FISCAL DECENTRALIZATION AND LOCAL PUBLIC SECTOR EFFICIENCY

by

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Abstract

FISCAL DECENTRALIZATION AND LOCAL PUBLIC SECTOR EFFICIENCY

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This paper investigates several aspects of the efficiency of local public finance organization in Ukraine. Using data for years 1996-2001, I am looking for what fiscal decentralization can contribute to the economic growth of Ukraine, in the first place. Second, I estimate the efficiency of local public sector from both sides of revenue and expenditure assignments. In particular, on the revenue side I investigate the strength of fiscal incentives of local governments to extend their tax base. From the expenditure side, I investigate the question of the optimal size of population to be served by one local government on the micro-government level. The obtained results indicate the negative impact of the fiscal decentralization on the economic growth in Ukraine. However, these results are not robust to the sensitivity analysis. The estimation of fiscal incentives of local governments to mobilize revenues suggests that disincentives are not that large as it was expected, although they still exist. The investigation of the character of public expenditures on the micro-government level reveals the necessity of restructuring lowest-tier governments towards amalgamation of the smallest village local governments in Ukraine for the purpose of more efficiency in public expenditures in the sense of minimization of operative costs.

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Chapter 1

INTRODUCTION

During the first decade of independence the system of public finance in Ukraine was functioning under the legislation and principles inherited from the Soviet Union. But year by year this system revealed several drawbacks. The old system of intergovernmental finance did not allow Ukraine to move effectively in the direction of fiscal decentralization. The most essential drawbacks of the inherited system were the lack of transparency, the subjective character of budget decisions, the permanent instability in expenditure and revenue responsibilities of budgets of different levels, i.e. what public goods should be provided by different levels of governments, the lack of motivation for local budgets to expand tax revenue base as the result of revenue sharing system and the lack of motivation to increase the efficiency of public expenditure. Using data for years 1996-2001, I investigate, first, what fiscal decentralization can contribute to the economic growth of Ukraine. Second, I estimate the efficiency of local public sector from both sides of revenue and expenditure assignments. In particular, on the revenue side I investigate the strength of fiscal incentives of local governments to extend their tax base. From the expenditure side, I investigate the question of the optimal size of population to be served by one local government on the micro-government level.

Chapter 2

LITERATURE REVIEW

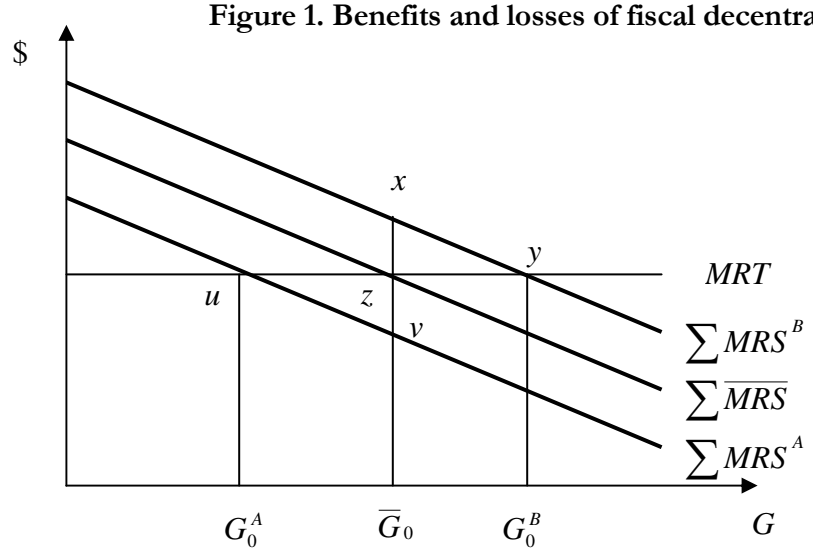
In most countries of the world the public sector is stratified into more than one level of government. Each level is assigned different rights and responsibilities in conducting public policy. The obvious questions that arise are whether there is economic justification for having certain hierarchy structure of governments, whether economic rationale exists for a given number of governments at each level and whether decentralization of fiscal rights and responsibilities results in more benefits for individuals who live within a given geographical or administrative area. The economic theory of fiscal federalism attempts to answer these questions.

At early stages of the development of the theory of fiscal federalism, it was generally assumed that the governments are benevolent and try to make efficient and effective public economic decisions based on the collective preferences of their constituents. Such decisions have two major goals that refer to the allocative and distributive roles of the government.

With the assumption of the government that behaves so as to maximize the well-being of its residents, the justification for fiscal decentralization is straightforward. The consumption of many kinds of public goods are not consumed on a nation-wide basis, but restricted to some local geographical area or some specific population group. In case when the central government takes all responsibility for allocation resources in provision of local public goods, it could tend to allocate resources uniformly among localities, while different localities may have different collective needs and tastes concerning quantity and quality of public goods.

The figure 1 illustrates the benefits from decentralizing responsibilities for provision of local public goods (Boadway, Wildasin, 1984):

Figure 1. Benefits and losses of fiscal decentralization.



For two localities, A and B, the sums of marginal benefits to their residents for different levels of public good G are represented by $\sum MRS^i$ curves (i=A,B). The marginal cost of the provision of public good G is assumed to be constant, the same across localities and equal to MRT. Thus, the optimal amounts of G^A and G^B refer to the case when marginal benefits are equal to the marginal costs, that is to the amounts of G_0^A and G_0^B. But the central government could tend to provide the level $\overline{G}_0$ of which satisfies the condition that average marginal costs across localities are equal to average marginal benefits. Such level of public good provision is less optimal and results in deadweight loss which is the area *uvz* plus area *zyx*.

The condition for the optimal provision of public goods was developed by Samuelson (1954). This condition addresses that allocation of public goods is Pareto efficient if only the sum of marginal rates of substitution between private and public goods for all regarded individuals and the marginal rate of

transformation between private and public goods are equal. But this equality demands for government to have perfect information about preferences of individuals. But individuals usually do not reveal their true willingness to pay for public goods. Individuals that have high willingness to pay tend to free ride and to avoid paying the actual value they assign to the good. As a result, the summation of marginal benefits from consuming the public good is undervalued and Samuelson's conditions for Pareto efficient allocation of public goods do not hold.

Tiebout (1956) argues that, although revealing individuals' preferences is problematic for centralized public goods provision, it need not apply to provision of local public goods. Assuming full knowledge and full mobility of households and resources within the country, an individual can choose that locality which best satisfies his preference pattern for a public good. This is a major difference between central and local provision of public goods. At the central level the preferences of a consumer are determined first and the government tries to adjust to the pattern of these preferences, whereas various local governments have their revenue and expenditure patterns more or less set. Given these revenue and expenditure patterns, a consumer moves to that community where local government best satisfies his set of preferences. In such way a decentralized economy is able to reveal preferences of individuals and allows the government to provide public goods more efficiently comparing with a centralized economy. Tiebout's theoretical framework has some drawbacks mainly contained in the assumptions he made: full knowledge of differences between communities, full mobility of consumers and their resources, sufficiently large number of communities regulated by different local governments, no restrictions due to employment opportunities.

Despite the fact that some theories suggest benefits from fiscal decentralization, disadvantages for the economy because of decentralized governments are also discussed in the literature. Thus, there exist tradeoffs between centralization and decentralization.

For instance, both positive and negative externalities may exist in the society with decentralized government. If government of one locality provides education of very high quality for its residents, but some of people received education move to another locality for further inhabitance, then the latter locality receives positive externalities (Rosen, 1999). The negative example of externalities in local public goods provision is law enforcement (Marlow, 1995). When governments of different regions provide law enforcement of different quality, then it is possible to expect criminals to move to a region with law enforcement system of lower quality.

Competition among different local jurisdictions of the same level is considered to be beneficial for the citizens' welfare according to the Tiebout model. However, this may bring additionally distortions to the economy. When local governments, while competing with other local jurisdictions, decrease tax burdens for local economic agents, this may result in the lack of resources to provide local public services of demanded quality (Marlow, 1995).

Fiscal decentralization can also entail extra costs in terms of the central government's ability to carry out effectively its macroeconomic management (Ter-Minassian, 1997). A loss of major tax instruments or of control over a large share of public expenditure can severely constrain the central government, for example, in raising taxes or cutting spending to curb an overheated demand.

Traditional theories of federalism concentrated on allocative benefits of decentralization. But recently the theory of "market-preserving federalism" has

developed (Qian and Weingast, 1997) emphasizing on additional benefits of decentralization. This theory has two new focuses. First, it abandons the assumption of benevolent governments, stressing the importance of the political and fiscal incentives of governments. Second, it looks beyond the central-local fiscal relationship to study how such relationship affects the government's behavior toward other economic agents such as enterprises. The issue of aligning government incentives with promoting markets is especially acute for transition economies. In these countries governments have often been the central barrier to economic development. Qian and Weingast point out that when the government is tempted to take away too much income and wealth, then the "state predation" problem arises so that the state does not maintain "positive" market incentives that reward economic success. But they also claim that for many transition economies even more acute problem arises in this context. It is known as "soft budget constraint" problem.

Qian and Roland (1998) investigate the soft budget constraint problem in more details. The local government is said to have a soft budget constraint when it expects to be bailed out in case of financial trouble. This creates disincentive for local government to properly observe financial discipline in public spending. Qian and Roland build the theoretical framework for the mentioned problem and prove that fiscal decentralization in form of fiscal competition between jurisdictions prevents inefficient government spending, creating disincentives for local governments to bail out inefficient projects.

Jin, Qian and Weingast (1999) investigated fiscal decentralization and fiscal incentives in the central-provincial relationship during China's reform. They obtained four major findings in their study. Their first major finding reveals strong correlation between local revenue collection and local expenditure in post-reform period. By way of comparison, this correlation was extremely weak before

the reform. It was also revealed that the ratchet effect after the reform (that is, the central government reacts to higher local revenues this year by requiring higher remittances next year) fell by more than half as compared to the pre-reform period. Second, it was found that this strong correlation was due to the implementation of the fiscal contracting system. The third major finding concerned the effects of fiscal incentives on provincial structural change and government behavior. It was found that, across provinces and over time, stronger fiscal incentives – measured in terms of higher marginal local revenue retention rate – positively affect the development of non-state enterprises in terms of the growth of rural or total non-state enterprise employment. Stronger fiscal incentives also induce more reforms in state-owned enterprises in terms of the increased shares of contract workers in the total state employment and bonuses in total employee wages. Finally, China's fiscal contracting system is also associated with a declining inter-provincial inequality over time in terms of per capita budgetary spending.

Zhuravskaya (1998) investigates and compares local fiscal incentives in China and Russia. Particularly, she emphasizes on the revenue assignments of local governments and claims that the existing revenue sharing system in Russia creates poor incentives for local governments to increase their efforts in raising own revenues because any increase in own revenues results in immediate crowding-out by the central government through renegotiation of tax sharing rules between regional and local governments. The main finding is that when own revenues of the locality budget rise, they are on average 90 per cent offset by a decrease in the shared revenues. This leads to predatory governmental behavior towards businesses, since it is shown that the strength of government fiscal incentives is positively correlated with the speed of private business formation in the locality. It is also presented that fiscal incentives serve as a determinant of the share of local spending on education and health care: local governments spend a higher

share of total expenditures on education and health care when they face stronger fiscal incentives. Finally, the evidence is found that the strength of fiscal incentives positively affects the efficiency of public spending. In contrast, it is found that in China local shared revenues are independent of the changes in local own revenues.

While a lot of investigation was devoted to the problem of how expenditure and revenue responsibilities should be divided between central and local governments, other researchers concentrated on the problem of optimal structure of local governments. It means that it is not only important what are the shares of revenue and expenditure assignments of local governments comparing to central government, but also what is the optimal number of local governments within given area.

The research of Soul (2000) establishes theoretical support and performs empirical calculations for the determination of the optimal size and boundaries of the local government jurisdiction of Australia. The main idea of the research is grounded in the dependence of the efficiency of political and economic performance on the jurisdiction size.

Stansel (2002) examines whether local government structure has impact on economic growth and addresses the question whether it is better in a given area to have one large monopolistic local government or many small competitive local governments. He finds that many small local governments produce superior economic performance. This contradicts to the market failure theory which suggests the superiority of large local governments.

A competitive system of many small local governments offers two distinct advantages: it better accommodates consumer preferences and it better constrains the behavior of government. The areas dominated by monopolistic

local governments will offer consumers fewer choices of tax-service bundles than areas with many competing local governments. In an area with a wider variety of available tax-service bundles a given resident will choose a jurisdiction that closely meets his/her own preferences. Also interjurisdictional competition encourages local governments to produce public services efficiently and limits the ability to extract monopoly rents. In addition, when local jurisdictions are small, each resident's voice carries more weight than in larger ones, so that elected officials are likely to be more accountable to their constituents.

On the other hand, a consolidated system of one or a few local governments also offers two distinct advantages over a fragmented system: it can achieve economies of scale and internalizes externalities. Some of the services provided by local governments, such as wastewater treatment and water-supply service, are capital-intensive processes that involve large fixed costs before any output can be produced. Since long-run average total costs are declining over large ranges of output, such services can be produced more efficiently on a larger scale. Thus, large local governments can often provide public services with substantial economies of scale. However, this benefit is limited. Some labor-intensive services, such as police protection and fire protection, turn out to have significant diseconomies of scale.

Inman et al (1997) specify that decision on the number of local governments must rest on the economies of scale concept. All possible economy due to the increased scale must be exhausted. The community reaches its optimal size when the average cost per resident of production of public services just equals the marginal cost of adding one more user to the service consumption. This decision rule refers only to the congestible goods – such that provision of one more unit of such good (i.e. additional household or resident) requires accommodation of additional public facilities. These are health and education, recreation, sanitation,

fire services. "Pure" public goods (with zero or very low marginal cost of production) should be supplied by the largest government possible. Therefore, responsibility for its provision must be transferred to the central government.

It is usually discriminated between the capital intensive (vertically integrated) and labor intensive (horizontally integrated) roles of the government. The former are water and electricity supply and the latter – road repairing. The aggrandizement of the network size of the vertically integrated services will ensure the economies of scale. The effect for horizontally integrated services will come through the utilization of more cost efficient external production sources and enhanced technology that will become more widely available. However, this effect is expected to be far less significant. Another interesting point that is that while transaction costs for horizontally integrated firms has fallen, costs associated with horizontally integrated services.

Chapter 3

INTERGOVERNMENTAL RELATIONS IN UKRAINE

During the first decade of the independence the system of intergovernmental fiscal relations was functioning under the principles inherited from the Soviet Union times. However, the system also undergone some changes. In the following chapter we describe the setup of Ukraine's intergovernmental fiscal system, its development and revealed drawbacks.

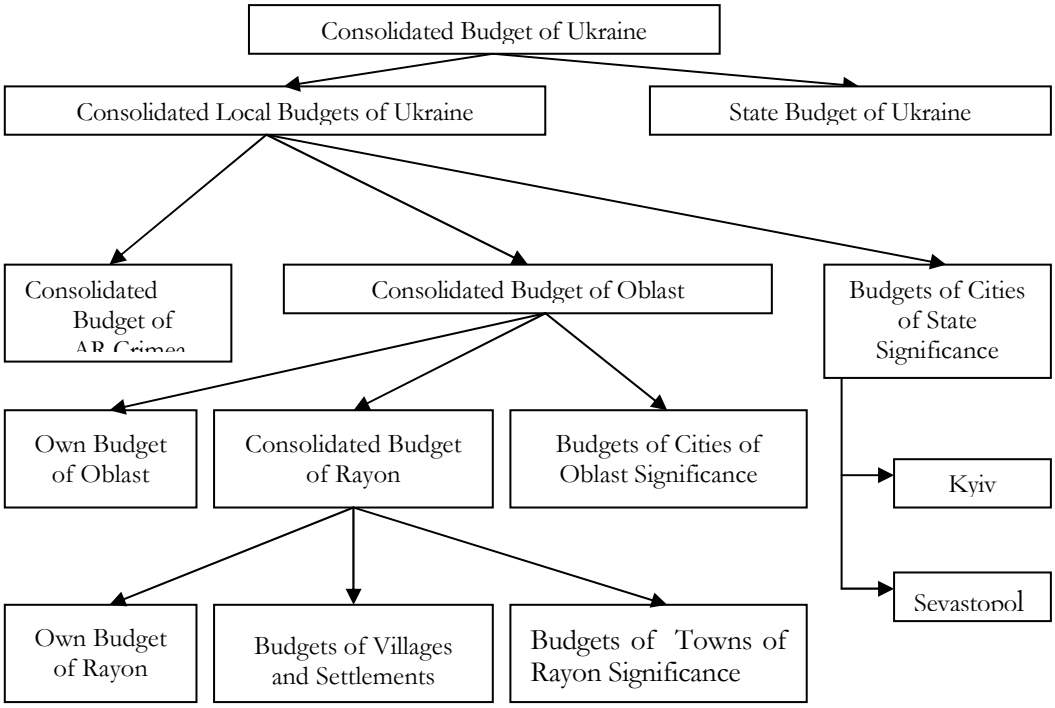
The intergovernmental budget structure in Ukraine.

According to the newly adopted in 2001 Budget Code of Ukraine, budget system of Ukraine consists of the state budget and local budgets. Local budgets include the budget of Autonomous Republic of Crimea, 24 oblast budgets, budgets of two cities with special status, namely Kyiv and Sevastopol, 488 rayon budgets, 104 budgets of city rayons and budgets of local self-governance. The budgets of village, settlement and town communities are recognized as budgets of local self-governance. The structure of the budget system is represented on the figure 2.

The choice of the optimal size of a territorial division is one of the most important problems that should be settled in order to increase the efficiency and effectiveness of local public expenditures. Many countries faced this problem and tried to solve it in the past. In 1960's and 1970's municipal reforms were held in several western economies. The result of these reforms was the reduction of the number of the lowest territorial divisions or communities. So, in Denmark the number of communities was diminished from 1388 to 275 as the result of the reform of 1974. In Germany the number of communities decreased from 24 278 to 8 514 during the reforms of 1967-1968, in England and Wales – from 1383 to

402 in the process of 1972 reforms. Where the process of amalgamation of communities was voluntary, the reforms progressed very slowly. In Belgium the

Figure 2. The budget structure in Ukraine.



number of communities declined from 2 663 to 2 359 through 1961-1971. In France the number of communities is even increasing.

The experts of the World Bank have estimated the minimum size of a territorial division, which is necessary condition for efficient governance, to be from 5 to 6 thousand people. In Ukraine almost 10.5 thousand local jurisdictions (near 87 % of total number) have less than 5 thousand people. Actually, more than half of all village and settlement jurisdictions in Ukraine would fall short of necessary local

public expenditures, even if all tax revenues raised within their territories were left for them. Furthermore, by the Article 140 of the Constitution of Ukraine, each village, settlement or town has the right for self-governance. Since Ukraine has near 30 thousand inhabited territorial entities, the number of communities served by a separate local government potentially may increase. At the same time the Constitution allows only voluntary amalgamation of territorial entities. Therefore, the need for the reform of administrative-territorial system in Ukraine is exigent.

Pre-reform problems in the intergovernmental relations.

The drawbacks of the intergovernmental budgetary system mentioned above refer to the need of change in the structure of local governments. However, problems in the sphere of intergovernmental relations existed even within the given structure of local governments before the adoption of the Budget Code. They can be identified in five main directions main directions.

First, there were no clear-cut rules concerning the distribution of expenditure responsibilities between national and local budgets. This resulted in the lack of responsibility for the provision of the public services. Consequently, they were provided non-effectively.

Further, expenditure responsibilities were delivered to local governments without providing them with corresponding revenue sources. Thus, intergovernmental liabilities were quickly accumulated.

Very often the distribution of responsibilities between different levels of government was not optimal. For example, kindergartens were supported by the national budget, while tax administration offices, courts and military recruiting offices were financed by local budgets.

Second, the major part of local revenues was formed by assessments from national taxes, and the norms of these assessments changed every year. Therefore, local governments had no opportunities to plan and to forecast volumes of local revenues in the medium and long term periods. Hence, there were no incentives for local governments to make efforts to expand revenue base, since increase in actual revenues in a given year led to the reduction of the volume of transfers from national budget in the next year.

Third, there was no transparency in the distribution of intergovernmental transfers. This distribution occurred as the result of subjective estimates of the difference between forecasted volumes of local expenditures and revenues. Such practice compelled local authorities to overestimate necessary volumes of local expenditures and underestimate potential volumes of local revenues. To achieve this, local authorities boosted their network and artificially increased stuff, supported non-efficient budget infrastructure. Consequently, more efficient mechanisms of provision of public services had no way to be implemented.

The mechanism of equalizing fiscal capacities in Ukraine.

Before the start of budget reforms the equalization instruments of fiscal capacities between local governments included transfer policy as well as tax sharing mechanism. But with the start of the reforms the government managers refused from the latter mechanism, since it was regarded as inefficient.

Before the adoption of the Budget Code the revenues of local governments consisted of three types of revenues, namely, fixed, own and regulating. Fixed local revenues were national tax revenues that were assigned to subnational governments, for example, enterprise profit taxes of locally owned enterprises. Own tax revenues comprised taxes levied on specific local activities, such as advertising, parking. Regulating taxes were the main revenue sources for all levels

of government and consisted of national taxes that were shared between central and local governments. The principle of intergovernmental relations when national taxes are shared between central and local governments is known as tax sharing. Such principle was attributable mainly to the countries of the former Soviet Union and had no corresponding counterpart in the developed countries. Such mechanism is not appropriate for transition economies, as Thirsk (1999) claims. The four major taxes that were used as sharing instruments are value-added tax (VAT), personal income tax (PIT), enterprise profit tax (EPT) and excise tax. The magnitudes of shares and choices of taxes to regulate local budgets differed from year to year. For instance, all four major taxes had different shares for different oblasts in 1992 and 1993. Some progressive change in this respect happened in 1994 when Ukrainian parliament adopted the budget law with equal shares of PIT, excise and EPT taxes for every oblast. However, VAT tax remained extremely differentiated in shares between oblasts. VAT shares remained in oblasts budgets had inverse relation with the tax revenue capacities of an oblast. While poor oblasts were allowed to keep all of VAT tax revenues, relatively little shares were retained in rich industrial oblasts. The budgets of the years of 1995 and 1996 were formed under the same principle. With the year 1997 the scheme of revenue collection came close to put away tax sharing and to implement tax separation system between central and local budgets. VAT revenues were assigned solely to the central budget, while PIT and EPT tax revenues were transmitted for the local budgets. Excise tax continued to be shared. Further, in 1998 the central government succeeded to work out the law that discarded the tax sharing policy. And again in 1999, the government turned back to the policy of tax sharing. The year 2000 is regarded in this work as the period of start of the reforms. Starting from this year the central government authorities abandoned the policy of tax sharing that was maintained in the Budget Law of Ukraine for the year 2000. And, finally, the Budget Code was adopted in 2001 that supported the new direction in revenue equalizing policy.

The mechanism of equalizing revenues based on tax sharing that existed before the reforms caused significant disincentives for local governments to collect different taxes, because the greater efforts local authorities put into collecting taxes, the less share of regulating taxes were left for the oblast thereafter.

From normative point of view it may seem irrelevant to what level of government to assign particular taxes and the shares of those taxes. However, in practice it appears that it does matter, since the State's tax collectors are subject to dual subordination to the central government which employs them and to the oblast in which they live and work (Thirsk, 1999). Thus, collectors of the taxes may concentrate the efforts on collecting those taxes that have higher share for the oblast than other taxes.

Another consequence of the volatility of tax shares which brings distortions to the effectiveness of local public finance is that local governments face high level of uncertainty in predicting the revenue sources for next periods. This may result in excessive public spending, as the local government is not well informed about affordable level of public expenditure.

To conclude, current budget reforms in Ukraine need thorough evaluation. Although it is quite early to derive any strong results of reforms, we aspire to employ several econometric techniques to estimate a few aspects of undergoing reforms.

Chapter 4

FISCAL DECENTRALIZATION AND ECONOMIC GROWTH

Empirical evidence

The examination of intergovernmental structure across countries reveals definite contrast in the level of fiscal decentralization in the industrialized and developing countries. The study of Oates (1985) showed that an average share of subnational government spending in total public expenditure constituted 35 percent in industrialized countries, while in developing countries it reached only 11 percent. Furthermore, in terms of public revenues the level of decentralization in developing countries was less than 10 percent. It indicates strong evidence that there exists strong correlation between the level of economic development of the country and the degree of its fiscal decentralization.

Several empirical studies tried to estimate the impact of fiscal decentralization on economic growth. Zhang and Zou (1998) used data for China for the late 70's years and found that fiscal decentralization actually reduced economic growth. Davoodi and Zou (1998), using data for 46 developing and developed countries, have found that fiscal decentralization is detrimental to economic growth in developing countries and no significant results were obtained for developed countries. Based on the data of 1992-1996 for US states, Nobuo and Massayo (2002) provided evidence that fiscal decentralization contributed to economic growth in the US.

Although the empirical results about the impact of fiscal decentralization on the local economic growth are rather ambiguous, we expect to obtain positive

relation, relying on the predictions of the theory of fiscal federalism, outlined above.

Methodology

For the purpose of testing this hypothesis we use the panel data estimation technique. The major reasons for this is that besides population other factors may influence the decisions upon shared revenues and thus upon the changes in shared revenues. Their omission from the regression will result in the biased estimates. So, panel data estimation specified as either fixed or random effects solves this problem as both "fixed" and "random effects" capture the impact of possible omitted factors on a dependent variable. Another reason for panel data estimation is that on the cost of assumption of the same coefficient on the included variables in the regressions for all regions and time periods we gain opportunity of empirical estimation of a model. Otherwise, the shortness of both cross-section and time series data would have eliminated such opportunity.

Although Hsiao (1986) suggests the use of fixed effects model in case when sample exhausts population, we start estimation with random effects model, as this model gives more efficient coefficient estimates compared to the fixed effects model. However, this model is vulnerable to the correlation between random effects and error terms. This results in biasness of the coefficients estimates. The Hausman specification test is used to check for this possibility. In case this test rejects the hypothesis that coefficients are not biased, we turn to the fixed effects estimation. Finally, if F-test accepts the null hypothesis of insignificance of the group effects, our model simplifies to the simple pooled OLS estimation which gives us more efficiency compared to the fixed effects model.

The model specification of this hypothesis (hypothesis 1) is of the following form:

$$\begin{bmatrix} econ \\ growth \end{bmatrix} = f\left(\begin{bmatrix} fiscal \\ decentralization \end{bmatrix}, \begin{bmatrix} control \\ \text{var}iables \end{bmatrix}\right),$$

Expected:

$$\partial\begin{pmatrix} economic \\ growth \end{pmatrix} \Big/ \partial\begin{pmatrix} fiscal \\ decentralization \end{pmatrix} > 0$$

Data description.

For the purpose of the estimation of the hypothesis 1 the panel data that includes observations for three time periods, namely the years 1998-2000, is used. The cross-section dimension consists of observations for 24 oblasts and Autonomous Republic of Crimea. The data for the variable of fiscal decentralization are obtained from Fiscal Analysis Office and State Tax Administration of Ukraine, the data for economic growth are from the Ministry of Economy and control variables are taken from the yearbooks of State Committee of Statistics.

The dependent variable, i.e. *economic growth* in regions, is measured as the annual percentage change in real gross value-added in a given oblast.

Fiscal decentralization is proxied by the share of own revenues in the consolidated revenues of an oblast. This measure reflects decentralization on the revenue side. The own revenues here include revenues collected from local taxes and fees, fixed taxes and also revenues from tax shares of major taxes assigned to the local governments. Consolidated revenues reflect total revenues collected by State Tax Administration of Ukraine in each oblast.

To control for economic growth in regions, the following variables are included into our model.

Human capital is included by the justification of neo-classical growth theory which says that inclusion of human capital solves the problem of diminishing returns to capital and labor and allows for endogenous economic growth. Economic growth may not be sustained without the enhancement of human capital.

The more favourable are economic and legal conditions in a region for business development, the more newly created enterprises appear in the economy, thus contributing to the economic growth. Therefore, we include the proxy variable that controls for business development. This variable is constructed as the number of *small and medium enterprises* per one thousand of employed residents in a region.

The *inflation* is often regarded in the economic theory as the most crucial factor leading to the recession of the economy. Therefore we include retail price index as a proxy for inflation variable to control for this distortion effect.

To reflect the structural shift that occurred in the economy during the period under investigation, we include the measure of *income inequality* in the economy. It is measured as the standard deviation of earnings in the industrial and agricultural sectors.

We also include *urbanisation* and *average wage* variables to control for the specific conditions of the regions. Urbanisation is measured as the share of city residents in the whole population of a region.

Empirical results

To assess the direction and magnitude of the influence of fiscal decentralization on the economic growth in regions we perform the sensitivity analysis of economic growth modelling.

The first model includes all variables that are expected to input to the economic growth of a region. The coefficient on the fiscal decentralization is negative but statistically insignificant. This may be the result of the loss of freedom due to excessive number of variables of the model. So, following the general to specific approach, in the next two steps we exclude control variables that are statistically insignificant and highly correlate with the variable of our interest.

Table 1 Estimation output of the Hypothesis 1

	Growth	Rev Dec	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	correl		*fe*	*re*	*re*	*re*	*re*	*re*
Rev Decentral	-0.19		-8.84	***-18.85***	***-16.33***	-12.46	-11.79	-11.88
Human Capital	0.13	**-0.25**	1.62	-0.12		-0.03		
Small-Med Enterpr	**0.41**	-0.08	0.69	***1.12***	***1.12***	0.13	0.13	0.11
Income Inequality	**0.29**	**-0.37**	-0.22	-0.04		***-0.23***	***-0.23***	***-0.22***
Retail Price Index	**-0.41**	**-0.15**	**-75.43**	**-78.91**	**-75.58**	-5.99	-5.02	
Average Wage	**0.50**	**-0.20**	0.13	**0.09**	**0.08**	***0.11***	***0.11***	***0.11***
Urbanization	0.12	0.05	-55.63			**-11.14**	-12.20	-11.44
Constant			84.18	**92.36**	**85.70**	7.79	5.97	-0.52
d_99						**12.83**	**12.82**	**13.37**
d_00						**12.29**	**12.16**	**12.49**
00.00 – significant (0.05)			***00.00 -*** significant (0.1)					

To control for the influence of time in the model (in other words partially solving the problem of non-stationarity of the series and, thus, solving the problem of possible spurious correlation), we introduce time specific dummy variables into further specifications. This results in the distortion of the previous estimates in the sense that coefficient on the variable of fiscal decentralization loses statistical significance, although remains negative. Exclusion of non-significant variables that correlate with the variable of our interest does not change the pattern.

So, based on the results above, with a grain of salt we may claim that fiscal decentralization is actually slightly detrimental to the economic growth of the regions in Ukraine.

Chapter 5

THE STRENGTH OF FISCAL INCENTIVES OF LOCAL GOVERNMENTS

The performance of local governments is closely tied up with their incentives to fulfil effectively their functions and responsibilities. In this chapter we proceed with estimation of the strength of local governments in Ukraine to mobilize revenues in regions, and what is the impact of such incentives on the development of business activity in a region.

Theoretical model

This section presents theoretical justification for the existence of fiscal incentives for local governments. The development of the model is based on the theoretical framework developed by Zhuravskaya (1998).

Consider a chief of a local jurisdiction who solves the following maximization problem:

$$\max_{P,B} cP + B \text{ subject to } P \le \overline{T} + \varphi g(P) y(B)$$

The chief strives to maximize her utility by choosing the level of public goods provision *P* and the level of regulation of private business *B*. She receives private benefit from excessive business regulation *B*, since it gives opportunities to receive bribes that are offered in exchange for relief from regulation (registration, licensing, various inspections). The chief also gains political benefit from the provision of public goods, given by *cP*. We assume that $0 < c < 1$. This means that the chief values B higher than P. The provision of public resources is subject

to constraint of available budget revenues that include transfers from the central government T and the share of consolidated tax revenues, $\varphi g(P)y(B)$, that is left for the locality. The amount of collected tax revenues in a locality $g(P)y(B)$ is increasing in P and diminishing in B. The parameter $0<\varphi\leq 1$ reflects the strength of fiscal incentives, i.e. the ability of the chief to raise tax revenues at the margin. The closer φ to zero, the weaker are fiscal incentives of the chief to raise revenues, while the closer it is to one, the stronger incentives. Besides, we assume the validity of the following propositions:

Proposition 1. $\partial B/\partial\varphi < 0$

Proposition 2. $\partial P/\partial\varphi > 0$

These propositions address that if the strength of fiscal incentives has positive impact on the level of public goods provision, and also that stronger fiscal incentives reduce the level of inefficient business regulation by the chief.

Taking to consideration the problems of the lack of incentives of local governments to raise revenues what was described in chapter 3, and relying on the theoretical framework outlined above, we hypothesize the existence of weak fiscal incentives in Ukraine before the start of budgets reforms in the year 2000, and the rise in the strength of fiscal incentives after the year 2000.

Methodology

To test this hypothesis (hypothesis 2) we employ the same panel data technique as it was described in the previous chapter

The model specification of the first part of this hypothesis is of the following form:

$$\begin{bmatrix} shared \\ revenues \end{bmatrix} = f\left(\begin{bmatrix} own\_revenues \\ before\_2000 \end{bmatrix}, \begin{bmatrix} own\_revenues \\ after\_2000 \end{bmatrix}, \begin{bmatrix} control \\ \text{var}iables \end{bmatrix}\right), \quad (2.1)$$

Expected:

$$\partial(shared\_revenues)/\partial(own\_revenues) \to 0$$

would mean the presence of incentives and

$$\partial(shared\_revenues)/\partial(own\_revenues) \to -1$$

absence of incentives.

The second part of the hypothesis 2 is based on the model of the following specification:

$$\begin{bmatrix} growth\_of \\ bu\,\text{sin}ess\_activity \end{bmatrix} = f\left(\begin{bmatrix} strength\_of \\ fiscal\_incentives \end{bmatrix}, \begin{bmatrix} control \\ \text{var}iables \end{bmatrix}\right), \quad (2.2)$$

Expected:

$$\partial\begin{pmatrix} growth\_of \\ bu\,\text{sin}ess\_activity \end{pmatrix} \Big/ \partial\begin{pmatrix} strength\_of \\ fiscal\_incentives \end{pmatrix} > 0$$

Data description

In order to estimate hypothesis 2, the set of data for the years 1996 – 2001 is used for the first part of the hypothesis, while the data spanning 1996 – 2000 for the second part of it. Since the model includes the variables which indicate the change between years, the time dimension of the panel data therefore covers five and four time periods correspondingly. The cross-section dimension includes data for 24 Ukrainian oblasts. The cities of Kyiv and Sevastopol are excluded.

Although Ukrainian legislation equates the budgets of these cities to oblast budgets, they seem to outlay from the general pattern. The observations for Autonomous Republic of Crimea were also excluded as the data for a couple of years for this region were missing. The data for own and shared revenues of local governments and government expenditures are obtained from the Fiscal Analysis Office, and the data for other control variables from the State Statistics Committee.

We proceed here with the justification of the proxy variables used for empirical estimation of the models.

In the model 2.1. transfers are used as a proxy for shared revenues, and all other revenues assigned to local governments are used to measure their own revenues. It is worth to note that by choosing these proxies we partially misspecify model from the start. Because for the reasons mentioned in the part that describes the situation in Ukraine, shared revenues proxied by transfers cover only part of the concept of revenue sharing. On the other hand, own revenues proxied in the way we do contain part of revenues which is rather shared than own in its nature. There are two justifications to follow this way. First, it is hard to disentangle shared and own parts of the revenues, because shares have different volatility for different periods and for different regions. The second reason is that the inclusion of the revenues from taxes that are shared between different levels of government into the shared revenues is not completely correct as the fact that shares for some regions are rather stable supports the idea that these revenues are own in nature. Besides, by doing this, we leave local governments with only revenues from local taxes which constitute extremely small part of the local governments' revenues. And it is doubtful whether testing the influence of change in shared revenues on this small part will reflect the influence of tax incentives.

To control for the influence of other factors in model 2.1. we use population as it is a very influential factor in the decision upon transfers. We also include dummy variables for different years to take account for the systematic changes in the shared revenues of all regions in a particular year.

To pick out the change in the incentives since the period when reforms started we include additional variable which is the product of change in own revenues and dummy for the period 2000 – 2001.

In the model 2.2 the dependent variable is measured by the change in the number of small and medium enterprises per one thousand workers in the region. This variable is calculated as the ratio of the number of small and medium enterprises in a region to the number of workers. The data for the last variables is taken from the Yearbook 2000 of the Ukrainian State Committee of Statistics. Further, we use a very simple proxy variable to measure the strength of fiscal incentives of local governments to raise own revenues. This is a binary variable which takes the value one when the changes of own and shared revenues in a given period for a given region are of the same signs (this is an indicator of strong incentives), and minus one if such changes have opposite signs (an indicator of weak incentives)[1]. Zero change in the magnitude of transfers is regarded as the evidence of strong incentives. In such cases the incentive variable takes the value of one.

Control for the influence of other factors on the growth of business activity in a region is performed through the introduction into the model of population of the region (to control for the size of the region) and dummy variables for time periods (to control for time specific influence).

---

[1] **This variable is similar to the one used by Zhuravskaya (1998)**

Empirical results

The following results were obtained for the model 2.1:

Table 2 Summarized estimation results for model 2.1

	Model 2.1a	Model 2.1b	
		Specif 1	Specif 2
Own Revenues Change	**-0.16**	**-0.14**	**-0.14**
Population	2.47	6.69	***7.21***
Dummy_97	**50690**		***16341***
Dummy_98	-7669		**-41865**
Dummy_99	-17271		**-50858**
Dummy_00	**59261**		
Dummy_00_01*OwnRevCh		**-0.22**	**-0.24**
Const	11142	**21194**	**35566**
adj R-squared	*0.53*	*0.26*	*0.49*
00.00 - significant (0.05)	***00.00*** **-** significant (0.10)		

In all cases random effects model specification was rejected in favour of the fixed effects by Hausman test, and the fixed effects specification was rejected by F-test in favour of the pooled OLS estimation technique (complete estimation output is presented in the appendix).

In the model (model 2.1a in the Table 1) that does not take into consideration the change in the incentives since the start of the reforms, coefficients on the change in the own revenues variable is negative and statistically significant. The value of the coefficient (-0.16) belongs to the expected boundary [-1;0]. However this value is much closer to zero than to minus one that in terms of the hypothesis indicates the presence of strong fiscal incentives for the local governments to raise own revenues for the period 1997 – 2001.

Separating the influence of the change in the own revenues on the change of shared revenues in the period after reforms have started compared to the pre-reform period (inclusion of the product of change in own revenues and dummy for the period 2000 – 2001), we again received negative and statistically significant coefficient on the change of own revenues variable with slightly lower value than it was obtained in the previous model. This coefficient is robust to the specification with and without dummies for 1997-99 periods. The coefficient on the newly included dummy variable is also negative and statistically significant, supporting the idea of the change in the pattern of fiscal incentives for the period after the start of the reforms. It is also rather robust to the inclusion and exclusion of dummies for years of the pre-reform period. As long as coefficients on these dummies are statistically significant, we use the results of models containing these dummies for our further analysis.

So, the measure of the incentives for the period after the reforms in this model is the sum of the coefficient of the change in own revenues and the coefficient before the newly included variable. By the results of this model, this measure is equal to –0.38 (=[-0.14]+[-0.24]). The standard error of this measure (standard error of the sum of the coefficients) is equal to 0.062, consequently this measure is statistically significant.

Hence, speaking in the language of economists, we obtained the results that, first, suggest rather strong incentives for local governments to raise their own revenues in Ukraine in the period 1997-2001. Second, these incentives diminish since the start of the reforms. This result might seem a bit counterintuitive. However, it is well explained by the way the data was generated.

As we have already mentioned, own revenues before the year 2000 included shares of revenues from major taxes collected in regions, and these shares were rather volatile. However, with the year 2000 tax sharing was cancelled by the

Budget Law of Ukraine. Therefore, before the year 2000 transfers were only the part of equalising mechanism (another part of equalisation was performed through changing shares). But after that period transfers were the only instrument employed by the central government to redistribute revenues between local governments. So, it is rather straightforward that transfers with the start of the reforms are more sensitive to the changes in the success of local governments to raise revenues. And this is reflected in the higher absolute value of the parameter of the model that describes the influence of the change in the own revenues on the shared revenues of the last two years under investigation.

By the same token, the way our data was generated made it very possible to receive the estimate of the incentive coefficient for the whole sample to be close to minus one. Because if government uses both transfers and shares of the taxes to redistribute revenues, it is rational to expect that transfers are more sensitive to the change in the revenues that partially play the equalising role than to the pure local revenues. The fact that the coefficient is still much closer to zero strengthens the conclusion that transfers do not cause any distortions to the revenue collection of the governments.

In the model that measures the influence of the fiscal incentives of local governments on the promotion of the development of small and medium business, coefficient on the incentive variable is highly statistically insignificant (p-value = 0.975)[2]. This finding is rather alarming. Because if fiscal incentives of local governments do not induce them to expand the tax base through the development of small business, then what should be the mechanism that will force the local governments to create favourable environment for the local small business? Another conclusion that suggests itself is that local governments with

[2] The complete estimation procedure is presented in the appendix.

high incentives to raise revenues support the aggressiveness of tax administration what is negative factor for the business development in regions.

Chapter 6

OPTIMAL POPULATION SIZE OF A LOCAL GOVERNMENT JURISDICTION

This hypothesis claims that there must be some rational limit to the number of administrative jurisdictions that might operate efficiently within the economy. As the consequence, there is optimal size of the local government jurisdiction; and this optimum may be established theoretically and (or) empirically[3].

Methodology

The analysis is performed through the assessment of the statistically significant relationship between the local government jurisdiction size and different performance characteristics of the government. These should include measures of efficiency on the part of:

- Revenue collection (total revenue, risen volumes of different taxes, received transfers);
- Quantity of public services provision (both number of categories and amount of services of each category);
- Quality of public services (these should mainly include expenditures on different public services);
- Cost of government operation (administrative expenditure);

[3] The concept of *efficiency* in this context is used rather loosely. In some cases *effectiveness* might be a better term. However this is not crucial for the purpose of hypothesis evaluation.

Government influences various spheres of the residents' life. Ideally assessment of all the possible effects should be grasped. At least the most general realms should be mentioned:

- Residents' income per head and expenditure per head, savings, economic growth of the jurisdiction etc.

Technically methodology is based on the finding of the functional dependence between performance characteristics and government size by the means of sensitivity analysis. Optimal government size is calculated as minimum or maximum of the function depending on performance characteristic in question.

Data description

For the purpose of estimation of this hypothesis, data on the lowest tire governments in Ukraine is used. Data is constrained to villages of only four rayons that are located in different parts of Ukraine. Therefore, the sample is rather representative. So, the results are valid not only to these rayons, but may be spread to the overall situation in Ukraine. The substantial drawback of the investigation is that although data contains major performance variables of the governments, there are no data to control for other factors influencing government performance except for the government jurisdiction size. In our analysis this variable is measured as the number of residents in the settlement. So, assumption is made that these factors are similar within rayons, while dissimilarities across regions are captured by rayon's dummies.

Data allows investigating the relation between government jurisdiction size and such performance characteristics as: administrative, health, education and cultural expenditures, and the volume of transfers to the jurisdiction.

Table 3. The correlation coefficients between government performance characteristics and the size of its jurisdiction.

	2000	2001	2002
	correl coef with population size		
Expenditure:			
Administrative	-0.43	-0.39	-0.44
Health			-0.15
Culture	-0.21	-0.21	-0.12
Educational	-0.49	-0.53	-0.60
Revenues			
Transfers		-0.35	-0.19

This relation is represented graphically in the appendix..

Empirical results

In the following estimation the appropriateness of the functional form of the model that describes the influence of the government population size on the performance characteristic is jointly tested by the Ramsey RESET test (to test for the omitted variables), F test (to test for the joint significance of the included variables) and value of the adjusted R-squared (measures the explanatory power of the model).

The output of the "best" models in terms of the mentioned characteristics is summarized below.

Table 4 Summarized Estimation Results of Hypothesis 3

	Expenditure Per Capita							
	Transf	Administrative			Health	Culture		
	2002	2000	2001	2002	2002	2000	2001	2002
pop	**-63.6**	**103.8**	**269.5**	**450.3**	4.9	0.4	***1.1***	**2.1**
$(pop)^2$	**11.3**	**-25.4**	**-72.6**	**-178.4**	-1.9			
$(pop)^3$		***2.6***	**7.7**	**37.7**				
Lr(pop)		**-75.2**	**-160.3**	**-208.4**		**-1.5**	**-3.1**	**-4.9**
d_1		**-4.5**	**-5.6**	**-10.5**		**-1.9**	**-2.7**	**-6.4**
d_2	***-29.6***			**-6.5**		**-1.5**	**-2.1**	**-4.2**
d_3						0.2		-0.1
const	**138.5**	**-63.1**	**-179.6**	**-270.6**	***14.5***	**2.3**	**3.0**	**5.6**
p-v (ovtest)	*0.99*	*0.34*	*0.00*	*0.04*	*0.75*	*0.11*	*0.02*	*0.12*
Adj R-sq	*0.07*	*0.79*	*0.69*	*0.82*	*-0.01*	*0.47*	*0.42*	*0.48*
p-v(F-test)	*0.02*	*0.00*	*0.00*	*0.00*	*0.43*	*0.00*	*0.00*	*0.00*
N of obs	*94*	*93*	*93*	*93*	*86*	*82*	*84*	*88*
00.00 - signif at 0.05					***00.00*** - signif at 0.1			
Efficient size	**2.8**	**3.5**	**7.9**	**1.0**		**3.8**	**2.8**	**2.3**

Model for education expenditure was not estimated as data for this policy characteristic is available only for one rayon. In the model for health expenditure coefficients on the population size variables are statistically insignificant. Model for transfers has low value of adjusted R-squared, however test statistic of RESET test is statistically significant. Other models have rather satisfactory characteristics.

So, the bottom row of the table reports the calculated optimums of the functions derived from the estimated models. These values range from 1 thousand up to 7.9 thousands of residents in the optimal regions from the point of view of the population size. The average value of the optimum is 3.44 thousands of inhabitants. This value is lower than the one estimated by the World Bank.

Chapter 7

CONCLUSIONS AND POLICY RECOMMENDATIONS

Ukraine currently undergoes budget reforms that started with the adoption of the Budget Code in 2001. Every step of these reforms needs thorough evaluation. The goal of this paper was to estimate several aspects of the efficiency of the organization of local public finance in Ukraine.

In particular, we tried to investigate, first, what fiscal decentralization could contribute to the economic growth of Ukraine. Second, we tried to estimate the strength of fiscal incentives of local governments to mobilize revenues and extend their tax base. Third, we investigated the question of whether the optimal size of population to be served by one local government on the micro-government level exists.

We obtained results that indicate the negative impact of the fiscal decentralization on the economic growth in Ukraine. However, these results are not robust to the sensitivity analysis. Besides, the drawback of our model is the usage of short data series for the analysis (the period of 1998 – 2000).

Since in our model we use the variable of revenue decentralization, the further research of the relation between fiscal decentralization and economic growth may be directed at the estimation of expenditure decentralization on economic growth.

The estimation of the strength of fiscal incentives of local governments to mobilize revenues within given jurisdiction suggests that disincentives are not that

large as it was expected, although they still exist. Again, the interpretation of results should be done with care because of some weakness of the proxy variable that were used in the estimation.

Further, there is no evident impact of fiscal incentives of local governments on the business development in Ukrainian regions.

The investigation of the character of public expenditures on the micro-government level reveals the necessity of restructuring lowest-tier governments towards amalgamation of the smallest village local governments in Ukraine for the purpose of more efficiency in public expenditures in the sense of minimization of operative costs

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Appendix 1
Estimatin output for hypotesis 1

```
Random-effects GLS regression                   Number of obs      =        75
Group variable (i) : region                     Number of groups   =        25

R-sq:  within  = 0.6450                         Obs per group: min =         3
       between = 0.0939                                        avg =       3.0
       overall = 0.4414                                        max =         3

Random effects u_i ~ Gaussian                   Wald chi2(7)       =     79.20
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
      ec_gr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
      sh_or |  -14.06665   9.916478    -1.42   0.156    -33.50259    5.369287
    hum_cap |  -.0152188   .1485296    -0.10   0.918    -.3063315    .2758938
        sme |   .7317744    .630546     1.16   0.246     -.504073    1.967622
   inc_ineq |  -.2109426   .1358783    -1.55   0.121    -.4772592    .0553741
        rpi |  -76.76507    17.6807    -4.34   0.000    -111.4186   -42.11154
    av_wage |   .1860814   .0545341     3.41   0.001     .0791965    .2929663
urbanization |  -35.95135   13.75632    -2.61   0.009    -62.91325   -8.989447
      _cons |   100.2644   26.37161     3.80   0.000     48.57701    151.9518
------------+-----------------------------------------------------------------
    sigma_u |  4.9185845
    sigma_e |  6.9849178
        rho |  .33148753   (fraction of variance due to u_i)
------------------------------------------------------------------------------


Hausman specification test

             ---- Coefficients ----
            |      Fixed       Random
      ec_gr |    Effects      Effects       Difference
------------+----------------------------------------
      sh_or |  -8.840779    -14.06665         5.225874
    hum_cap |    1.62076    -.0152188         1.635979
        sme |   .6880524     .7317744        -.0437221
   inc_ineq |  -.2152252    -.2109426        -.0042826
        rpi |  -75.43375    -76.76507          1.33132
    av_wage |    .131112     .1860814        -.0549694
urbanization |  -55.63057    -35.95135        -19.67923

    Test:  Ho:  difference in coefficients not systematic

                chi2(  7) = (b-B)'[S^(-1)](b-B), S = (S_fe - S_re)
                          =    22.03
                Prob>chi2 =     0.0025


Fixed-effects (within) regression               Number of obs      =        75
Group variable (i) : region                     Number of groups   =        25

R-sq:  within  = 0.6613                         Obs per group: min =         3
       between = 0.0057                                        avg =       3.0
       overall = 0.1086                                        max =         3

                                                F(7,43)            =     11.99
corr(u_i, Xb)  = -0.8336                        Prob > F           =    0.0000

------------------------------------------------------------------------------
      ec_gr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
      sh_or |  -8.840779   13.47844    -0.66   0.515    -36.02264    18.34109
    hum_cap |    1.62076   1.228019     1.32   0.194    -.8557774    4.097297
        sme |   .6880524   1.083813     0.63   0.529    -1.497664    2.873769
   inc_ineq |  -.2152252   .2399954    -0.90   0.375    -.6992222    .2687717
        rpi |  -75.43375   19.66967    -3.84   0.000    -115.1014   -35.76608
    av_wage |    .131112   .1052252     1.25   0.220    -.0810949    .3433189
urbanization |  -55.63057   319.8171    -0.17   0.863    -700.6033    589.3421
      _cons |   84.17664   204.4568     0.41   0.683    -328.1498     496.503
------------+-----------------------------------------------------------------
    sigma_u |  16.474691
    sigma_e |  6.9849178
        rho |  .84763152   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(24, 43) =     2.51              Prob > F = 0.0042
```

```
Random-effects GLS regression                   Number of obs      =        75
Group variable (i) : region                     Number of groups   =        25

R-sq:  within  = 0.6343                         Obs per group: min =         3
       between = 0.0662                                        avg =       3.0
       overall = 0.3754                                        max =         3

Random effects u_i ~ Gaussian                   Wald chi2(6)       =     65.66
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
      ec_gr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
      sh_or |  -18.84605   10.16473    -1.85   0.064    -38.76855    1.076445
    hum_cap |   -.116692   .1479691    -0.79   0.430    -.4067061    .1733222
        sme |   1.116126   .6357169     1.76   0.079     -.129856    2.362108
    inc_ineq |  -.0442182   .1243558    -0.36   0.722     -.287951    .1995147
        rpi |  -78.90539    18.4921    -4.27   0.000    -115.1492   -42.66153
    av_wage |    .092182   .0426354     2.16   0.031     .0086182    .1757458
      _cons |   92.35697   27.41266     3.37   0.001     38.62914    146.0848
------------+-----------------------------------------------------------------
    sigma_u |  4.7235539
    sigma_e |  6.9075165
        rho |  .31862512   (fraction of variance due to u_i)
------------------------------------------------------------------------------


Hausman specification test

              ---- Coefficients ----
             |      Fixed       Random
      ec_gr |    Effects      Effects       Difference
------------+----------------------------------------
      sh_or |  -8.065279    -18.84605         10.78077
    hum_cap |   1.588255     -.116692         1.704947
        sme |   .7162658     1.116126        -.3998604
    inc_ineq |  -.2252422    -.0442182         -.181024
        rpi |  -75.48624    -78.90539          3.41915
    av_wage |   .1402266      .092182         .0480446

    Test:  Ho:  difference in coefficients not systematic

                chi2(  6) = (b-B)'[S^(-1)](b-B), S = (S_fe - S_re)
                          =     2.29
              Prob>chi2 =     0.8917



Random-effects GLS regression                   Number of obs      =        75
Group variable (i) : region                     Number of groups   =        25

R-sq:  within  = 0.6361                         Obs per group: min =         3
       between = 0.0566                                        avg =       3.0
       overall = 0.3664                                        max =         3

Random effects u_i ~ Gaussian                   Wald chi2(4)       =     63.00
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
      ec_gr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
      sh_or |  -16.32888   9.098541    -1.79   0.073    -34.16169    1.503932
        sme |    1.11666   .6192099     1.80   0.071    -.0969689    2.330289
        rpi |  -75.58135   18.44476    -4.10   0.000    -111.7324   -39.43028
    av_wage |   .0767144   .0323393     2.37   0.018     .0133307    .1400982
      _cons |   85.70296   26.55329     3.23   0.001     33.65947    137.7465
------------+-----------------------------------------------------------------
    sigma_u |  4.3068675
    sigma_e |  6.9312149
        rho |  .27855341   (fraction of variance due to u_i)
------------------------------------------------------------------------------

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```

Hausman specification test

	---- Coefficients ----		
ec_gr	Fixed Effects	Random Effects	Difference
sh_or	-8.257706	-16.32888	8.071175
sme	.9490393	1.11666	-.167621
rpi	-86.29401	-75.58135	-10.71266
av_wage	.1332325	.0767144	.0565181

Test: Ho: difference in coefficients not systematic

chi2(4) = (b-B)'[S^(-1)](b-B), S = (S_fe - S_re)
= 1.04
Prob>chi2 = 0.9030

Random-effects GLS regression — Number of obs = 75
Group variable (i) : region — Number of groups = 25

R-sq: within = 0.7023 — Obs per group: min = 3
between = 0.1711 — avg = 3.0
overall = 0.5350 — max = 3

Random effects u_i ~ Gaussian — Wald chi2(9) = 109.86
corr(u_i, X) = 0 (assumed) — Prob > chi2 = 0.0000

ec_gr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
sh_or	-12.45809	10.07152	-1.24	0.216	-32.1979	7.281722
hum_cap	-.0339179	.1435321	-0.24	0.813	-.3152356	.2473998
sme	.1278739	.629193	0.20	0.839	-1.105322	1.361069
inc_ineq	-.2291051	.1379277	-1.66	0.097	-.4994385	.0412283
rpi	-5.991723	26.8051	-0.22	0.823	-58.52875	46.54531
av_wage	.1142686	.0615528	1.86	0.063	-.0063726	.2349099
urbanization	-11.13687	15.8309	-0.70	0.482	-42.16487	19.89113
d_99	12.82621	3.548455	3.61	0.000	5.871365	19.78105
d_00	12.28754	5.013577	2.45	0.014	2.461112	22.11397
_cons	7.791806	36.86777	0.21	0.833	-64.4677	80.05131
sigma_u	5.1190379					
sigma_e	6.5385665					
rho	.38001068	(fraction of variance due to u_i)				

Hausman specification test

	---- Coefficients ----		
ec_gr	Fixed Effects	Random Effects	Difference
sh_or	-17.32124	-12.45809	-4.863149
hum_cap	1.327917	-.0339179	1.361835
sme	-.6274835	.1278739	-.7553574
inc_ineq	-.2552997	-.2291051	-.0261946
rpi	-3.650247	-5.991723	2.341476
av_wage	.0381898	.1142686	-.0760788
urbanization	-144.4484	-11.13687	-133.3115
d_99	13.58639	12.82621	.7601779
d_00	13.85456	12.28754	1.56702

Test: Ho: difference in coefficients not systematic

chi2(9) = (b-B)'[S^(-1)](b-B), S = (S_fe - S_re)
= 3.92
Prob>chi2 = 0.9166

Random-effects GLS regression — Number of obs = 75
Group variable (i) : region — Number of groups = 25

R-sq: within = 0.7021 — Obs per group: min = 3

```
       between = 0.1702                                        avg =       3.0
       overall = 0.5346                                        max =         3

Random effects u_i ~ Gaussian                  Wald chi2(8)       =    109.58
corr(u_i, X)       = 0 (assumed)               Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       ec_gr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       sh_or |  -11.78929   9.772962    -1.21   0.228    -30.94394    7.365367
         sme |   .1328605   .6181564     0.21   0.830    -1.078704    1.344425
    inc_ineq |  -.2250859   .1352293    -1.66   0.096    -.4901304    .0399586
         rpi |  -5.016297   26.67484    -0.19   0.851    -57.29801    47.26542
     av_wage |   .1149848   .0606906     1.89   0.058    -.0039666    .2339361
urbanization |  -12.19834    15.0256    -0.81   0.417    -41.64797    17.25129
        d_99 |   12.81633   3.526603     3.63   0.000     5.904316    19.72834
        d_00 |   12.16026   4.939498     2.46   0.014      2.47902     21.8415
       _cons |    5.97062   36.58558     0.16   0.870    -65.73581    77.67705
-------------+----------------------------------------------------------------
     sigma_u |  4.8979773
     sigma_e |  6.5517712
         rho |   .3585125   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. xthaus

Hausman specification test

               ---- Coefficients ----
              |      Fixed       Random
       ec_gr |    Effects      Effects       Difference
-------------+----------------------------------------
       sh_or |  -18.23064    -11.78929        -6.441355
         sme |   -.500004     .1328605        -.6328645
    inc_ineq |  -.2656432    -.2250859        -.0405573
         rpi |  -9.370472    -5.016297        -4.354175
     av_wage |   .0519666     .1149848        -.0630182
urbanization |  -121.5169    -12.19834        -109.3186
        d_99 |   14.50697     12.81633         1.690639
        d_00 |   17.08285     12.16026         4.922593

    Test:  Ho:  difference in coefficients not systematic

                chi2(  8) = (b-B)'[S^(-1)](b-B), S = (S_fe - S_re)
                          =     2.94
                Prob>chi2 =     0.9383

.


Random-effects GLS regression                  Number of obs      =        75
Group variable (i) : region                    Number of groups   =        25

R-sq:  within  = 0.7012                        Obs per group: min =         3
       between = 0.1736                                       avg =       3.0
       overall = 0.5351                                       max =         3

Random effects u_i ~ Gaussian                  Wald chi2(7)       =    113.17
corr(u_i, X)       = 0 (assumed)               Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       ec_gr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       sh_or |  -11.87947   9.689411    -1.23   0.220    -30.87036    7.111432
         sme |   .1065525   .6169138     0.17   0.863    -1.102576    1.315681
    inc_ineq |  -.2239471   .1350752    -1.66   0.097    -.4886897    .0407955
     av_wage |   .1142333   .0607124     1.88   0.060    -.0047608    .2332274
urbanization |  -11.44041    14.8106    -0.77   0.440    -40.46865    17.58783
        d_99 |   13.36962   2.228094     6.00   0.000     9.002638    17.73661
        d_00 |   12.48777   4.754663     2.63   0.009     3.168797    21.80673
       _cons |  -.5197868    8.64212    -0.06   0.952    -17.45803    16.41846
-------------+----------------------------------------------------------------
     sigma_u |  5.1018429
     sigma_e |   6.482043
         rho |  .38251951   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. xthaus
```

Hausman specification test

	---- Coefficients ----		
ec_gr	Fixed Effects	Random Effects	Difference
sh_or	-18.4283	-11.87947	-6.548832
sme	-.6009757	.1065525	-.7075282
inc_ineq	-.2723606	-.2239471	-.0484135
av_wage	.0494801	.1142333	-.0647532
urbanization	-126.1067	-11.44041	-114.6663
d_99	15.64513	13.36962	2.275505
d_00	18.04409	12.48777	5.556323

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[S^(-1)](b-B), S = (S_fe - S_re)
= 1.57
Prob>chi2 = 0.9797

APPENDIX 2

Hypothesis 2 (Stata estimation output)

Model 2.1a

```
Random-effects GLS regression                   Number of obs      =       120
Group variable (i) : region                     Number of groups   =        24

R-sq:  within  = 0.5725                         Obs per group: min =         5
       between = 0.4507                                        avg =       5.0
       overall = 0.5560                                        max =         5

Random effects u_i ~ Gaussian                   Wald chi2(6)       =    141.51
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |  -.1634769   .0318152    -5.14   0.000    -.2258335   -.1011202
        pop |   2.474349   3.689963     0.67   0.502    -4.757846    9.706544
       d_97 |   50690.22   10770.32     4.71   0.000     29580.78    71799.66
       d_98 |  -7669.077   10782.19    -0.71   0.477    -28801.78    13463.63
       d_99 |  -17271.33   10897.97    -1.58   0.113    -38630.95    4088.287
       d_00 |   59261.36   11517.43     5.15   0.000     36687.62    81835.11
      _cons |   11142.05   9937.202     1.12   0.262    -8334.513     30618.6
------------+-----------------------------------------------------------------
    sigma_u |          0
    sigma_e |  39192.406
        rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


Fixed-effects (within) regression               Number of obs      =       120
Group variable (i) : region                     Number of groups   =        24
R-sq:  within  = 0.5733                         Obs per group: min =         5
       between = 0.0512                                        avg =       5.0
       overall = 0.2796                                        max =         5
                                                F(6,90)            =     20.15
corr(u_i, Xb)  = -0.7139                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |  -.1524944   .0343736    -4.44   0.000    -.2207835   -.0842053
        pop |  -42.12105   168.0811    -0.25   0.803    -376.0435    291.8014
       d_97 |   55147.15   18627.61     2.96   0.004     18140.15    92154.16
       d_98 |  -3838.994    16746.1    -0.23   0.819    -37108.05    29430.06
       d_99 |  -13933.58   15013.71    -0.93   0.356    -43760.94    15893.78
       d_00 |   62569.67   14006.66     4.47   0.000     34742.99    90396.35
      _cons |   90848.78   304064.7     0.30   0.766    -513228.8    694926.4
------------+-----------------------------------------------------------------
    sigma_u |  44241.082
    sigma_e |  39192.406
        rho |  .56029062   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(23, 90) =     0.42              Prob > F = 0.9892


      Source |       SS       df       MS              Number of obs =     120
-------------+------------------------------           F(  6,   113) =   23.58
       Model |  1.9189e+11     6  3.1981e+10           Prob > F      =  0.0000
    Residual |  1.5323e+11   113  1.3560e+09           R-squared     =  0.5560
-------------+------------------------------           Adj R-squared =  0.5324
       Total |  3.4512e+11   119  2.9002e+09           Root MSE      =   36824

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |  -.1634769   .0318152    -5.14   0.000    -.2265085   -.1004452
        pop |   2.474349   3.689963     0.67   0.504    -4.836134    9.784832
       d_97 |   50690.22   10770.32     4.71   0.000     29352.27    72028.17
       d_98 |  -7669.077   10782.19    -0.71   0.478    -29030.54    13692.38
       d_99 |  -17271.33   10897.97    -1.58   0.116    -38862.17    4319.501
       d_00 |   59261.36   11517.43     5.15   0.000     36443.26    82079.47
      _cons |   11142.05   9937.202     1.12   0.265    -8545.343    30829.43
------------------------------------------------------------------------------
```

```
Random-effects GLS regression                   Number of obs      =       120
Group variable (i) : region                     Number of groups   =        24
R-sq:  within  = 0.2597                         Obs per group: min =         5
       between = 0.6624                                        avg =       5.0
       overall = 0.2783                                        max =         5
Random effects u_i ~ Gaussian                   Wald chi2(3)       =     44.73
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |  -.1393641    .045793    -3.04   0.002    -.2291166   -.0496115
        pop |   6.685779   4.675882     1.43   0.153    -2.478782    15.85034
  d_or_0001 |  -.2170979   .0731338    -2.97   0.003    -.3604375   -.0737583
      _cons |   21193.81   9547.272     2.22   0.026     2481.503    39906.12
------------+-----------------------------------------------------------------
    sigma_u |          0
    sigma_e |  50686.626
        rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


Fixed-effects (within) regression               Number of obs      =       120
Group variable (i) : region                     Number of groups   =        24

R-sq:  within  = 0.2625                         Obs per group: min =         5
       between = 0.0581                                        avg =       5.0
       overall = 0.0416                                        max =         5
                                                F(3,93)            =     11.03
corr(u_i, Xb)  = -0.9438                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |   -.128868   .0534761    -2.41   0.018    -.2350609   -.0226752
        pop |  -81.24196   149.9059    -0.54   0.589    -378.9253    216.4414
  d_or_0001 |  -.2353794   .1009148    -2.33   0.022    -.4357761   -.0349827
      _cons |   184603.4   278836.6     0.66   0.510    -369110.8    738317.6
------------+-----------------------------------------------------------------
    sigma_u |  85534.228
    sigma_e |  50686.626
        rho |  .74010398   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(23, 93) =     0.17              Prob > F = 1.0000


      Source |       SS       df       MS              Number of obs =     120
-------------+------------------------------           F(  3,   116) =   14.91
       Model |  9.6039e+10     3  3.2013e+10           Prob > F      =  0.0000
    Residual |  2.4908e+11   116  2.1472e+09           R-squared     =  0.2783
-------------+------------------------------           Adj R-squared =  0.2596
       Total |  3.4512e+11   119  2.9002e+09           Root MSE      =   46338

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |  -.1393641    .045793    -3.04   0.003    -.2300628   -.0486653
        pop |   6.685779   4.675882     1.43   0.155    -2.575394    15.94695
  d_or_0001 |  -.2170979   .0731338    -2.97   0.004    -.3619486   -.0722473
      _cons |   21193.81   9547.272     2.22   0.028     2284.238    40103.39
------------------------------------------------------------------------------

Model 2.1b

Random-effects GLS regression                   Number of obs      =       120
Group variable (i) : region                     Number of groups   =        24

R-sq:  within  = 0.5126                         Obs per group: min =         5
       between = 0.6616                                        avg =       5.0
       overall = 0.5167                                        max =         5

Random effects u_i ~ Gaussian                   Wald chi2(6)       =    120.82
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |  -.1361763   .0384325    -3.54   0.000    -.2115026   -.0608501
```

```
         pop |   7.213948    3.88102     1.86   0.063    -.3927107    14.82061
        d_97 |   16340.94   9732.135     1.68   0.093    -2733.695    35415.57
        d_98 |  -41865.44   9715.405    -4.31   0.000    -60907.28    -22823.6
        d_99 |  -50858.28   9651.504    -5.27   0.000    -69774.88   -31941.68
   d_or_0001 |  -.2398572   .0616482    -3.89   0.000    -.3606855   -.1190289
       _cons |      35566   8862.585     4.01   0.000     18195.65    52936.34
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  41880.065
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


Fixed-effects (within) regression               Number of obs      =       120
Group variable (i) : region                     Number of groups   =        24
R-sq:  within  = 0.5127                         Obs per group: min =         5
       between = 0.5598                                        avg =       5.0
       overall = 0.5144                                        max =         5
                                                F(6,90)            =     15.78
corr(u_i, Xb)  = 0.0445                         Prob > F           =    0.0000

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |  -.1339956   .0445492    -3.01   0.003    -.2225003   -.0454908
        pop |   4.329964     201.48     0.02   0.983    -395.9452    404.6052
        d_97 |   16673.65   16333.77     1.02   0.310    -15776.24    49123.54
        d_98 |  -41568.81    14211.5    -2.93   0.004    -69802.43   -13335.18
        d_99 |   -50564.7   12375.36    -4.09   0.000    -75150.52   -25978.89
   d_or_0001 |  -.2289095   .0912334    -2.51   0.014    -.4101605   -.0476585
       _cons |    40625.5   369171.7     0.11   0.913    -692798.4    774049.4
------------+-----------------------------------------------------------------
     sigma_u |  9208.9809
     sigma_e |  41880.065
         rho |  .04612131   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(23, 90) =     0.22              Prob > F = 0.9999


      Source |       SS       df       MS              Number of obs =     120
-------------+------------------------------           F(  6,   113) =   20.14
       Model |  1.7833e+11     6  2.9722e+10           Prob > F      =  0.0000
    Residual |  1.6679e+11   113  1.4760e+09           R-squared     =  0.5167
-------------+------------------------------           Adj R-squared =  0.4911
       Total |  3.4512e+11   119  2.9002e+09           Root MSE      =   38419

------------------------------------------------------------------------------
       d_sr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
       d_or |  -.1361763   .0384325    -3.54   0.001     -.212318   -.0600347
        pop |   7.213948    3.88102     1.86   0.066    -.4750517    14.90295
        d_97 |   16340.94   9732.135     1.68   0.096    -2940.175    35622.05
        d_98 |  -41865.44   9715.405    -4.31   0.000    -61113.41   -22617.47
        d_99 |  -50858.28   9651.504    -5.27   0.000    -69979.65   -31736.91
   d_or_0001 |  -.2398572   .0616482    -3.89   0.000    -.3619935   -.1177209
       _cons |      35566   8862.585     4.01   0.000     18007.62    53124.38
------------------------------------------------------------------------------
```

Model 2.2

```
Random-effects GLS regression                   Number of obs      =        96
Group variable (i) : region                     Number of groups   =        24

R-sq:  within  = 0.0797                         Obs per group: min =         4
       between = 0.0146                                        avg =       4.0
       overall = 0.0662                                        max =         4

Random effects u_i ~ Gaussian                   Wald chi2(5)       =      6.38
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.2710

------------------------------------------------------------------------------
       d_bus |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |  -.0036836   .1163511    -0.03   0.975    -.2317275    .2243602
         pop |  -.0000655    .000117    -0.56   0.576    -.0002949    .0001639
        d_97 |   .4640751   .3098592     1.50   0.134    -.1432377    1.071388
        d_98 |   .6133146   .3179809     1.93   0.054    -.0099165    1.236546
        d_99 |   .0188738   .3091389     0.06   0.951    -.5870273    .6247749
       _cons |    1.27815    .317976     4.02   0.000     .6549288    1.901372
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  1.0855806
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------


Fixed-effects (within) regression               Number of obs      =        96
Group variable (i) : region                     Number of groups   =        24

R-sq:  within  = 0.0949                         Obs per group: min =         4
       between = 0.0158                                        avg =       4.0
       overall = 0.0046                                        max =         4

                                                F(5,67)            =      1.41
corr(u_i, Xb)  = -0.9973                        Prob > F           =    0.2335

------------------------------------------------------------------------------
       d_bus |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |  -.0453395   .1321665    -0.34   0.733     -.309145    .2184659
         pop |  -.0081152   .0084663    -0.96   0.341    -.0250141    .0087837
        d_97 |    .854633   .5049374     1.69   0.095    -.1532263    1.862492
        d_98 |   .9020697   .4167022     2.16   0.034     .0703286    1.733811
        d_99 |   .1591395   .3425999     0.46   0.644    -.5246927    .8429717
       _cons |    16.1409   15.66069     1.03   0.306    -15.11796    47.39977
-------------+----------------------------------------------------------------
     sigma_u |  7.8583125
     sigma_e |  1.0855806
         rho |  .98127354   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(23, 67) =     0.88              Prob > F = 0.6221


      Source |       SS       df       MS              Number of obs =      96
-------------+------------------------------           F(  5,    90) =    1.28
       Model |  7.28786587     5  1.45757317           Prob > F      =  0.2813
    Residual |  102.818821    90  1.14243134           R-squared     =  0.0662
-------------+------------------------------           Adj R-squared =  0.0143
       Total |  110.106686    95  1.15901775           Root MSE      =  1.0688

------------------------------------------------------------------------------
       d_bus |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |  -.0036836   .1163511    -0.03   0.975    -.2348353     .227468
         pop |  -.0000655    .000117    -0.56   0.577     -.000298     .000167
        d_97 |   .4640751   .3098592     1.50   0.138    -.1515142    1.079664
        d_98 |   .6133146   .3179809     1.93   0.057      -.01841    1.245039
        d_99 |   .0188738   .3091389     0.06   0.951    -.5952846    .6330321
       _cons |    1.27815    .317976     4.02   0.000     .6464355    1.909865
------------------------------------------------------------------------------
```

Appendix 3
Estimation of the hypothesis 3

Transfers Per Capita vs Population Size

```
      Source |       SS       df       MS              Number of obs =      94
-------------+------------------------------           F(  3,    90) =    3.34
       Model |  45559.0449     3  15186.3483           Prob > F      =  0.0229
    Residual |   409535.23    90  4550.39144           R-squared     =  0.1001
-------------+------------------------------           Adj R-squared =  0.0701
       Total |  455094.275    93  4893.48682           Root MSE      =  67.457

------------------------------------------------------------------------------
     trpc_02 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |  -63.61495   28.38946    -2.24   0.027    -120.0156    -7.21433
       pop_2 |   11.34869   6.416443     1.77   0.080    -1.398696    24.09607
         d_2 |  -29.64437   15.32477    -1.93   0.056    -60.08969    .8009489
       _cons |   138.4502   24.58854     5.63   0.000     89.60074    187.2996
------------------------------------------------------------------------------

Ramsey RESET test using powers of the fitted values of trpc_02
       Ho:  model has no omitted variables
                  F(3, 87) =      0.03
                  Prob > F =      0.9940
```

Relation: administrative expenditure per capita vs population size

```
2000

      Source |       SS       df       MS              Number of obs =      93
-------------+------------------------------           F(  5,    87) =   69.21
       Model |  10826.8346     5  2165.36692           Prob > F      =  0.0000
    Residual |  2722.06627    87  31.2881181           R-squared     =  0.7991
-------------+------------------------------           Adj R-squared =  0.7875
       Total |  13548.9009    92  147.270662           Root MSE      =  5.5936

------------------------------------------------------------------------------
   adm_pc_00 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   103.8482   25.75012     4.03   0.000     52.66703    155.0293
     log_pop |  -75.15995   10.85772    -6.92   0.000    -96.74084   -53.57907
       pop_2 |  -25.42279   8.337164    -3.05   0.003    -41.99381   -8.851778
       pop_3 |   2.634182   1.010099     2.61   0.011     .6265011    4.641864
         d_1 |  -4.453755   1.396056    -3.19   0.002    -7.228567   -1.678942
       _cons |  -63.10646   18.69909    -3.37   0.001    -100.2729   -25.93999
------------------------------------------------------------------------------

. ovtest

Ramsey RESET test using powers of the fitted values of adm_pc_00
       Ho:  model has no omitted variables
                  F(3, 84) =      1.13
                  Prob > F =      0.3404


2001

      Source |       SS       df       MS              Number of obs =      93
-------------+------------------------------           F(  5,    87) =   42.07
       Model |  25829.3341     5  5165.86682           Prob > F      =  0.0000
    Residual |  10683.0001    87  122.793105           R-squared     =  0.7074
-------------+------------------------------           Adj R-squared =  0.6906
       Total |  36512.3342    92  396.873198           Root MSE      =  11.081

------------------------------------------------------------------------------
   adm_pc_01 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
         pop |    269.512    51.0125     5.28   0.000     168.1191    370.9048
     log_pop |  -160.3495   21.50977    -7.45   0.000    -203.1025   -117.5965
       pop_2 |  -72.55945   16.51641    -4.39   0.000    -105.3876    -39.7313
       pop_3 |   7.748627   2.001065     3.87   0.000     3.771293    11.72596
         d_1 |  -5.642778   2.765668    -2.04   0.044    -11.13984   -.1457131
       _cons |   -179.553   37.04399    -4.85   0.000    -253.1819   -105.9241
------------------------------------------------------------------------------

. ovtest

Ramsey RESET test using powers of the fitted values of adm_pc_01
       Ho:  model has no omitted variables
                  F(3, 84) =     10.30
                  Prob > F =      0.0000
```

2002

```
      Source |       SS       df       MS              Number of obs =      93
-------------+------------------------------           F(  7,    85) =   60.90
       Model |  29773.0635     7  4253.29478           Prob > F      =  0.0000
    Residual |  5936.47355    85  69.8408654           R-squared     =  0.8338
-------------+------------------------------           Adj R-squared =  0.8201
       Total |   35709.537    92  388.147142           Root MSE      =  8.3571

------------------------------------------------------------------------------
   adm_pc_02 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   450.3388    95.4972     4.72   0.000     260.4647    640.2128
     log_pop |  -208.3969   28.84341    -7.23   0.000    -265.7454   -151.0485
       pop_2 |  -178.4069   49.21396    -3.63   0.000    -276.2574   -80.55633
       pop_3 |   37.67797   12.82964     2.94   0.004     12.16921    63.18672
       pop_4 |  -3.027435   1.241905    -2.44   0.017    -5.496673   -.5581958
         d_1 |  -10.46976   2.351171    -4.45   0.000    -15.14452   -5.795008
         d_2 |  -6.528641    2.06789    -3.16   0.002    -10.64016   -2.417122
       _cons |   -270.633   58.21982    -4.65   0.000    -386.3896   -154.8764
------------------------------------------------------------------------------

. ovtest

Ramsey RESET test using powers of the fitted values of adm_pc_02
       Ho:  model has no omitted variables
                  F(3, 82) =      2.84
                  Prob > F =      0.0428
```

Health Expenditure Per Capita vs Population Size

2002

```
Source |       SS       df       MS              Number of obs =      57
-------------+------------------------------           F(  2,    54) =    0.86
       Model |  306.056226     2  153.028113           Prob > F      =  0.4286
    Residual |   9602.2656    54  177.819733           R-squared     =  0.0309
-------------+------------------------------           Adj R-squared = -0.0050
       Total |  9908.32183    56  176.934318           Root MSE      =  13.335

------------------------------------------------------------------------------
     h_pc_02 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   4.883196    9.58913     0.51   0.613    -14.34185    24.10824
       pop_2 |  -1.944762   2.487567    -0.78   0.438    -6.932033    3.042509
       _cons |   14.52914   7.485528     1.94   0.057    -.4784374    29.53672
------------------------------------------------------------------------------

. ovtest

Ramsey RESET test using powers of the fitted values of h_pc_02
       Ho:  model has no omitted variables
                  F(3, 51) =      0.40
                  Prob > F =      0.7518
```

Culture Expenditure Per Capita vs Population Size

2000

```
Source |       SS       df       MS              Number of obs =      82
-------------+------------------------------           F(  5,    76) =   15.19
       Model |   83.296298     5  16.6592596           Prob > F      =  0.0000
    Residual |  83.3774548    76  1.09707177           R-squared     =  0.4998
-------------+------------------------------           Adj R-squared =  0.4668
       Total |  166.673753    81  2.05770065           Root MSE      =  1.0474

------------------------------------------------------------------------------
     c_pc_00 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     log_pop |  -1.451574   .5213526    -2.78   0.007    -2.489938   -.4132105
         pop |   .4348675   .3461285     1.26   0.213    -.2545072    1.124242
         d_1 |  -1.935052    .389656    -4.97   0.000    -2.711119   -1.158985
         d_2 |  -1.497856   .3807957    -3.93   0.000    -2.256276   -.7394355
         d_3 |   .2466637   .4096787     0.60   0.549    -.5692821    1.06261
       _cons |   2.348295   .5459626     4.30   0.000     1.260916    3.435673
------------------------------------------------------------------------------

. ovtest

Ramsey RESET test using powers of the fitted values of c_pc_00
       Ho:  model has no omitted variables
                  F(3, 73) =      2.09
                  Prob > F =      0.1083
```

2001

```
Source |       SS       df       MS              Number of obs =      84
-------------+------------------------------           F(  4,    79) =   15.75
       Model |  182.228146     4  45.5570365           Prob > F      =  0.0000
    Residual |  228.526241    79  2.89273722           R-squared     =  0.4436
-------------+------------------------------           Adj R-squared =  0.4155
       Total |  410.754387    83  4.94884803           Root MSE      =  1.7008

------------------------------------------------------------------------------
     c_pc_01 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   1.051226   .5628295     1.87   0.066     -.069058    2.17151
     log_pop |  -3.100059   .8496797    -3.65   0.000    -4.791304   -1.408814
         d_1 |  -2.724343    .474007    -5.75   0.000    -3.667831   -1.780856
         d_2 |   -2.10703   .4428523    -4.76   0.000    -2.988505   -1.225554
       _cons |    3.00073   .7505579     4.00   0.000     1.506782    4.494678
------------------------------------------------------------------------------

. ovtest

Ramsey RESET test using powers of the fitted values of c_pc_01
       Ho:  model has no omitted variables
                  F(3, 76) =      3.68
                  Prob > F =      0.0156
```

2002

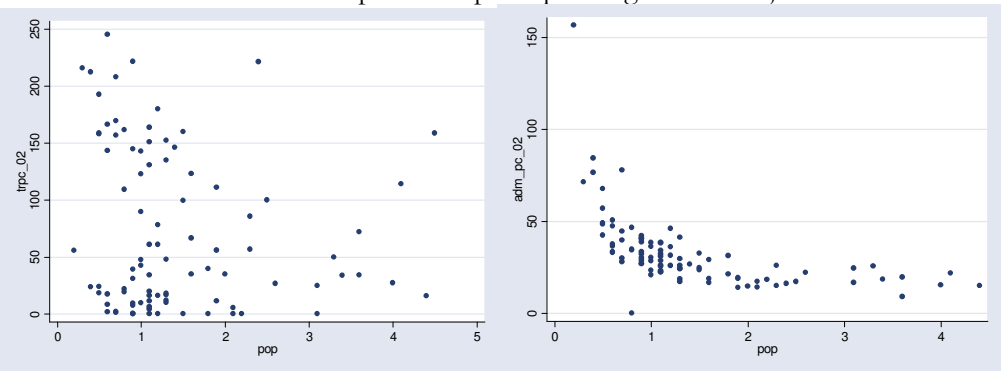
```
      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  5,    82) =   17.18
       Model |   727.26209     5  145.452418           Prob > F      =  0.0000
    Residual |  694.319216    82  8.46730752           R-squared     =  0.5116
-------------+------------------------------           Adj R-squared =  0.4818
       Total |  1421.58131    87   16.340015           Root MSE      =  2.9099

------------------------------------------------------------------------------
     c_pc_02 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pop |   2.063043   .9095632     2.27   0.026     .2536318    3.872454
     log_pop |  -4.944366   1.387092    -3.56   0.001    -7.703733   -2.184998
         d_1 |  -6.358858   1.103432    -5.76   0.000    -8.553936    -4.16378
         d_2 |   -4.20234   1.048043    -4.01   0.000     -6.28723   -2.117449
         d_3 |  -.1191519   1.134676    -0.11   0.917    -2.376384     2.13808
       _cons |   5.580902   1.474865     3.78   0.000     2.646926    8.514878
------------------------------------------------------------------------------
```

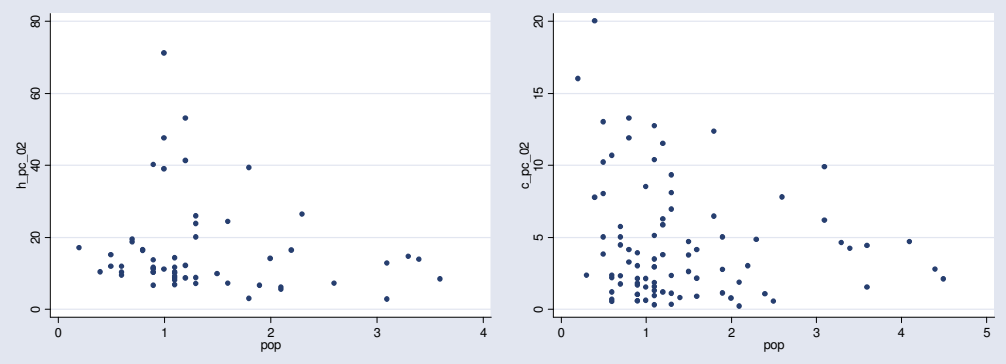
```
. ovtest

Ramsey RESET test using powers of the fitted values of c_pc_02
       Ho:  model has no omitted variables
                  F(3, 79) =      2.02
                  Prob > F =      0.1177
```

Transfers and administrative expenditure per capita vs government jurisdiction size



Health and culture expenditure per capita vs government jurisdiction size



Health and culture expenditure per capita vs government jurisdiction size