counties, cities and municipalities) that have assumed the obligation to finance decentralised functions (elementary and secondary education, health care, social welfare), and the 127 cities and municipalities that finance the fire services with an additional share in personal income tax (Table A – Decentralised Functions). From 2007 on, those LRUs financing all the decentralised functions have been able to increase their shares in personal income tax up to 12%. If they decide to take on the financing of just a few functions, they can obtain additional shares in personal income tax as follows: 3.1% for elementary education, 2.2% for secondary schools, 3.2% for health care, 0.5% for welfare centres, 1.7% for nursing homes and 1.3% for fire services.

If the LRUs that have assumed the obligation to finance decentralised functions do not obtain enough resources from the additional share in personal income tax to ensure that these functions are financed at the minimum financial standard, then they are allocated grants from the Equalization Fund by the central government (Table A – Equalization Fund). This fund is in fact another part of the personal income tax revenues that the central government allocates to the LRUs for the financing of decentralised functions. Only 295 local units qualify for this “topping up”. The other 275 local units are exempt because they have a special status in the financing system (ASNC, HMA and islands with joint capital projects).[38]

*Table A: Distribution of personal income tax between the central government and LRUs since 1994 (in %)*

| **Personal income tax** | | **1994-2001** | **2001-2003** | **2003-2007** | **2007-1/7/2008** | **Since 1/7/2008** |
|---|---|---|---|---|---|---|
| Standard | Central government | 70 | 29.6 | 24.6 | | |
| | County | 5 | 8 | 10 | 15 | 15.5 |
| | City/municipality | 25 | 32 | 34 | 52 | 55 |
| | Decentralised functions | | 9.4 | 10.4 | 12 | 12 |
| | Equalization Fund | | 21 | 21 | 21 | 17.5 |
| ASNC, HMA | Central government | 70 | | | | |
| | Country | 5 | 8 | 10 | 10 | 10 |
| | City/municipality | 25 | 92 | 90 | 90 | 90 |
| | Decentralised functions | | | | | |
| | Equalization Fund | | | | | |
| Islands – capital projects | Central government | 70 | | | | |
| | County | 5 | 8 | 10 | 15 | 15 |
| | City/municipality | 25 | 61.6 | 58.6 | 52 | 52 |
| | Decentralised functions | | 9.4 | 10.4 | 12 | 12 |
| | Equalization fund | | 21 | 21 | | |
| | Share for financing capital projects belongs to city/municipality | | | | 21 | 21 |
| The City of Zagreb | Central government | 50 | 24.6 | 21.6 | | |
| | County | 5 | | | | |
| | Zagreb | 45 | 45 | 47 | 67 | 70.5 |
| | Decentralised functions | | 9.4 | 10.4 | 12 | 12 |
| | Equalization Fund | | 21 | 21 | 21 | 17.5 |

*Source: Zakon o financiranju jedinica lokalne samouprave i uprave.*

Apart from the personal income tax share, cities and municipalities also receive 60% of the tax on real estate transfer in their respective territories for the financing of their basic functions (see Table B).

[38] The central government has entitled these local units to a greater amount of personal income tax collected in their respective territories. Cities and municipalities in the ASNCs and HMAs obtain the greatest part of the personal income tax collected, because they are also allocated the part of the tax that the central government would otherwise earmark for the Equalisation Fund and for the financing of decentralised functions (Table A).

*Table B: Distribution of shared taxes between the central government and LRUs since 1994 (in %)*

<table>
<tr><th>Taxes on</th><th>1994-2000/01</th><th colspan="2">2000/01-2007</th><th>2007</th></tr>
<tr><td>Corporate income</td><td colspan="3">Central government 70%, county 10%, city or municipality 20%</td><td>Central government budget revenue</td></tr>
<tr><td>Corporate income (ASNC, HMA)</td><td colspan="2">Central government 70%, county 10%, city or municipality 20%</td><td>County 10%, city or municipality 90%*</td><td>Central government budget revenue</td></tr>
<tr><td>Real estate transfer</td><td colspan="4">Central government 40%, city or municipality 60%</td></tr>
<tr><td>Games of chance</td><td colspan="2">Central government 50%, city or municipality 50%</td><td colspan="2">Revenue of central government budget**</td></tr>
</table>

** Since 22 July 2000, Zakon o područjima posebne državne skrbi.*
*** Since 1 July 2001, Zakon o financiranju jedinica lokalne samouprave i uprave.*

*Source: Zakon o financiranju jedinica lokalne samouprave i uprave.*

*Revenue sharing for horizontal fiscal equalization*. Governments to date have used tax sharing both to reduce vertical inequalities arising from the assumption of basic and decentralised functions, and as an instrument for horizontal fiscal equalization[39] aimed at mitigating fiscal differences in individual LRUs. Thus, the government, the MF and other competent ministries have used tax sharing particularly to support ASNC and HMA, as well as those island cities and municipalities that have entered into agreements for joint capital project financing. Since 2001 and 2003 respectively, they have ceded almost the entire revenues from personal and corporate income tax to cities and municipalities in the ASNC and HMA (Tables A and B – ASNC, HMA).

*Tax revenue sharing for the financing of capital projects*. In order to protect the islands and to stimulate demographic development, in 2003, the government adopted incentive measures for the development of 45 island local units. These included relief for the purchase and lease of farmland and for the financing of capital projects for water and water supply, spatial planning and improvement of traffic infrastructure. Moreover, from 2001 to 2007, the central government allocated part of its personal income tax revenues to these local units. From 2007 on, the Government and the MF additionally exempted island units from the obligation to pay part of their personal income tax revenue into the Equalization Fund. In this way, a part of the personal income tax revenues of the central government became an additional source of revenue for island units to finance capital projects (Table A – island capital projects).

[39] Before the decentralisation in 2001, there were no in-depth analyses of the effects of the central government measures on the alleviation of existing horizontal fiscal inequalities, and it is a matter for consideration whether some new inequalities arose after 2001, as a result of the confusion of the mechanisms and criteria for the allocation of grants from the central government budget. The main instrument for horizontal fiscal equalisation consists of various types of current grants.

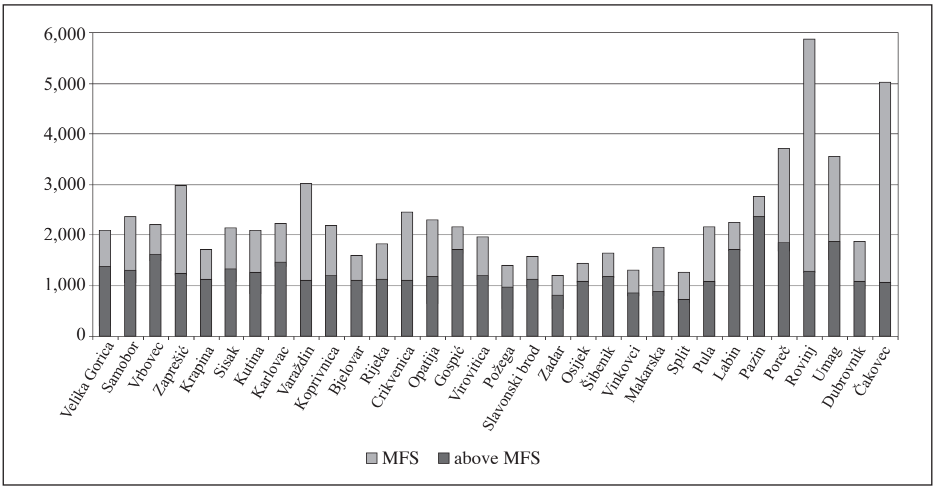
## APPENDIX 2: A short description of current grants from the central government to counties, cities and municipalities

*1) Equalization grants for decentralised functions*

Since 2001, the government has provided an extra part of its personal income tax revenue to 53 local units (cities, municipalities and counties) that have taken on the obligation to finance decentralised functions (elementary and secondary education, health care, welfare) and to 127 cities and municipalities that have established and financed their fire services. The government has also provided resources from the equalization fund to the units that have assumed decentralised functions but have not obtained enough funds from their extra share in personal income tax revenue to reach the minimum financial standards for these functions. On the recommendation of the relevant ministries (of health, science, education and sport, and welfare), the government sets minimum financial standards every year, representing the costs of carrying out a certain activity. In defining these standards, the ministries have to take into account the different needs of local units. For example, the criteria for the allocation of resources to cover the material and financial expenditures in secondary schools and pupil hostels is the number of pupils enrolled times the average annual cost per pupil. The average annual cost is determined annually for each individual local unit.

However, it is not clear how these minimal financial standards for the decentralised functions are calculated, nor is it clear on what figures they are based. No figures, for example, are published on which the calculation of the average cost per pupil in given local units is based. Graph 1 shows that there are important differences between cities in the minimum financial standard per pupil and that this calculation needs reconsidering.

*Graph 1: Expenditures up to and above the minimum financial standard for elementary schools per pupil in 2005, distribution among cities in kuna*




*Source: A Model for the introduction of compulsory secondary education, 2007. Zagreb: Ivo Pilar Institute of Social Sciences and Institute of Public Finance.*

*2) Current grant of the MF to ASNC, groups I and II, cities and municipalities*

It is allocated to the local units with below-average abilities to collect revenue from their own sources. However, there are many criteria, which change frequently and are far from being clear (Table C). As late as in 2008 the public was told what is meant by different criteria of the formula and how they are used in a formula. But still many things relating to that formula are unclear because formula is rather complicated and non-transparent.[40]

*Table C: Criteria for the allocation of current grants from the MF to cities and municipalities in the ASNC, Group I and II, 2002-2009*

| | **2002** | **2003** | **2004** | **2005-2009** |
|---|---|---|---|---|
| Population according to the 2001 census | + | + | + | + |
| Average revenue per capita of cities and municipalities at the national level (national average) | + | + | + | + |
| Average per capita revenue of a group of ASNC (individual cities or municipalities) | + | + | + | + |
| Expenditure for capital projects as a share in total expenditure | + | + | + | + |
| Rationality of performance of the functions of the system (number of employees, expenditure per employee) | + | + | + | + |
| Expenditures for the functions of a city (with a population of 30,000) | + | + | + | + |
| Adjustment factor for a gradual transition to a new model of calculating grants | + | + | + | - |
| Balancing material expenditures (population size and per capita expenditure) | - | + | + | - |
| Population density (per km$^2$) at the level of ASNC, Group I and II (collective average) | - | - | - | + |
| Population density (per km$^2$) of a given municipality or city | - | - | - | + |

*Source: Zakon o izvršavanju državnog proračuna; (+) – the criteria is employed, (-) – the criteria is not employed.*

*3) Current grant allocated by the MF to counties*

From 2002 to 2005, the grant to counties was intended to correct for differences in fiscal capacities, and for investment in development programmes of the counties as well as their municipalities and cities. Since 2005, as stated by the Budget Execution Act, this grant has been provided only for investment in the development programmes of the counties, including those of their municipalities and cities.[41] The counties can use part of the

[40] For more details about this formula see Bronić (2008).
[41] Excluding the purchase of passenger cars.

grant for their own needs, whereas the other part is redistributed, according to the criteria they set, to their own cities and municipalities outside the ASNC, Groups I and II. The public has never seen the formula according to which the MF allocates this grant to counties, nor has it been informed about how the counties decide to redistribute the grant to their own cities and municipalities.

*4) Current grants provided by other ministries and central government institutions to counties, cities and municipalities*

These grants also have no clear-cut criteria. Neither the size nor the structure of current grants from, for example, the Ministry of Culture or the Ministry of the Sea, Tourism, Transportation and Development to a given county, municipality or city, is known to the public. In the central budget, all that is known is that a certain amount of current grant was earmarked for a given project. But to what municipality, city or county it has been paid is not shown.

*5) Budgetary reserves and compensation for damage caused by natural disasters*

There is no specification of exactly how budgetary reserves and compensation for damage caused by natural disasters are spent, neither is it clear where this money goes and why. For example, in the draft central government budget for 2007 it says that in 2005, 315 million kuna was spent for budgetary reserves, but there is no indication of the amount paid, or the recipient, or the purpose of the payment.[42]

*6) Current grant as a substitute for corporate income tax revenues*

From 2007 on, corporate income tax is no longer shared among the local units. Therefore, the Government decided to pay grants from the central government budget only to municipalities and cities in the ASNC and HMA, in the amounts equivalent to the corporate income tax revenues earned in their respective territories. For example, in the central government budget for 2007, 287 million kuna was earmarked for this purpose, but the local units that were to receive it were not specified.

[42] Figures do exist in the Ministry of Finance, but they have not been made public.

## APPENDIX 3: Calculating the Gini coefficient

For each variable, we first calculate the *per capita* amount, thus obtaining new variables: $x^1$, $x^2$, $x^3$, $x^4$ and $x^5$. For each new variable, we calculate a different Gini coefficient by using the following procedure. The observed variable is marked as $x$. The Gini coefficient is two times the area between the Lorenz curve and the perfect equality line. That is why at the beginning we need to calculate the abscissa and ordinate of the Lorenz curve. The values of variable $x$ should first be arranged in ascending order, so that $x_1<x_2<\ldots<x_{N-1}<x_N$.

The abscissas of the Lorenz curve, $L_i$ are the cumulative proportions of the weighted variable $x$:

$$L_i = \frac{\sum_{j=1}^{i} w_j x_j}{\sum_{k=1}^{N} w_k x_k}$$

The weight is $w$. We have used two types of weights[43]: the area of the county, population of the county and a "unit-based" weight ($w_i$=1 for every $i$=1… N). This means that for each variable we have obtained three types of Gini coefficients. $N$ is the number of units in the population; in our case the population represents 20 Croatian counties, so $N$=20.

The ordinates of the Lorenz curve, $p_i$, are the cumulative proportions of the weighted members of the population:

$$p_i = \frac{\sum_{j=1}^{i} w_j}{\sum_{k=1}^{N} w_k}$$

Finally, the Gini coefficient is calculated as follows:

$$G = 2 \cdot \sum_{i=1}^{N} \left( p_i - L_1 \right)$$

[43] For more details about the problems of using the Gini coefficient for measuring inequalities among regions, see OECD (2003a, 2003b).

## APPENDIX 4: Table D

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| County (narrowly defined) | Fiscal capacity (FC) in million kuna, 2003 | Population in thousands | 75% of FC per capita in kuna, 2003 | Is 75% of a county's average FC per capita less than 75% of the national average FC per capita in kuna, 2003? | 75% of the national average FC per capita – 75% of a county's average FC per capita in kuna, 2003 | Amount of grants based on FC in million kuna for 2005 = number of points = (5 × 2) | County area in km$^2$ | Population density (PD) = Population number / area = (2/7) |
| Zagreb | 81.3 | 309.7 | 196.91 | 0 | | | 3,060 | 0.10 |
| Krapina-Zagorje | 24.3 | 142.4 | 127.83 | 1 | 51.6 | 7.35 | 1,229 | 0.12 |
| Sisak-Moslavina | 30.9 | 185.4 | 124.93 | 1 | 54.5 | 10.11 | 4,468 | 0.04 |
| Karlovac | 35.3 | 140.8 | 188.01 | 0 | | | 3,626 | 0.04 |
| Varaždin | 48.9 | 176.3 | 207.83 | 0 | | | 1,262 | 0.14 |
| Koprivnica-Križevci | 26.0 | 124.5 | 156.64 | 1 | 22.8 | 2.84 | 1,748 | 0.07 |
| Bjelovar-Bilogora | 22.1 | 133.1 | 124.38 | 1 | 55.1 | 7.33 | 2,640 | 0.05 |
| Primorje-Gorski Kotar | 113.5 | 305.5 | 278.75 | 0 | | | 3,588 | 0.09 |
| Lika-Senj | 14.3 | 53.7 | 199.99 | 0 | | | 5,353 | 0.01 |
| Virovitica-Podravina | 13.6 | 93.4 | 109.07 | 1 | 70.4 | 6.57 | 2,024 | 0.05 |
| Požega-Slavonia | 15.0 | 85.8 | 130.73 | 1 | 48.7 | 4.18 | 1,823 | 0.05 |
| Brod-Posavina | 22.9 | 176.8 | 97.23 | 1 | 82.2 | 14.53 | 2,030 | 0.09 |
| Zadar | 37.0 | 159.7 | 174.04 | 1 | 5.4 | 0.86 | 3,646 | 0.04 |
| Osijek-Baranja | 59.0 | 330.5 | 133.81 | 1 | 45.6 | 15.09 | 4,155 | 0.08 |
| Šibenik-Knin | 20.7 | 113.3 | 137.32 | 1 | 42.1 | 4.77 | 2,984 | 0.04 |
| Vukovar-Srijem | 34.5 | 204.8 | 126.34 | 1 | 53.1 | 10.88 | 2,454 | 0.08 |
| Split-Dalmacija | 121.7 | 463.7 | 196.88 | 0 | | | 4,540 | 0.10 |
| Istra | 98.2 | 206.3 | 357.04 | 0 | | | 2,813 | 0.07 |
| Dubrovnik-Neretva | 29.2 | 122.9 | 178.00 | 1 | 1.5 | 0.18 | 1,781 | 0.07 |
| Međimurje | 24.2 | 118.4 | 153.50 | 1 | 26.0 | 3.07 | 729 | 0.16 |
| Total | 872.6 | 3,646.9 | | 13 | | | 55,953 | |
| Average | | | 239.27 | 1 – yes | | 87.77 | | 0.07 |
| 75% of average | | | 179.46 | 0 – no | | | | |

| | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|
| County (narrowly defined) | Is the PD of a county lower than the national average? | Amount of grant based on PD in million kuna = Number of points = (national average / county average) × 1,000,000 | Total number of points based on FC and PD (in million kuna), 2005 (6 + 10) | Personal income tax refunds by the central government instead of counties | Counties whose refunds exceeded the amounts calculated by the formula, in million kuna (12 – 11) | Final amount of grant needed = final points = (FC + PD – refunds) in million kuna, 2005 (11 – 12) | Point value, 2005 (totally 17/ totally 14) | Additional amount of grant receivable by counties after personal income tax refund, in million kuna (column 14 × 0,5227) – author's calculation |
| Zagreb | 0 | | | 0.7 | 0.67 | | | |
| Krapina-Zagorje | 0 | | 7.4 | 0.9 | | 6.4 | | 3.4 |
| Sisak-Moslavina | 1 | 1.6 | 11.7 | 4.4 | | 7.3 | | 3.8 |
| Karlovac | 1 | 1.7 | 1.7 | 3.1 | 1.41 | | | |
| Varaždin | 0 | | | 0.9 | 0.88 | | | |
| Koprivnica-Križevci | 0 | | 2.8 | 0.1 | | 2.8 | | 1.4 |
| Bjelovar-Bilogora | 1 | 1.3 | 8.6 | 1.0 | | 7.7 | | 4.0 |
| Primorje-Gorski Kotar | 0 | | | 3.4 | 3.43 | | | |
| Lika-Senj | 1 | 6.5 | 6.5 | 3.6 | | 2.9 | | 1.5 |
| Virovitica-Podravina | 1 | 1.4 | 8.0 | 1.0 | | 7.0 | | 3.6 |
| Požega-Slavonia | 1 | 1.4 | 5.6 | 1.6 | | 4.0 | | 2.1 |
| Brod-Posavina | 0 | | 14.5 | 1.0 | | 13.5 | | 7.1 |
| Zadar | 1 | 1.5 | 2.4 | 2.4 | 0.06 | | | |
| Osijek-Baranja | 0 | | 15.1 | 3.8 | | 11.3 | | 5.9 |
| Šibenik-Knin | 1 | 1.7 | 6.5 | 1.8 | | 4.7 | | 2.5 |
| Vukovar-Srijem | 0 | | 10.9 | 4.8 | | 6.1 | | 3.2 |
| Split-Dalmacija | 0 | | | 3.8 | 3.75 | | | |
| Istra | 0 | | | 1.0 | 0.97 | | | |
| Dubrovnik-Neretva | 0 | | 0.2 | 4.7 | 4.55 | | | |
| Međimurje | 0 | | 3.1 | 0.1 | | 2.9 | | 1.5 |
| Total | 8 | 17.0 | 104.8 | 44.0 | 15.72 | 76.5 | 0.523 | 40.0 |
| Average | 1 – yes | | | | | | | |
| 75% of average | 0 – no | | | | | | | |

| | 17 | 18 | 19 | 21 | 22 | 23 |
|---|---|---|---|---|---|---|
| County (narrowly defined) | Additional amount of grant actually received by counties after personal income tax refund, in million kuna (Ministry of Finance data) | Total grant and refunds acutally received, in million kuna (17 + 12) | Total amount of grant that should have been received based on FC and PD, in million kuna (column 11) | Amount received (grants + refund) per capita (column 18 / population number) | Total amount of grant that should have been received based on FC and PD per capita (column 11 / population number) | Amount of grant that should have been received – the amount of grant and refund actually received per capita in kuna (22 – 21) |
| Zagreb | | 0.7 | 0.0 | 0 | 0 | -0 |
| Krapina-Zagorje | 3.5 | 4.4 | 7.4 | 31 | 52 | 20 |
| Sisak-Moslavina | 4.0 | 8.4 | 11.7 | 45 | 63 | 18 |
| Karlovac | | 3.1 | 1.7 | 22 | 12 | -10 |
| Varaždin | | 0.9 | 0.0 | 5 | 0 | -5 |
| Koprivnica-Križevci | 1.9 | 2.0 | 2.8 | 16 | 23 | 7 |
| Bjelovar-Bilogora | 3.5 | 4.4 | 8.6 | 33 | 65 | 32 |
| Primorje-Gorski Kotar | | 3.4 | 0.0 | 11 | 0 | -11 |
| Lika-Senj | 1.0 | 4.6 | 6.5 | 85 | 121 | 36 |
| Virovitica-Podravina | 4.6 | 5.6 | 8.0 | 60 | 86 | 25 |
| Požega-Slavonia | 2.1 | 3.7 | 5.6 | 43 | 65 | 22 |
| Brod-Posavina | 7.5 | 8.5 | 14.5 | 48 | 82 | 34 |
| Zadar | 0.2 | 2.6 | 2.4 | 17 | 15 | -2 |
| Osijek-Baranja | 5.5 | 9.3 | 15.1 | 28 | 46 | 17 |
| Šibenik-Knin | 2.5 | 4.2 | 6.5 | 37 | 57 | 20 |
| Vukovar-Srijem | 2.1 | 6.9 | 10.9 | 34 | 53 | 19 |
| Split-Dalmacija | | 3.8 | 0.0 | 8 | 0 | -8 |
| Istra | | 1.0 | 0.0 | 5 | 0 | -5 |
| Dubrovnik-Neretva | | 4.7 | 0.2 | 38 | 1 | -37 |
| Međimurje | 1.6 | 1.7 | 3.1 | 14 | 26 | 12 |
| Total | 40.0 | 84.01 | 104.82 | 582.31 | 766.02 | 183.72 |
| Average | | | | | | |
| 75% of average | | | | | | |

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