DRIVING URBAN ECONOMIC GROWTH – EVIDENCE FROM TRANSITION ECONOMIES

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Abstract

Small business, human capital, policies make a key contribution to the economy in terms of employment and growth. More recent studies explaining variability in urban economic growth have shifted their focus to urban areas of the developed and developing world with a very scarce research on urban growth drivers in transition economies.

Author attempts to bridge this gap and investigate urban GDP per capita growth across seven Eastern Neighbourhood countries using data for 98 core cities—rather than administrative regions or municipalities. More specifically, dynamic panel data study is undertaken to shed some light on the role of physical and human capital, small business, socio-economic, environmental and spatial characteristics as well as policies, integration and government size in the urban economic growth during 1995-2008. Not only do the results now provide consistent estimates of parameters, but they also support relevant theoretical insights.

Keywords: Urban growth, urban policy, agglomeration, spatial dependence, transition.

JEL Codes: H41 L26 R11 R50 P25

Introduction

While there has been relatively little work on urban economies and economic growth in transition countries, this paper does not come out of a research vacuum. Some urban economists, notably Roback (1982), Glaeser et al. (1995), Cheshire and Magrini (2009) wrote explicitly about urban economic growth, mostly in a neo-classical framework assuming full spatial equilibrium. Moreover, growth economists from outside of urban economics, like Barro (1991) and Barro and Sala-i-Martin (1991, 1992 and 1995) have had important insights about the drivers of urban economic growth. In this paper, I will discuss the local roots of urban economic growth and agglomeration economies looking at the sample of countries of former Soviet Union (fSU).

Over the last twenty years, a large empirical literature has focused on determining the characteristics associated with the economic growth in cities and other local markets (e.g., regions, metropolitan areas). Major part of this research follows from the economic growth theory and cross-country growth (Owyang et. al. 2008). He emphasized the fact that cities within the same country represent a rich cross section of economies with relatively similar cultural and institutional characteristics, and that they constitute an attractive sample that can be used to test growth theories. According to Owyang et. al. (2008) a rich cross section of urban economies with relatively similar inherited from socialist system cultural and institutional characteristics may be efficiently used to test drivers of economic growth given that the majority of the economic activity of the fSU is traditionally located within urban areas. The countries analysed represent a space of geographically sticky people due to existence of national borders and working permits that citizens of the same block should apply for to be eligible to work in the other country. The reasons for ex-soviets low responsiveness to differences in opportunities across space and national barriers seem complex. The costs of movement are high compared to the USA or even European Union, because of transactions costs, housing, work, health insurance policies, etc.

Our research result that full spatial equilibrium does not hold in space of cities in the fSU which implies that people can improve their welfare by moving from one location to another whether that is between neighbourhoods in one city or from one city to another (Cheshire and Magrini, 2009). Differences in wages, quality of institutions, demographic and socio-economic structures make differences in the value of amenities across cities.

This paper also carries policy implications and provides an answer for a question whether it is reasonable to think of a single fSU 'urban system'; it sheds light on the mechanisms producing urban growth adjustment and how national borders still constraint this; it reveals an important limitation of the Tiebout's (1956) logic. The issue in the context of fSU systems of local government is similar to those described by Cheshire and Magrini (2009), when 'one has to consider a world in which people are not perfectly mobile and there may be important classes of local public goods which have spatial spillovers associated with their consumption and/or their production' in a particular city or location.

In addressing questions of differential urban economic growth the question of the most appropriate spatial units to look at arises instantly. In the US, urban scholars use data for core-based metropolitan regions or so-called Core-based Statistical Areas (CBSAs).

Consistent data for all fSU countries analysed within the indicators of a primarily interest is available since 1990 with more extensive data since 1995. A definition of the core-city does not vary greatly across fSU and some country's definitions do usefully translate to others. For example, in Russia, Belarus, Armenia and Ukraine, until recently the concept of the agglomeration corresponded quite closely to that of a core-city, since land use planning in

these countries did not permit continuous expansion of built-up areas up to a regional level and did attempt to impose growth boundaries (e.g. same could be seen in the British and Dutch systems, unlike German or French). The data on 98 cities of the fSU, namely 54 cities in Russia, 6 cities in Belarus, 26 cities in Ukraine 5 cities in Georgia, 5 cities in Armenia and two capital-cities of Baku and Kishinev is now available for statistical analysis through CIS Urban Audit[1]. The analysis in this paper employs data for a specific definition of core-based city in the fSU as analogue to European Urban Audit.

Acknowledging the fact there has been more research on economic growth and city in the developed and developing countries rather than in emerging economies of transition the question to be further investigated is: why some cities in fSU so much more growing than others? New established capitals: Moscow, Kiev, Minsk and Tbilisi, and even regional cites such as Kazan, Belgorod and Vologda in Russia, Hrodna and Brest in Belarus seem almost magically growing in GDP per capita terms, but in declining cities in the South of Russia, Ukraine and Georgia such GDP per capita been very low. The League tables A1 and A2 of Top 10 and Bottom10 cities in terms of GDP per capita over a period of 1995-2008 demonstrate it in Appendix A.

The final objective of the paper is twofold. First, providing a background for future research on challenging the role of socio-economic, environmental and spatial factors in cities as well as policies, and the extent to which they account for GDP per capita growth. Second, understanding what contributes the most in urban economic growth as a driver of economic development and innovation, and policy makers need to take urgent action to boost their policies, implement local reforms and create ad-hoc spatial spillovers to build new and more responsible urban economic models in the fSU.

The paper proceeds as follows. The next section discusses theoretical issues of urban economics and growth. Section 3 describes the baseline, Section 4 - data and the methodology. Testing hypothesis and estimated results described in Section 5. Section 6 concludes.

2. Theoretical foundations: approach and methodological issues

Measuring drivers of urban economic growth in emerging economies may be difficult. In a sense, every city has its own specific characteristic and it's also troublesome to find the proxy for economic growth at the level of city. Using the GDP per capita growth rate to capture the level of urban growth does no weighting for the size of city and population. The history of the literature on Urban Economics and Growth in Transition economies is poor, however allows us to look quantitatively at the history of the urban growth research in these countries. An electronic search brings up the word ‘‘urban growth" and "transition economies" in 131 distinct articles in varies journals since the beginning of transition in 1990. At the same time, not all these article are about fSU countries, but also Southern Asia, South America and China. Restricting an electronic search to "urban economic growth" brings up the word "transition economies" in 91 distinct articles since the 1990. In many cases, the word "urban economic growth" occurs only once, often in the citation list.

The post-1990 articles that discuss urban economic growth at any length generally focus on urban growth in Western Europe and the US (e.g. Glaeser et al. 1995; Cheshire and Magrini 2009; Duranton and Puga 2004; and Rosenthal and Strange 2003, 2004) with a scarce research on transition economies of Eastern Europe and Russia. The cutting edge research journals during the period of 1990-2010 have published few articles about urban economic growth in transition economies. For instance, Journal of Urban Economics since 1990 has

published only one article by Sharma (2003) which examined growth rates of city populations in a time-series context using Indian population data from 1901–1991. The situation is similar at Regional Science and Urban Economics, with 1 paper of Henderson and Wang (2007) mentioning urban economic growth in Soviet block countries using GDP per capita data from the Penn World Tables website.

The situation is better with the Urban Studies with 7 papers on urban economic growth in transition economies since 1990 with 6 papers discussing Chinese cities and one English cities. There is still no emphasis on transition economies of Eastern Neighbourhood.

This paper aims to bridge this gap. We employ dynamic panel growth model, avoiding the convergence approach of the numerous studies following Barro (1991) and Barro and Sala-i-Martin (1991, 1992 and 1995)[2]. The beta-convergence approach was questioned by promising scholars (e.g. Magrini, 2004; Cheshire and Malecki, 2004; Cheshire and Magrini, 2009) as less informative for both theoretical and empirical reasons. Indeed, the beta-convergence approach includes the initial level of GDP per capita as an independent variable (with a range of additional control variables to account for differences in steady states and idiosyncratic 'shocks') and tests whether poorer cities/ regions at the start of the given period grow faster on average than those that were richer. This provides a measure of their rate of convergence. Should the units of observations be subdivisions of national territories, such as urban areas, then the statistical approach would be to include city dummies to control for all country-specific omitted variables as advised by Cheshire and Magrini (2009). On theoretical grounds, the final preference was not to use city dummies to control for city-specific effects (such as the economic cycle, local and national policy differences, etc.) affecting urban economic growth, but to include the lagged rate of growth of the GDP per capita of the city as an independent, so-called predetermined variable in a model. This comes from an importance of understanding better dynamic adjustment of urban economic growth and its differentials rather than to investigate b-convergence. The underlying view of London School of Economics, for example, is that urban economic growth differences are multivariate: the impact of some drivers is towards convergence (e.g. people and capital mobility, institutional and policy reforms within national and regional boundaries) while the impact of others is towards divergence (e.g. those involving agglomeration economies and dealing with effective market conditions). Finally, which effects dominate in any particular time period is to be further investigated and discussed by empirical researchers.

Based on enormous literature a number of theories can be identified as to likely to shape such cross-city variation, including (1) agglomeration economies; (2) availability of inputs to growth: human capital, including entrepreneurship, and the level of capital stock; (3) quality of institutions, government size and local reforms; (4) socioeconomic and demographic characteristics of cities; and (5) patterns of integration in space.

The first theory refers to local interactions that give rise to agglomeration spillover for urban economic developments have been extensively discussed in the surveys by Duranton and Puga (2004) and Rosenthal and Strange (2003, 2004).

Kiev and Moscow would have attracted people regardless of the existence number of population, small and large businesses in those cities. In many cases, however, urban growth is driven by the existing industrial structure of a city. People may cluster near potential customers or potential suppliers. Apparently, the hypothesis that agglomeration has a positive effect on urban productivity goes back to Marshall's (1920) and Chinitz's (1961) description of spillover benefits for a plant from other in the neighbourhood – information spillovers about technology, suppliers, purchases and market conditions (Fujita and Ogawa, 1982); scope for local intra-industry spillovers in specific activities; search for a matching improvements between workers and plants in local labour markets (Helsley and Strange,

1990; He and Pan, 2010). The scale of the urban environment may impact productivity through availability of a larger pool of workers and their skill diversity, co-location of firms across diverse industries, the proximity of customers and suppliers which reduce transport cost of trade and cooperation (e.g. Krugman, 1991; Agrawal et al., 2008; Gerlach et al., 2009). Agglomeration economies with large industrial clusters and developed networks in metropolitan areas (not necessarily capital-cities) are typical for FSU cities.

The simplest agglomeration economy is that proximity to suppliers and customers originating both from inside and outside the city, including a number of tourists and commuters, who visit a city for leisure and business reduces transportation costs and thereby increases productivity. To some extent, demographics of an area (e.g., number of residents or population density) are informative about the level of agglomeration economies. Capital-cities may not be the only drivers of agglomeration economies within fSU with a growing role of regional centres as business and social clusters.

Definition 1: The urban economic growth is higher in agglomeration economies.

Since the nineties the role of education and human capital externalities has been recognised as a key variable in theories of economic growth (Acs and Armington 2004). Models developed by Romer (1986), Bernanke and Gurkaynak (1992), Lucas (1988) and Krugman (1991) link these externalities within a geographically bounded region to higher rates of growth. Lucas (1988) show that the urban economies are the best spatial level to understand the mechanics of economic growth. Human capital benefits also sprout from educational institutional environment including colleagues and neighbours —through discussions, publications, talks and eventually may drive city productivity and growth. They show whether the evidence of a link between higher human capital within a geographically bounded region is or is not consistent with a spatialised adaptation of endogenous growth theory (Romer 1986, 1994).

The engine for growth can be as simple as a constant return to scale production function (the AK model) or more complicated set ups with spillover effects, increasing numbers of goods, increasing qualities, etc. There is also a connection between small business and urban growth discussed by Duranton and Puga (2001), Helsley and Strange (1990), Glaeser and Kerr (2009), Bosma and Schutjens (2009). One may expect economically more successful cities to be positively associated with the level of entrepreneurial activity. A wealthier business environment and city success associated with higher payoffs and productivity is likely to provide incentives to entrepreneurs in pursuing market (Claessens and Djankov, 2002, Glaeser, 2007), therefore revealing two-way interdependence between economic development and entrepreneurship.

Heterogeneity in returns to business across space will drive self-employed in the most profitable locations (Baumol 1990, 1993), due to differential supply of inputs, including finance availability.

Definition 2: Availability of inputs (e.g. human capital, including innovative and high-value added entrepreneurship, finance availability) foster local economic growth.

The third area is entirely alternative; it relates to the wider issue of the provision of local public goods and better institutions with jurisdictional public good and institutional spillovers and spatially immobile people. Local economic policies aim to increase the rate of economic growth of the territory to which they are applied (Cheshire and Magrini, 2009).

Their hypothesis advanced is that 'clusters' are more likely to develop and are more effective if the administrative boundaries of the region in term of population more closely corresponded to those of the city. The logic underlying this was that the more closely these boundaries coincided, the smaller would be spillover losses of growth gains to agents in surrounding jurisdictions and the lower would be the transactions costs of forming a 'growth promotion clusters' because there would be fewer agencies involved.

The EBRD indicators, covering three broad aspects of transition: enterprises (incorporating small- and large-scale privatisation and enterprise restructuring); markets and trade (price liberalisation and competition, and trade and foreign exchange system); and financial institutions (banking reform) as well as a role of local government size were included in a model as an interplay of local policies and their impact on urban productivity. The indicators have since been broadened and refined (see Parker, 2009; Transition report 2010).

International economics explains different growth rates and income levels by emphasising specialisation, human capital and institutions. This framework can be adapted to the analysis of metropolitan growth (Storper, 2010).

Definition 3: Better local policies achieved in various aspects of transition facilitate economic growth.

The fourth theory follows endogenous growth theory logic. It implies that places may differ in the in socioeconomic, environmental and demographic characteristics changing the patterns of local economic growth. The first is the spatial unemployment rates. If a city's growth rate is negatively influenced by a concentration of unemployment in it at the start of the period, then a concentration of unemployment in closely surrounding cities should also have a negative impact. This is not the case of fSU cities with sticky people restricted from moving from one city to another across the countries[3] and a long-lasting experience of "propiska" – obligatory registration which still exists in Russia, Ukraine and Belarus.

The second is demography, more specifically the prevalence of young people in cities. A number of research studies confirm that age and working experience are significant determinants of entrepreneurial entry (Minniti et al., 2005). Being middle aged makes entrepreneurial entry more likely which can help economic growth to occur. Work experience has been shown to benefit entrepreneurial entry, and even more so high-growth businesses (Mandelman and Montes-Rojas, 2009). Acs and Armington (2004) examined the relationship between the local levels of human capital and firm formation rates and found that they differ with the share of adults with college degrees, especially for industries that normally require college-educated founders, suggesting that an important mechanism is the spillover of relevant knowledge. City welfare, i.e. proportion of people living below minimum consumption budget, level of income and higher pool of labour force are likely to provide extra benefits and cost incentives to entrepreneurs and multinationals in pursuing market opportunities in these cities boosting local economic growth (Henderson, 2002).

Definition 4: Endogenous characteristics of cities drive variation in urban economic growth.

The fifth theory refers to the systematic spatial effects of integration across cities on urban growth. Clark et al. (1969), Cheshire and Magrini (2000) demonstrated a deep concern about these using as an independent variable the quantitative measures predicted by Clark before the impact of European integration was revealed. Theoretical developments

summarized in Fujita et al. (1999) have also given a significant boost to interest in this potential source of differences in urban growth. In addition to the measuring Clark et al.'s (1969) and Cheshire and Magrini (2009) change in urban economic potential, associated with possible patterns of integration in Eastern Neighbourhood space. Since the urban economic growth is analysed one would expect interactions between the growth performances of neighbouring cities. Particular attention was paid to cross-sectional or spatial dependence (e.g. Florax et al., 2003; Moscone and Tosetti, 2010). Spatial dependence could be a sign of omitted variable(s). If there is a problem of spatial dependence, the model does not include variable(s) conditions and mechanisms that cause economic conditions in one city systematically to influence developments in its neighbours. If these variables are not included, therefore, not only may parameter estimates be inconsistent (although there are econometric fixes available) but also it should prompt researchers to find suitable (spatial) variables reflecting the location of the city relative to its neighbours raising the issue of spatial dependence (Cheshire and Magrini, 2009).

Theory suggests that there are important spatial adjustment mechanisms exist for labour markets, demography and socio-economic characteristics of a city conditioned on a level physical of accessibility and other spatially determined features of urban economies. For example, labour markets, demography and socio-economic characteristics of a city adjust to differences in ways conditioned on measures of accessibility.

Definition 5: Spatial effects and patterns of integration across cities effect urban economic growth.

3. The model

In this paper we adopt a production function approach. I assume a standard Cobb-Douglas production function with Hicks-neutral technical change:

$$Y_{it} = TFP_{it} L_{it}^{\alpha} K_{it}^{\beta} \quad (1)$$

where i=1, …98 is a city index; t=1995,…2008 is a time index; Y is the GDP per capita in city i; L is labour input; K is private physical capital stock; TFP is total factor productivity representing technical change. I assume total factor productivity is driven by human capital, public expenditure and entrepreneurial activity:

$$TFP_{it} = \theta_{it} A_{it} G_{it} E_{it} \quad (2)$$

where A is agglomeration economies effect on productivity, G is the public expenditure, E is the stock of entrepreneurial capital and θ is the part of technical progress not caused by the factors mentioned.

Substituting (2) into (1) we obtain:

$$Y_{it} = \theta_{it} A_{it} G_{it} E_{it} L_{it}^{\alpha} K_{it}^{\beta} \quad (3)$$

First, we can assume constant returns to private inputs (L and K) and perfect competition. This is the standard assumption that allows us to compute α as the labour elasticity of output

and β=1−α as the capital elasticity of output. In addition, we assume that the "unexplained" technical progress depends on city and time fixed-effects in the form: $log\theta_{it} = \theta_i + \theta_t$.

Thus, taking the log of (3) we estimate the following baseline equation:

$$y_{it} = \theta_i + \theta_t + a_{it} + g_{it} + e_{it} + l_{it} + k_{it} + \varepsilon_{it} \quad (4)$$

where lower-case variables denote logarithms; θi and θt represent city and time-specific intercepts, respectively, that allow us to take account of city unobservable or omitted factors affecting spatial dependence across cities, economic growth and control for common cyclical dynamics or common output shocks; $\varepsilon_{i,t}$ is a stochastic error term. The econometric technique does not require that elasticities be the same across cities, therefore in the empirical specifications we will not impose homogenous coefficients.

Equation (4) could be extended by including the effect of spatial spillovers, entrepreneurial culture and institutional spillovers as discussed in the previous section.

4. Data and Methodology

4.1. Sample Description

In this study an extensive data was utilized collected through Offices of National Statistics in Russia, Ukraine, Belarus, Moldova, Georgia, Armenia and Azerbaijan. Data on the number of Universities is taken from High educational establishments in CIS and Universities worldwide information resources[4]. Data on the availability of transsexual and gay escort across CIS cities is taken from 'Holiday sex guide'[5]. Transition Indicators scores on enterprises, markets and trade, financial institutions and infrastructure are taken from European Bank for Reconstruction and Development, Economic and research data[6]; index of economic freedom is taken from The Heritage Foundation[7]. Matched datasets called "CIS Urban Audit dataset" over the period of 1995-2008 and contains annual data on small business and urban socioeconomic, spatial and institutional characteristics of the FSU cities and other. The sample covers 98 cities from seven FSU countries[8] These cities, though varying in size[9], are considered to be the most appropriate spatial units for modelling and analysis purposes (Fingleton, 2001; Fisher, 2009). The dataset is represented by 98 cities covering Russia (54 cities), Belarus (6 cities), Ukraine (26 cities), Moldova (1 city-capital), Georgia (5 cities), Armenia (5 cities), Azerbaijan (1 city-capital).

The basic method for defining the core-city analysed in this paper was to identify spatial units where there were at least 50,000 residents. These then define the 'city-cores'. Hinterlands were not defined from which more commuters flowed to the core than to any other, subject to a minimum cut-off level of commuting.

Overall, the following selection was employed criteria as in Urban Audit data[10]: approximately 40% of the national population should be covered by the CIS Urban Audit; all capital cities were included; where possible, regional capitals were included; both large (more than 250 000 inhabitants) and medium-sized cities (minimum 50 000 and maximum 250 000 inhabitants) were included; the selected cities should be geographically dispersed within each State.

4.2. Variable Description

GDP per capita growth taken in logs is used to measure urban economic growth. It has widely been used in a number of empirical studies in this area (Anselin and Rey, 1991; Cheshire and Magrini, 2009; Glaeser et al., 2010). In fact this is one of the variables most subject to distortion using NUTS city-level boundaries, because GDP is estimated at workplaces while people are counted where they live within a core-city. Because people can also commute to work across administrative boundaries, this means GDP per capita could be systematically overestimated for regions where the administrative boundaries exclude significant dormitory areas (e.g. Moscow, Saint-Petersburg, Samara and Kazan). In reality, this does not happen for a large number of FSU cities, so official figures will not systematically overstate city GDP per capita. The result is consistency in using GDP per capita proxy for urban economic growth.

Because of weak population decentralization over the period, the growth of GDP per capita could be overstated by some 20% for the largest four cities in Russia. There is a huge variation in the GDP per capita across our sample (see Table A1 and A2 for details). Interestingly, cities with the higher GDP per capita are both capitals and regional medium cities with the population over 4 million residents such as Moscow, Saint-Petersburg, Samara, Kazan and less than 400,000 residents as Brest, Hrodno, Syktyvkar and Belgorod. Table A3 provides variable definitions and descriptive statistics, while Table A4 shows the correlation matrix between CIS urban audit indicators pertaining to this study.

The GDP per capita for cities using the proportionate distribution of city population between regions at the same practical dates and applying these as weights to the relevant city GDP per capita[11]. To minimise the effects of measurement error, the start and end points of the series as the means for the first and last 3 years should be taken.

4.3. Methodology

Since the process of urban economic growth is costly and troublesome in terms of physical and human capital investment, implementing institutional and market liberalisation reforms, formulating employment and growth support programmes, one would expect the GDP per capita growth to adjust with delay to changes in socioeconomic, demographical, spatial and institutional characteristics in the city. Linear dynamic panel data model can help to better understand the dynamics of adjustment. The process of adjustment to changes in these factors may depend both on the passage of time—which argues for including several lags of these factors as regressors—and on the difference between equilibrium GDP per capita growth and the previous year's actual level—which argues for a dynamic model, in which lags of the dependent variable are also regressors.

In order to estimate/establish the determinants of urban economic growth the growth equation (4) could be written in the following structural form:

$$y_{it} = \beta_1 y_{i,t-1} + \beta_2 X_{it} + \beta_3 Z_{it} + \mu_{it} \qquad (5)$$

where the subscript i denotes the i-th town (i=1, ….98), and the subscript t denotes the t-th year (t=1, ….14), y_{it} is GDP per capita of a city I at time t, taken in logarithms; y_{it-1} is its lagged value of GDP per capita (predetermined variable). X_{it} is a vector of potentially endogenous variables, namely logarithm of number of small businesses (E), unemployment

rate, logarithm of capital investment per GDP (K), air pollution as a proxy for agglomeration effect (A) along with logarithm of population density; Z_{it} is a vector of strictly exogenous control variables (spatial spillovers, and institutional spillovers, etc.) listed in Table A3. The disturbance term is specified as the one-way error component model term:

$$\mu_{it} = \theta_i + \varphi_{it} \quad i=1, \ldots\ldots, 98 \quad t=1,\ldots,14 \qquad (6)$$

$$E[v_i] = E[\varphi_{it}] = E[v_i \varphi_{it}] = 0 \qquad (7)$$

where θ_i denotes a city specific effect. In order to capture year-specific effect I include time-dummies in the equation (5). The time effects θ_t are assumed fixed parameters to be estimated as coefficients of time dummies for each year in the sample. This can be justified given the numerous policy interventions, development of informational infrastructure, databases, institutional and banking sector reforms, small and large scale privatisation in these countries.

The dynamic structure of the model (5) makes the OLS estimator upwards biased and inconsistent, since the lagged level of income is correlated with the error term. The within transformation does not solve the problem, because of a downward bias (Nickell 1981) and inconsistency. A possible solution is represented by the Generalized Method of Moments (GMM) technique. Blundell and Bond (1998) show that when β_1 approaches to one, so that the dependent variable follows a path close to a random walk, the differenced-GMM (Arellano and Bond 1991) has poor finite sample properties, and it is downwards biased, especially when T is small. Bond (2002) argues that this is likely to be a serious issue for autoregressive model. Therefore, Blundell and Bond (1998) propose another estimator – the System-GMM– derived from the estimation of a system of two simultaneous equations, one in levels (with lagged first differences as instruments) and the other in first differences (with lagged levels as instruments). In multivariate dynamic panel models, the System-GMM estimator is shown to perform better than the differenced-GMM when series are persistent (β_1 close to unity) and there is a dramatic reduction in the finite sample bias due to the exploitation of additional moment conditions.

Instead of transforming the regressors to expunge the fixed effects, it transforms—differences—the instruments to make them exogenous to the fixed effects. This is valid assuming that changes in any instrumenting variable w_{it} are uncorrelated with the fixed effects—in symbols, that $E[w_{it} v_i] = 0$ for all i and t. This is to say, $E[w_{it} v_i]$ is time-invariant. If this holds, then Δw_{it-1} is a valid instrument for the variables in levels[12]

In particular, there is evidence that using results obtained with the System GMM confirm that: the system-GMM lies between the upper and lower bound represented by OLS and LSDV; there is a gain in efficiency; and the instrument set is valid.

Whether these three conditions are met, the two-step system-GMM results can be taken as a benchmark for dynamic panel data models (Bond 2002; Hoeffler 2002). Table A5 reports model estimation results and discuss a set of instruments used for levels and differences equations. Acknowledging multicollinearity issues and theoretical insights seven specifications of the model in eq. (1) was applied. Note that two-step Sargan/Hansen test for overidentification does not reject the null. Not all the moment conditions are used and in fact the collapse option was invoked to reduce these moment conditions. The test for first-order serial correlation in residuals rejects the null of no first-order serial correlation, but does not reject the null that there is no second-order serial correlation. This is what we can expect in a

first-differenced equation with the original untransformed disturbances assumed to be not serially correlated.

5. Results

This section explains the reasons for variable inclusion, hypothesis testing and discussion. In all models, the dependent variable was the annualised rate of growth of city GDP per capita at real prices from 1995–2008.

Other controls are designed to reflect underlying urban economic theory and evidence. The log of population size is included with the expectation that larger cities would have grown faster because of productivity gains in larger urban areas (e.g. Costa and Kahn, 2000; Cheshire and Magrini, 2000). This, however may not be the case of GDP per capita growth as productivity gains in larger urban areas may not be compensated increasing in number of residents who are unemployed (including cyclical unemployment) either look for a job or working in grey economy or work at home. The preferred specification is contained in the second column of Table A5. Higher population size has a negative effect on GDP per capita growth. Theory tells us that in an unregulated and unconstrained world, population density and agglomeration economies would be a positive effect on local growth. Population density and air pollution have been used in the literature as variables to proxy for potential agglomeration economies. However, rigid urban containment policies have, for example, been applied in FSU countries since 1950s so-called 'urban densification'. At the same time density of population is not sophisticated proxy for agglomeration economies as the number of residents is not consistent on the size of the city in FSU (city area, sq. km).

Although the population density coefficient is not significant the agglomeration hypothesis is supported. The effect of air pollution is consistent across all specifications, positive and statistically significant. It's also puzzling that city-capital dummy is not significant, although positive in the last, most robust specification (Henderson, 2002; Agrawal et al., 2008; Gerlach et al., 2009).

The theoretical reasons for expecting a concentration highly skilled human capital to have a positive impact on local economic growth as in Romer (1986, 1990), Krugman (1991) and Rosenthal and Strange (2008) adapted to a spatial context (Magrini, 1998; Barrios et al., 2007). Specifications (1-7) in Table A5 showed cities with higher capital investment and human capital concentrated in universities and their research institutes are likely to experience higher urban economic growth. Universities and research Institutions are necessarily related to innovation and high-value added entrepreneurship cooperating with small and large business, which sprouts in successful locations.

The number of small businesses as a proxy for entrepreneurial activity (specification 1, 3-6) shows that entrepreneurship in fSU cities is likely to be necessity-driven and associated with basic low-scale business activities (Mandelman and Montes-Rojas, 2009). Necessity-driven entrepreneurship is more likely to take a form of self-employment or small business start-up (Korosteleva and Mickiewicz, 2010). The coefficients of number of small businesses growth emphasis that it sprouts in locations with lower opportunity costs of entrepreneurship, limited labour market opportunities to be employed by large business and multinationals as well as locations experiencing industrial structural changes due to massive privatisation or market liberalisation. In order to capture the phenomenon of innovative-driven entrepreneurship positive impact on local growth it is worthwhile to exploring the effect of resident's welfare on urban economic growth though entrepreneurship. An

interaction term of number of small businesses and nominal wages was used to chase this relationship which appeared to be positive and highly significant.

Regarding a third theory, the results from Table A5 have proved significant and negative impact of government size on local urban growth. The definition of positive effect of policies and higher institutional quality on local economic growth was supported with the coefficients of economic freedom, small-scale privatisation and banking reform been positive and significant (see specifications 3 and 7); coefficients of governance and enterprise restructuring been positive and significant (see specifications 4, 5 and 7). Model fails to support positive effect of large-scale privatisation, competition policies and price liberalisation on local economic growth as the coefficients are not significant, although the signs are positive.

We might further hypothesise the relationship between the local urbal growth and policies. Should the value of the coefficients be significant and very high, so that the size of the 'relevant' unit of government substantially (national/regional level) exceeded the size of the city, then the incentive to generate urban growth promoting policies for the city might weaken. The size of the city here is determined by population. The interests of the city would begin to be lost in those of the country, which might favour rural areas or smaller centres.

We support the fourth definition as endogenous city characteristics add to explaining a variation in urban economic growth across space. Proportion of residents living below minimum consumption budget are highly significant and negative, although unemployment rate and proportion of young person index as an indirect measure of young population (Minniti et al., 2005; Glaeser and Kerr, 2009; Fairlie and Robb, 2008; Doms et al., 2010) are not significant and negative. This is not puzzling, as lower opportunity costs and low welfare level will result in a necessity-driven entrepreneurship (Korosteleva and Mickiewicz, 2010, Estrin et. al. 2009) which does not help growth, rather illuminating the fact of weak economic endowments.

As an additional variable to account for systematic spatial patterns in growth "peripherality" dummy tested these explanations and further illuminated the drivers of differential urban economic growth rates. The conclusion is that cities in the FSU are not any more depended on Moscow as a former centre of venture and human capital in FSU. Cities behave like city-states confined by national boundaries. This implies that differences in GDP per capita across fSU cities not only reflect differences in productivity but also differences in welfare.

Additionally, to reflect spatial adjustment processes the values of latitude and longitude, are positive, but only latitude is significant. These variables control for city-location, but along with Hansen J-statistics test and residual autocorrelation tests resolve control for cross-sectional independence in the model.

6. Conclusions

The conclusion is, therefore, that by including variables reflecting theoretically relevant spatial and dynamic adjustment mechanisms, choosing System GMM approach it is possible effectively to eliminate problems of spatial dependence, endogeneity and control for time and city-level effects. If theoretically appropriate variables reflecting spatial processes are included and instruments are well specified, spatial dependence is eliminated.

The empirical evidence supports the main definitions:

1. Local differences in physical and human capital, innovative and high-added value (genuine) entrepreneurial activity are important factors in explaining differential rates of

urban economic growth. This provides support for the theoretical works on the significant role of human capital and innovation in regional economic growth.

2. Former Soviet Union integration hasn't had a significant impact in accelerating growth in cities gaining most in terms of economic potential—mainly 'core' cities—but at the same time, offsetting for all other factors including these systematic impacts of peripheral cities.

The results partially support the conclusion of Cheshire and Magrini (2006, 2009) that an assumption of 'full spatial equilibrium' is not appropriate in Europe holding true for the fSU with its geographically immobile population.

3. Policies such as small-scale privatisation, banking sector reform, governance and enterprise restructuring, economic freedom and government arrangements for cities systematically influence their urban economic growth performance. Where there is a jurisdiction approximating the boundaries of an economically self-contained city, economic growth should be stronger, other factors equal.

4. Agglomeration economies affect local growth. This is interesting in the debate about the agglomeration economies as a main source of growth, since it implies that it is not population density per se in case of FSU cities, but opportunities for productive interactions: innovative and genuine entrepreneurial start-up, city location, plant's cooperative networks with each other, suppliers, access to bigger market.

While density theoretically should rise with city size, which does not always hold for the FSU cities it is a negative since it reduces the propensity for productive interactions other things equal by raising congestion and the price of urban space as proved by Cheshire and Magrini (2009).

5. In explaining difference in rates of urban economic growth and in choosing where to live we turn to highly skilled workers, level of poverty, opportunity cost of doing business and employment opportunities (unemployment rates) and business freedom – one of the main messages for policy makers.

Policies that foster local economic growth are not conceived as being just initiated to capital investment, supporting innovative business nor even, necessarily, with promoting local growth through policies (e.g. market liberalisation, freedom for doing business, etc). Policies may start from less bureaucratic local councils, tighter environmental constraints or subsidising business with the main focus on activities that government at an urban level can effectively influence, such as innovative business start-up policies, supply of skills (innovative training, Investor in People, advanced knowledge management techniques, etc.) and cooperation with universities and research institutions, demography issues and government spending. It is plausible to think of the findings on the institutional policy variables and agglomeration economies as identifying a 'policy level'.

Notes

[1] "CIS Urban Audit is the matched dataset collected through Offices of National Statistics in Russia, Ukraine, Belarus, Moldova, Georgia, Armenia and Azerbaijan sponsored by the Global Development Network jointly with its regional partners: The Economics Education and Research Consortium (EERC), Kyiv School of Economics (KSE) and CERGE-EI University as a part of a larger project "Cities: An Analysis of the Post-Communist Experience" during 2009-2010. 'CIS Urban Audit' data has been continuously updated and expanded and the analysis reported here uses the most recent version of October 2010. More details about the data are given in Section 3.

[2] For recent surveys of the b-convergence literature see Durlauf and Quah (1999), Magrini (2004).

[3] An exception from this is The Eurasian Economic Community (EAEC or EurAsEC) originated from the Customs union between Belarus, Russia and Kazakhstan on 29 March 1996.

[4] For more detailed information please see http://univer.in and http://univ.cc

[5] For more detailed information please see http://www.holidaysexguide.com

[6] For more detailed information please see http://www.ebrd.com/pages/research/analysis.shtml

[7] For more detailed information please see http://www.heritage.org/Index/

[8] The EU's Nomenclature des Unite´s Territoriales Statistiques (NUTS) regions are a nesting set, which tries to reconcile different national territorial divisions. In this study NUTS3 city level data is used.

[9] The size of city by number of residents included in the sample varies from less than 50, 000 such as Gori in Georgia, Naryan-Mar and Nazran in Russia to 10,500,000 people in Moscow, Russia.

[10] Please see http://www.urbanaudit.org/help.aspx for further details.

[11] To illustrate this process of estimation the technique introduced by Cheshire and Magrini (2009) was implemented with the example of Samara (same for all cities): the urban population of our Samara region / oblast was divided between seven NUTS 3 municipalities for which National Statistics GDP per capita data was available. In 2008 the urban population of Samara core-city was 1,136,221 and Samara's oblast urban population was 2,553,307, hence proportionate distribution of Samara's population between these urban NUTS regions population was 0.4450. These proportions were applied as weights to each of the seven NUTS3 regions' GDP per capita to estimate the value of GDP per capita for the core-city of Samara. The city data for any year were estimated using population weights calculated from national population censuses or registration data for the same period in time to that for which the regions' / oblasts' data (e.g. GDP per capita) related.

[12] Please see Roodman (2006) for more extensive discussion on System GMM estimator.

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Appendix A

Table A1: Top 10 cities by GDP per capita, USD current prices (1995-2006)

City/ Country	1996	City/ Country	2008	Rate of change 2008/1996, %
Arkhangelsk, Russia	2870	Arkhangelsk, Russia	11226	391.1
Kazan, Russia	3042	Kazan, Russia	11197	368.0
Lipetsk, Russia	2596	Brest, Belarus	10269	---
Moscow, Russia	4331	Moscow, Russia	33891	782.5
Murmansk, Russia	3205	Murmansk, Russia	11672	364.1
Perm, Russia	2625	Kiev, Ukraine	11411	---
Petrozavodsk, Russia	2668	Belgorod, Russia	10237	---
Saint Petersburg, Russia	2583	Hrodna, Belarus	10183	---
Yaroslavl, Russia	2540	Naryan-Mar, Russia	101299	---
Vologda, Russia	3485	Vologda, Russia	12088	346.8

Table A2: Bottom 10 cities by GDP per capita, USD current prices (1995-2006)

City/ Country	1996	City/ Country	2008	Rate of change 2008/1996, %
Cherson, Ukraine	826	Cherson, Ukraine	2512	304.1
Elista, Russia	846	Chernigov, Ukraine	1959	---
Gyumri, Armenia	436	Chernovtsy, Ukraine	1986	---
Kishinev, Moldova	884	Grozny, Russia	2560	---
Makhachkala, Russia	658	Kharkov, Ukraine	2355	---
Nalchik, Russia	623	Nalchik, Russia	1774	284.7
Nazran, Russia	482	Nazran, Russia	1487	308.5
Vladikavkaz, Russia	936	Kirovograd, Ukraine	2668	---
Yerevan, Armenia	424	Nikolayev, Ukraine	1824	---
Vanadzor Armenia	435	Ternopil, Ukraine	2661	---

Table A3: Descriptive statistics and definitions of the variables

Variable	Definition	Mean	St. dev.	Min	Max	Obs.
gdppr	GDP per capita, USD	2884.09	5643.41	214.88	101299.20	1157
capital_ investmt_gdp	Ratio of capital investment to GDP	0.23	0.16	0.01	1.51	987
SME	Number of small businesses registered	9604.41	22056.23	60.00	231800.00	1160
unemploym	Unemployment rate, %	3.45	4.08	0.10	30.20	1040
poor	Prop. of residents below minimum consumption budget, %	36.75	22.15	0.8	96.0	1168
university	Number of universities in city	7.33	13.26	1.00	103.00	1372
education	Prop. of students at level 1 to 6 ISCED in total resident population, %	14.40	6.32	1.50	44.00	1042
resident	Number of residents in city	654358.70	1142262.00	24431	10500000	1307
expenditure_ gdp	Ratio of expenditure of municipality to city GDP	0.59	0.47	0.03	5.73	1077
capitalcity	1= capital-city, 0 otherwise	0.07	0.26	0.00	1.00	1372
popdensity	Population density in the city per sq. km	2708.45	1470.94	337.70	9721.55	1307
airpollution	Air pollution from stationary sources, tons per resident	0.29	0.55	0.00	5.46	1148
latitude	Latitude	50.70	6.20	40.10	68.58	1372
longitude	Longitude	38.12	8.34	20.31	56.19	1372
young_person index	Based on the proportion of full-time students in a total population adjusted and rescaled with the minimum of 0 for 0.5% and maximum of 1 for 44%	0.33	0.14	0.03	1.00	1042
peripherality	1=>1000 km from Red square, Moscow, 0 otherwise Ratio of tax income to GDP	0.50	0.50	0	1	1372
hfbusfree	Index of economic freedom, 0-100, 0 – economic repression; 100 – total freedom of business.	55.82	6.62	40.00	85.00	1274
banking	Banking reform and interest rate liberalisation from 4- to 4+	2.17	0.41	1.00	3.00	1372
compet_pol	Competition policy; from minus 3 – no competition to 3+ strong competition	2.21	0.24	1.00	2.33	1372
small_pri	Small-scale privatisation; from minus 4 to 4+	3.72	0.56	1.00	4.00	1372
large_pri	Large -scale privatisation; from minus 4 to 3+	2.92	0.60	1.00	4.00	1372
price_lib	Price liberalisation; from minus 4 to 4+	3.85	0.37	2.33	4.33	1372
gov_restr	Governance and enterprise restructuring; from minus 4 to 4+	2.05	0.30	1.00	2.33	1372

Source: CIS Urban Audit 1995-2008. Project "Cities: An Analysis of the Post-Communist Experience" supported by Economics Education and Research Consortium (EERC), Kyiv School of Economics (KSE) and CERGE-EI University and Global Development Network.

Table A4: Correlation matrix for CIS urban audit and EBRD Economic and Research data variables

	lngdppr	lncapital_ invest_gdp	unemploym	Lnresident	university	lnpoor	capitalcity	lnexpenditure _gdp	lnpopdensity	airpolution_ res	latitude	longitude	young_person	peripherality	lnSME_wage	hfbusfree	banking	compet_pol	small_pri	large_pri	price_lib
lncapital_invest_gdp	0.0557	1																			
unemploym	-0.2473	-0.1234	1																		
lnresident	0.1433	-0.0145	-0.3272	1																	
university	0.2263	0.0063	-0.1541	0.6822	1																
lnpoor	-0.6257	-0.0826	0.0311	-0.2006	-0.1547	1															
capitalcity	0.0317	0.0297	0.1761	0.4508	0.5592	-0.0668	1														
lnexpenditure_gdp	-0.2699	0.1924	-0.163	-0.2997	-0.3861	0.0925	-0.3782	1													
lnpopdensity	0.0382	-0.082	0.1099	0.2614	0.2896	0.0737	0.1921	-0.3473	1												
airpolution_res	0.3688	-0.1225	-0.0966	-0.1685	-0.1154	-0.2235	-0.1165	-0.0714	-0.1255	1											
latitude	0.4391	-0.1494	-0.395	0.1732	0.1175	-0.3668	-0.1459	-0.0571	0.0406	0.3892	1										
longitude	-0.0224	-0.0758	0.2078	-0.0069	-0.0936	-0.2102	-0.0209	0.1198	-0.4251	0.1627	-0.0395	1									
young_person	-0.2687	-0.045	0.6961	-0.3048	-0.1857	0.1075	0.2069	-0.1175	-0.0315	-0.0247	-0.2954	0.2486	1								
peripherality	-0.1451	0.0979	0.3063	-0.3137	-0.2132	0.1422	0.0393	0.0896	-0.3206	0.076	-0.4302	0.1151	0.2559	1							
lnSME_wage	0.5512	0.1101	-0.2218	0.7181	0.5985	-0.5416	0.3134	-0.3187	0.1812	0.0555	0.2283	0.0279	-0.28	-0.1929	1						
hfbusfree	-0.0031	-0.1633	0.3018	-0.0818	-0.039	-0.1277	0.073	0.0247	-0.0729	0.0199	-0.0569	0.2458	0.2054	0.0963	0.0291	1					
banking	0.4067	0.1045	0.1336	-0.0783	-0.0064	-0.1182	0.0198	-0.0664	-0.0267	0.0023	-0.213	0.0423	-0.0232	0.0989	0.2085	-0.0404	1				
compet_pol	0.2673	0.0434	-0.4842	0.1485	0.065	-0.0384	-0.2058	0.147	-0.2067	0.0887	0.3149	-0.0565	-0.3858	-0.202	0.2373	-0.1274	0.1455	1			
small_pri	0.0803	-0.2391	0.0021	-0.0332	-0.0124	-0.0397	-0.1503	0.1163	-0.3243	0.0784	0.0782	0.4187	-0.0145	0.014	0.2284	0.1503	0.4451	0.4343	1		
large_pri	-0.1493	-0.314	0.1739	-0.1094	-0.0394	0.0702	-0.1323	0.0145	-0.266	0.0422	-0.0173	0.4486	0.1146	0.0755	0.0934	0.2331	0.3577	0.3198	0.8922	1	
price_lib	-0.0761	-0.0935	0.2762	-0.1431	-0.0315	0.1564	-0.0021	-0.1661	-0.1047	0.0036	-0.307	0.2165	0.1506	0.1665	-0.0015	0.2008	0.5187	0.0892	0.5052	0.5773	1
gov_restr	0.1038	-0.1678	0.062	-0.0594	-0.0151	-0.1116	-0.1267	0.1553	-0.2681	0.0637	-0.0184	0.3783	-0.0433	0.0492	0.1479	0.2613	0.4809	0.2895	0.6673	0.7194	0.7633

Note: Level of statistical significance is not presented to safe space. Source: CIS Urban Audit 1995-2008; All Variables are taken in logarithms, excluding those available in per cent.

Table A5: Urban growth model estimation results: System GMM

Estimation of the model Dependent variable y_{it} (GDP per capita in logarithms)							
Dependent variable y_{it}	(1)	(2)	(3)	(4)	(5)	(6)	(7)
y_{it-1}	0.62*** (0.06)	0.55*** (0.11)	0.54*** (0.10)	0.62*** (0.08)	0.53*** (0.10)	0.52*** (0.10)	0.62*** (0.11)
lncapital_investm_gdp	0.01 (0.04)	0.01 (0.05)	-0.04 (0.05)	0.05 (0.05)	0.00 (0.05)	0.06* (0.06)	0.08* (0.04)
unemploym	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.01 (0.01)
university	0.01** (0.00)	0.01*** (0.00)	0.01*** (0.00)	0.01** (0.00)	0.01* (0.00)	0.01* (0.00)	0.01* (0.00)
lnexpenditure_gdp	-0.20*** (0.07)	-0.30*** (0.09)	-0.20** (0.10)	-0.21** (0.08)	-0.23*** (0.09)	-0.20*** (0.08)	-0.17*** (0.06)
lnpopdensity	0.01 (0.05)	-0.05 (0.13)	-0.01 (0.06)	0.01 (0.04)	0.01 (0.05)	-0.01 (0.05)	-0.04 (0.04)
airpolution_res	0.09** (0.04)	0.07** (0.05)	0.11** (0.05)	0.11*** (0.04)	0.11*** (0.04)	0.08*** (0.03)	0.13** (0.05)
latitude	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01** (0.00)	0.01** (0.00)	0.01*** (0.00)
longitude	0.00 (0.00)	0.01* (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.01 (0.00)	0.00 (0.00)
LnSME	-0.13* (0.07)		-0.12* (0.07)	-0.11* (0.06)	-0.30** (0.14)	-0.33** (0.16)	
lnresident		-0.31*** (0.11)					
lnpoor	-0.17*** (0.07)	-0.18** (0.08)	-0.20*** (0.06)	-0.13** (0.06)			-0.09* (0.06)
capitalcity	-0.04 (0.11)		-0.06 (0.10)	-0.02 (0.09)	-0.05 (0.10)	-0.11 (0.13)	0.13 (0.17)
hfbusfree			0.01** (0.00)				0.01* (0.00)
banking			0.25* (0.15)				0.58*** (0.19)
compet_pol			-0.12 (0.08)				
small_pri			0.51*** (0.19)				0.41*** (0.10)
large_pri				-0.05 (0.07)	-0.01 (0.07)		
price_lib				-0.07 (0.26)	0.08 (0.21)		0.11 (0.21)
gov_restr				0.39* (0.21)	0.22* (0.21)		0.61*** (0.23)
lnSME_wage					0.25* (0.13)	0.27** (0.14)	
young_person							-0.15 (0.15)
peripherality							0.03 (0.04)
constant	0.93 (0.64)	1.22 (0.97)	4.19*** (1.46)	1.48 (1.25)	4.83*** (1.71)	4.28*** (1.47)	6.08*** (1.58)
Number of obs.	726	771	726	726	729	729	738
F-statistics	875.5	644.1	1285.8	1170.7	1101.1	998.6	1619.5
Pr>z AR(2)	0.31	0.53	0.51	0.18	0.45	0.73	0.34
Hansen test	0.22	0.070	0.25	0.13	0.32	0.39	0.19

Dif. Hansen test	0.24	0.68	0.11	0.34	0.93	0.44	0.19
Number of instruments	76	74	76	76	88	88	68

Notes: Year and country dummies are not shown to save space. *** - significant at 0.01; ** - significant at 0.05; * - significant at 0.1 Standard errors are in parentheses robust to heteroskedasticity. The figures reported for the Hansen test and Difference Hansen test are the p-values for the null hypothesis, valid specification. Instruments for first differences equation GMM-type [L(2/.).(LnSME lngdppr unemploym lncapital_investm_gdp airpolution_res] collapsed taken in logarithms. Instruments for levels equation: GMM-type [DL.(lnSME unemploym lngdppr lncapital_investm_gdp airpolution_res) collapsed and all other regressors, including time controls, used as standard instruments here. Note: the autocorrelation test show that the residuals are an AR(1) process which is what is expected. The test statistic for second-order serial correlation based on residuals from the first-difference equation.

Source: Authors' calculations based on CIS Urban Audit dataset 1995-2008.