Institutions, reform policies and productivity growth in agriculture: evidence from former communist countries

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Abstract

There are important differences among former communist countries in performance of their agricultural sectors that are commonly attributed to variation in inherent institutions and reform policy choices. In this paper the link between institutions, reforms and (labour) productivity growth in agriculture is analysed within an augmented neo-classical growth model framework derived from a production function. For the empirical analysis panel data over the transition period (1990–2001) were used that cover 15 former communist countries, applying a GMM-IV estimator. Estimation results strongly support the view that the shift to individual land use, measuring farm restructuring, as well as the overall economic reforms, supported by democratic institutions, have positively contributed to the (labour) productivity growth in former communist countries' agriculture.

Additional keywords: Central and Eastern Europe, individual farming, transition

Introduction

This paper examines the factors behind the differences among 15 former communist countries in performance of their agricultural sectors.[1] Various studies have shown that the distortions imposed in the past by the planned economy, with respect to type of prevailing institutions, ownership, and management of land have weighed heavily during the first decade of transition [see Rozelle & Swinnen (2004) for an overview of relevant studies]. Policies to eliminate these distortions have been implemented at a varying pace, often because of opposition by vested interests and groups fearing the loss of employment and access to subsidized resources. This has resulted in substantial differences among countries in output and productivity growth.

The progress in agricultural reform has been strongly associated with progress in general economic reform (Anon., 2002). Such progress has in turn been closely

Table 1. Indicators of reform, farm restructuring and agricultural performance over the period 1990–2001 for 15 former communist countries.

Region	Country	Performance indicator[1]		Farm restructuring indicator			Reform indicator		
		GAO^w [2]	GAO [2]	ITAL[2] pre-reform	ITAL 2000	Transfer-ability[3]	WB ECA [2]	Procedure[4]	EBRD [2]
Central Europe	Czech Rep.	171	78	1	26	L, BS	9.2	R	3.58
	Hungary	238	77	13	51	L, BS	9.2	R	3.75
	Poland	91	92	76	84	L, BS	8.0	I	3.58
	Slovakia	132	66	2	9	L, BS	8.2	R	3.42
Balkans	Albania	110 [5]	116 [5]	3	90 [5]	L, BS	7.6	DP	2.75
	Bulgaria	62 [6]	67 [6]	14	56 [6]	L, BS	8.0	R	3.04
	Romania	79	91	14	85	L, BS	7.4	R	2.92
	Slovenia	113	118	83	94	L, BS	9.2	I	3.29
Baltic States	Estonia	135	49	4	61	L, BS	9.0	R	3.54
	Latvia	66	39	4	89	L, BS	9.0	R	3.17
	Lithuania	76	69	9	87	L, BS	8.0	R	3.33
Commonwealth of Independent States	Belarus	83	59	7	14	URNT, BSP	1.8	DS	1.63
	Kazakhstan	72 [6]	56 [6]	0	24 [5]	URT, BSP	5.8	DS	2.79
	Russia	69	64	2	13 [5]	L, BSP	5.8	DS	2.63
	Ukraine	58	58	6	18 [5]	L, BSP	6.0	DS	2.58

[1] Cumulative indices in 2001 (1990 = 100).

[2] GAO^w = gross agricultural output per worker; GAO = gross agricultural output; ITAL = share of total agricultural land used for individual farms; WB ECA = progress index of land reform in 2001; EBRD = progress index of general economic reform in 2001.

[3] L, BS = leasing; buy-and-sell; URNT, BSP = user rights non-transferable, buy-and-sell of private plots problematic; URT, BSP =user rights transferable, buy-and-sell of private plots problematic; L, BSP = leasing, buy-and-sell problematic.

[4] Dominant form. R = restitution; I = individual pre-1990; DP = distribution of plots; DS = distribution of shares.

[5] Data for 1998.

[6] Data for 1999.

Sources: EBRD, FAO, ILO, World Bank and national statistics offices.

associated with more democratic and competitive political systems and institutions. As a result, the more successful agricultural reformers have been the Central European countries (CEC). By contrast, in many of the Commonwealth of Independent States (CIS) major institutional and policy hurdles to improving the performance of the sector have long remained. There is evidence suggesting that improving the performance of the agricultural sector requires adoption of policies that can boost productivity through restructuring and investment (Lerman *et al.*, 2004). But for that to happen, greater clarity concerning title to land and the facilitation of a better functioning land and inputs market are required. The reforms most relevant to agriculture have included price and trade liberalization, land reform, farm restructuring and individualization of agricultural land use, privatization of input supply and agro-processing, and changes in rural finance.

Table 1 summarizes indicators of progress in reforms among 15 former communist countries. It is evident that progress has varied widely but that a number of patterns emerge. Progress in general economic reform and progress in agricultural reform are highly correlated. Consequently, the more advanced reformers are mostly found among the CEC and the Baltic States. In the CIS, general economic reform, including price liberalization has proceeded more slowly. The differences in implementation across the range of reforms have been characteristic of the intermediate and late reformers. For example, in Belarus, Kazakhstan, Russia and Ukraine implementation of land reform and institutional change has lagged behind.

Table 1 also shows that there have been major differences among the 15 countries in the methods by which land has changed ownership. Restitution of farmland to former owners has been the most common land reform process in the CEC, Balkans, and Baltic States except for Poland, Albania and Slovenia.[2] Typically, in most countries the reform laws have specified that land had to be restituted to former owners, using historical boundaries, if possible. If not, former owners have been entitled to a plot of land of comparable size and quality. Most CIS countries, including Russia and Ukraine, have distributed collective and state farmland equally among collective farm members or state farm employees in the form of paper shares or certificates.[3] In Belarus and Kazakhstan, however, only private ownership of household plots has been permitted. Physical distribution of farmland to farm workers or rural households on an equal per capita basis occurred in Albania and partly in Hungary and Romania (Lerman *et al.*, 2004). This variation in the features of land reform can be largely attributed to initial conditions and institutional specificities, such as the length of time since the land was nationalized and the ethnicity and equality of land ownership before collectivization.

The tradability of land or ability to transfer land has also varied substantially. In the countries with advanced land reform, rights to buy and sell, as well as leasing, have been universally implemented. Nevertheless, there remains – even within this group – significant variation in the share of land held by individuals. The break-up of collective farms into individual farms has taken place in very different ways and resulted in a diverse picture within groups of countries that are otherwise homogeneous with respect to success in the transition process. In Albania, for example, there was a complete break-up of the collective farms, whereas in Kazakhstan and Slovakia the share of land used by individual farms remained small. At present, the former communist countries

commonly have a mix of farm organizations, such as private co-operative farms, joint-stock companies, family farms and part-time farmers (e.g., Rizov, 2005a).

Despite the diverse outcomes there has been a relatively uniform strategy of agricultural transition aimed to improve efficiency and productivity by replacing the institutional and organizational features of the command economy with attributes borrowed from the practice of market economies (Lerman, 1999). The ideal transition agenda formulated in the early 1990s – mostly on economic grounds – envisaged a shift from collective to more efficient individualized land use as the ultimate goal. Individual land use was expected to allow farmers, once established as independent entities, to engage in land-market transactions and optimize the size of the holdings given their managerial skills and availability of resources (e.g., Deininger, 1995; Lerman, 1998; Rizov, 2003). This process was expected to increase efficiency and productivity, and ultimately result in growth of incomes. Thus one could hypothesize – given necessary economic reform being implemented – that individualization of land use would positively influence agricultural productivity because of the higher efficiency of the individual family farm organization. Besides, individualization could also have an indirect effect on agricultural productivity growth, resulting from the more efficient reallocation of resources among farm organizations.

In this paper this hypothesis is empirically tested within a neo-classical growth model framework following Rizov (2005b). This approach avoids criticisms on the grounds of lack of theoretical and objective criteria for including various explanatory variables and controls for unobserved country-specific effects and endogeneity of the reform variables.[4] The present analysis is an extension of Rizov (2005b), explicitly discussing the links between inherent institutions and reform policy choices. Furthermore, additional policy variables are used in the econometric analysis. The estimation results are robust to various timing assumptions and support the view that the shift to individual land use has positively contributed to the (labour) productivity growth in the agricultural sectors of former communist countries. It is also concluded that the effect of initial conditions and institutions manifests through the impacts of individualized land use and general economic reforms. So the effect of inherent institutions on agricultural (labour) productivity growth is only indirect.

Institutions and agricultural reform policies

In this chapter the relationships between inherent institutions and the evolution of agricultural reform policies is investigated.[5] It has been argued by several authors (e.g., Lerman *et al.*, 2004; Rizov, 2005b) that individualization of agricultural production has had significant impact on productivity growth. Clearly, at the heart of agricultural reform and farm restructuring is the issue of land ownership and land use. The critical policy decision has been whether to pursue restitution of land to previous owners, or distribution to collective farm workers. This policy choice has in part been driven by institutional factors such as the history of private land ownership, concentration of ownership prior to collectivization, and the number of years under communism. Private land ownership was a well-established institution in

the CEC and Balkans, and legal ownership rights remained in force even during the Communist period. For these countries the question was not whether to restitute land to legal owners, but how, since the political cost of not restituting land and property was higher than the cost involved in breaking up the co-operative farms (Swinnen, 1999). In countries where land ownership before collectivization was highly unequal, the choice involved was deciding what value should be attached to considerations of historical justice as against current equity. Moreover, privatization – either through straight restitution, distribution, or a combination of the two – could be managed in such a way to rebalance land holdings among different social groups, i.e., foreigners as against nationals or members of a dominant ethnic group as against a minority. Finally, in countries where over several generations communist attitudes towards the land had taken firmer root, the demand for private land ownership was weaker, and this contributed to the choice of share distribution or limited use rights rather than distribution of land plots.

Here we argue that the choices of reform policies were predetermined by inherent institutions. Consequently, the choices about the way in which the land reform was to be implemented in the early stages of transition have generated their own dynamics. Privatization through land share issues – as in Kazakhstan, Russia, and Ukraine – has tended to strengthen vested interest groups opposed to further land reform. Uncertainties over title and the high transaction costs associated with starting independent farms have reduced incentives for rural entrepreneurs to leave the incompletely privatized collective farms. In the absence of enforceable ownership rights and a law on mortgages, credit has been largely unavailable to independent farmers, which in turn has fed a preference for maintaining under-priced access to the inputs, technology and social services provided by the collective farm system. As a result, farm restructuring and individualization of land use have developed slowly in countries that issued land shares. For example, in Belarus, Russia and Ukraine, countries that pursued allocation by land (paper) shares, the proportion of land in individual farms has been less than 20%. In Albania and Romania, which pursued allocation of land by physical plots, the share of land in individual farms between 1989 and 2000 increased to almost 90% (Table 1).

Resistance to reform can be traced to a variety of factors. In the CIS countries, for example, there is evidence that some regional authorities not only resisted reforms because this would have reduced the level of subsidy to the sector, they also resisted the restructuring of former collectives as they comprised a significant part of their regional power base. As such, regional authorities used the redistribution of subsidies and the provision of soft budget constraints at collective farms to shore up support, whereas agricultural producers preferred the *status quo* for fear of jeopardizing their access to subsidies.[6] Indeed, defensive motives on the part of incumbents have been an important part of the story. With few outside opportunities and uncertainty about future access to land and associated inputs, collective-farm workers and managers have generally remained passive.

Although such obstacles to agricultural reform have proven formidable in some countries, they have not been insurmountable. The consequent progress in reform in Bulgaria, Romania, Kazakhstan, Russia and Ukraine illustrates how shifts in governing

coalitions to more reform-oriented parties, fiscal crises, as well as external pressure, can affect policy. Thus, an acute financial and fiscal crisis in Bulgaria in 1996 led to loss of power by the successor communist party and to the advent of a new government that was able to implement wide-ranging agricultural reforms. In 1998, faced with mounting problems in the farming sector, Kazakhstan saw a significant policy shift in farm restructuring. A combination of repeated write-offs of public sector debts, the widespread use of barter and a severe drought had brought Kazakhstan's farming sector to the brink of collapse. The government launched a new programme of farm restructuring based on recognition of the need for extensive application of bankruptcy law. In Russia, the combination of strong presidential leadership and a shift in the balance of power in the Russian State Duma has overcome political opposition to the 2002 Land Law. This new legislation significantly strengthened the right to ownership of agricultural land and paved the way for the emergence of a land market. Romania has also made dramatic progress in agricultural reform since 1998, particularly in improving the public institutions that support the agricultural sector and in privatizing state-owned agro-processing companies. These reforms have, in part, been set in motion by the need to fulfil requirements set out in the EU's *acquis communautaire* in order to qualify for second-round accession. This external factor has also been important for some of the advanced reformers in Central and Eastern Europe who have managed to press through reforms despite the persistence of a conservative rural base.

Comparative politics studies of the former communist countries demonstrate a positive correlation between democratic systems of governance reflecting the presence of progressive institutions, and overall economic reform involving stabilization, structural and institutional reform (De Soto, 2000; Olson, 2000). This can be attributed to the fact that a greater degree of political openness and a larger number of checks on government power by representative civil society organizations characterize stable democratic systems. Apart from the conduct of regular elections and political competition, stable democracies also tend to promote the rule of law, free speech and other civil and political rights. This makes them more likely to be resistant to capture by special (individual or group) interests that seek to maximize their private benefits. Empirical research suggests that stable democracies are also better at protecting private property rights and enforcing contracts, without which farmers face reduced incentives to invest in their land and improve agricultural productivity (Conning & Robinson, 2001).

Analysis of Spearman correlations between our reform indicators in Table 1 and indicators of democratic institutions confirm the pattern discussed above. There is a strong positive correlation between the degree of reform success in both the agricultural sector and the overall economy and the five-year (1997–2001) average measure of democracy taken from the Freedom House database.[7] Conversely, the worst performing transition countries have been those with low measures of democracy. However, it is also important to note (Table 1) that measures of overall reform – such as the EBRD indicators – are strongly correlated with measures of reform in agriculture. As such, there is a clear positive association between democratic institutions and reform in general. The relationships are confirmed by an analysis of the correlations, using the Freedom House five-year average political governance indicator. It was found that broad-based multi-party coalitions have generally been the

more successful ones in implementing and sustaining reform in both the agricultural sector and the overall economy. Interestingly, as asserted by Mainwaring & Shugart (1997), this goes against much of the conventional wisdom in the literature, holding that successful reform has normally been associated with strong executives insulated from the constraints of political competition and from the compromises that are often required to sustain coalition governments.[8]

Methodology and data

The link between institutions, reforms and (labour) productivity in agriculture was econometrically investigated, focusing on the experiences of the 15 former communist countries listed in Table 1. The main data sources were the national statistics offices, the Food and Agriculture Organization (FAO), the Organisation for Economic Co-operation and Development (OECD), the European Bank for Reconstruction and Development (EBRD), and the World Bank. Comparable agricultural sector annual data were available over the period 1990–2001. However, no data were available for each year for all countries, making the panel unbalanced. Clearly, availability of comparable data limits the set of countries and variables used in our econometric analysis, even though we used the best aggregate agricultural sector data available.

The productivity growth in agriculture was measured in terms of growth of the gross agricultural output per worker, GAO^w. According to Solow's neo-classical model it is more appropriate to use per worker than per capita variables, because the model is based on a production function and not every person from the country's population contributes to production (Solow, 1956). Contrary to previous empirical studies that focused on average changes in the early years of transition (e.g., Lerman, 2000; Macours & Swinnen, 2000a, b), we considered year-to-year changes in GAO^w. By calculating the growth rates in agricultural production per worker for each country at a given point in time it was possible to demonstrate the high heterogeneity among countries (Table 1).

In the Solow model, growth in output per worker depends on the actual output per worker, $q(t)$, the initial output per worker, $q(0)$, the initial level of technology, $A(0)$, the rate of technological progress, a, the savings/investment rate, s, the growth rate of the labour force, l, the depreciation rate, d, the share of capital in output, k, and the rate of convergence to steady state, Cl, according to the following equation:

$$\ln q(t) - \ln q(0) = -(1 - e^{-Ct})\ln q(0) + (1 - e^{-Ct})\ln A(0) + at \tag{1}$$

$$+ (1 - e^{-Ct})\frac{k}{1-k}\ln(s) - (1 - e^{-Ct})\frac{k}{1-k}\ln(l + a + d).$$

The model predicts that a high savings/investment rate will affect growth positively, whereas a high labour force growth corrected for the rate of technological progress and the rate of depreciation will have a negative effect on growth.

GAO^w was measured in Purchasing Power Parity adjusted US dollars and was calculated by using the 1990 level of agricultural Gross Domestic Product obtained

from the EBRD database and the FAO annual output index over the period 1990–2001. Due to the lack of any better measure, the savings–investment rate, s, was calculated as the ratio of output and input agriculture-specific prices. This ratio is a good proxy for the gross margin that is closely related to the availability of internal funds. Under conditions of imperfect financial markets and credit constraints the sensitivity of investment to internal financing has been shown to be high (see e.g., Fazzari *et al.*, 1988). The annual data for agricultural labour force are from the countries' national statistics offices and the International Labour Organization (ILO), the latter being a more reliable source of agricultural employment data than FAO. The average labour force growth rate, l, was computed as the difference between the natural logarithms of agricultural labour force at the end and beginning of each year. Like in the literature (e.g., Mankiw *et al.*, 1992; Islam, 1995; Caselli *et al.*, 1996), the sum of the natural logarithm of labour force growth rate and 0.05 (for constant technological progress and depreciation rate) was calculated as a proxy for $\ln(l + a + d)$.

The model was augmented with control variables that represent measures of general economic and agricultural reforms as well as the measure of individualization.[9] Progress in general economic reforms, REFORM, was measured as the average of a set of EBRD indicators including measures for price and trade liberalization, privatization, and enterprise restructuring, which capture the extensiveness of economic reforms in several dimensions.[10] The measures of agricultural reform, AGREFORM, were derived from the World Bank ECA indicators and from own calculations following the World Bank methodology and using data from national statistics offices. Five components make up the World Bank ECA index: (1) price and market liberalization, (2) land reform, (3) agro-processing industry restructuring, (4) rural finance development, and (5) institutional reform. The extent of farm restructuring was measured as the share of total agricultural land that is used by individual farms, INDIVID (ITAL in Table 1). Data from the countries' national statistics offices and Macours & Swinnen (2000a) were used. The values of all measures of reform-progress and farm restructuring were expressed in natural logarithms.

Possible estimation techniques for the model specified in Equation (1) are cross-section regressions using data averaged over long periods (e.g., Barro, 1991; Mankiw *et al.*, 1992; Sala-i-Martin, 1997) or a dynamic panel data approach (e.g., Islam, 1995; Caselli *et al.*, 1996). Single cross-section growth regressions have several disadvantages: (1) the time series are reduced to a single mean and not all available information is used, (2) it is very likely that single cross-section regressions suffer from omitted variable bias, and (3) one or more of the regressors may be endogenous. Within a dynamic panel data framework (e.g., Hansen, 1982; Arellano & Bond, 1991) it is possible to account for unobserved country-specific effects and allow for endogeneity of the regressors.[11] The panel data model takes the following form:

$$g_{it} = \alpha + \beta q_{it-1} + \gamma x_{it} + v_i + \varepsilon_{it} \qquad (2)$$

where g_{it} denotes the growth rate of GAO^w for country i ($i = 1,...,I$) at time t ($t = 2,...,T$), q_{it-1} is the logarithm of the level of GAO^w at the beginning of each period, and x_{it} is a vector of regressors such as investment rate and employment growth, following the

Solow model. Furthermore, as in most empirical studies that are based on more general models a range of measures of reform was included. The time-invariant *unobserved country-specific effects* and the random error term are denoted v_{it} and ε_{it}, respectively.

Using Equation (2) the dynamic panel data model was rewritten as:

$$q_{it} - q_{it\text{-}1} = \alpha + \beta q_{it-1} + \gamma x_{it} + v_i + \varepsilon_{it}$$

which then becomes

$$q_{it} = \alpha + \beta^* q_{it-1} + \gamma x_{it} + v_i + \varepsilon_{it} \qquad (3)$$

where $\beta^* = (\beta + 1)$.

In estimating Equation (3) the issue of how to treat time-invariant country-specific characteristics such as initial conditions, inherent institutions, and type of land reform adopted, was explicitly addressed. If measured time-invariant country characteristics, w_i, are included in the analysis, Equation (3) becomes:

$$q_{it} = \alpha + \beta^* q_{it-1} + \gamma x_{it} + \delta w_i + v_i + \varepsilon_{it}$$

However, the measured country-specific characteristics, w_i, may be correlated with the unobserved country-specific effects, v_i, or the error term, ε_{it}. In order to address inconsistency problems due to (1) omitted unobserved time-invariant country effects (Hsiao, 1986), (2) small number of time periods, T (Nickell, 1981), or (3) correlations between regressors and v_i and/or ε_{it} the first-difference GMM-IV estimator was applied. Thus, Equation (3) was estimated without including the measured country-specific characteristics, w_i, i.e., $v_i^* = \delta w_i + v_i$ was substituted for v_i.[12]

In the first-difference equation, under standard assumptions, the instrument set consists of lags of the dependent variable as well as right-hand-side regressors. Values of q_{it} lagged two periods or more are valid instruments because q_{it-2} and earlier values are generally correlated with Δq_{it-1} but not with $\Delta \varepsilon_{it}$. If the regressors, x_{it}, are strictly exogenous ($E[x_{it}\varepsilon_{ip}] = 0$ for all p, t) then all past, present and future values of x_{it} are valid instruments in the first-difference equation, even if the x_{it} are correlated with v_i. However, it is likely that some of the regressors in our model, e.g., policies or policy outcomes (capital and labour reallocation rates as well as shares of individual farming), were not strictly exogenous. There may be a feedback mechanism where past shocks to productivity are correlated with current policies or outcomes. Following Arellano & Bond (1991) we then used values of the predetermined x_{it} lagged one period or more as valid instruments in the first-difference equation. If a regressor is endogenous we have to allow for correlation between the current value of this regressor and current shocks to productivity, as well as for feedback from past shocks to productivity. In that case, valid instruments in the first-difference equation are values of the endogenous x_{it} lagged two periods or more.

Estimation results

The results of GMM-IV estimations based on the neoclassical growth model have been summarized in Table 2. The estimated equations are log-linear so that the estimated coefficients of all explanatory variables can be interpreted as elasticities. The left-hand-side variable is the change in the logarithm of gross agricultural output per worker (GAO^w). All regressions included time dummies (not shown, just like the constant), which in all regressions were found to be jointly significant. There was no second-order serial correlation (the m_2-test) and the Sargan test did not reject the validity of instruments in all specifications.

First, a regression corresponding to the textbook Solow model was run [Table 2, column (1)]. All variables are statistically significant ($P < 0.01$) and have the expected signs. The negative regression coefficient on initial GAO^w – as in most published work – is interpreted as conditional convergence, where investment has a positive and growth of labour force a negative impact as suggested by the Solow model.[13] The implied rate of convergence to steady state (C) was about 7% per annum, which is quite high but not surprising for the case of economic transition. It appears that the most important determinant of growth in agricultural (labour) productivity is the reduction in excess labour, which is interpreted as an indicator of passive restructuring whereas active restructuring is defined as new investment (Coricelli & Djankov, 2001).

Next, regressions augmented with measures of progress in agricultural and general economic reforms and in individualization of agricultural production were run to assess the effects on productivity growth. In column (2) of Table 2 the results are presented of the Solow model augmented with a measure of general economic reforms (REFORM). The results of the base regression hold, as the coefficient of the reform variable is statistically significant ($P < 0.05$) and positive as expected. REFORM is a synthetic indicator of policy outcomes and reform policies adopted, measuring the advancement in general economic reforms. Like in other studies it is interpreted as an important condition for successful restructuring of the agricultural sector (Lerman, 2000; 2001; Macours & Swinnen, 2000a, b), recognizing that the impact of reforms is affected by policy choices and initial conditions.[14]

Individualization of agricultural production is an important indicator of restructuring agriculture. It is the major outcome of the agriculture-specific reform policies adopted. The importance of land reform policies lies with the fact that they have resulted in different magnitudes of the shift of land to individual farms (INDIVID). So by assessing the impact of individualization on (labour) productivity growth we provided an implicit evaluation of the success of land reform policies adopted. The results from augmenting the Solow model with INDIVID [Table 2, column (3)] show that individualization was important for (labour) productivity growth. With respect to both sign and magnitude, the regression coefficients for the base variables are as in previous model specifications, whereas the coefficient of the individualization variable is positive and statistically significant ($P < 0.01$). This result is important because we found a positive effect of individualization, using a dynamic model controlling investment and changes in the labour force, which were very important factors of the agricultural sector transformation during the period of analysis.

Table 2. GMM-IV regression coefficients [1] with standard errors [2] (in parentheses) of augmented Solow models of gross agricultural output per worker for 15 former communist countries (n = 102).

Variable	Dependent variable (GAO^w)				
	(1) Base model	(2) + REFORM	(3) + INDIVID	(4) + AGREFORM	(5) + (REFORM+INDIVID + AGREFORM)
ln (q_{t-1})	−0.0699 *** [3]	−0.0830 ***	−0.1180 ***	−0.1205 ***	−0.1515 ***
	(0.0157)	(0.0162)	(0.0182)	(0.0208)	(0.0274)
ln (s)	0.1159 ***	0.1587 ***	0.1514 ***	0.1520 ***	0.1576 **
	(0.0369)	(0.0357)	(0.0335)	(0.0339)	(0.0330)
ln ($l+a+d$)	−0.6957 ***	−0.6793 ***	−0.7236 ***	−0.7379 **	−0.7774 **
	(0.1339)	(0.1244)	(0.1201)	(0.1215)	(0.1256)
ln REFORM	–	0.0685 **	–	–	0.0660 *
		(0.0319)			(0.0334)
ln INDIVID	–	–	0.0599 ***	–	0.0475 **
			(0.0228)		(0.0220)
ln AGREFORM	–	–	–	0.0620 **	0.0551 ns
				(0.0306)	(0.0383)
- - - - - - - - - - -					
Tests [4]					
m_1	0.00	0.00	0.00	0.00	0.00
m_2	0.13	0.13	0.16	0.16	0.15
Sargan	0.88	0.96	0.90	0.91	0.90

[1] Coefficients represent elasticities.

[2] Standard errors are robust to general heteroskedasticity.

[3] Statistical significance. ns = not statistically significant; * = $P < 0.10$; ** = $P < 0.05$; *** = $P < 0.01$.

[4] *P*-values of the null hypothesis.

The results of the impact of agricultural reform (AGREFORM) on productivity growth [Table 2, column (4)] are similar to the results in column (2) where the effect of general economic reform was estimated. The levels of statistical significance of the effects are also similar. It was interesting, however, to assess whether AGREFORM had an independent impact on growth or whether it was purely a proxy for success in general economic reforms. So we tested for interdependence of effects in the following specification where all the measures of reform were included.[15]

In Table 2 [column (5)] the results from the Solow model specification augmented with both measures of reform (REFORM and AGREFORM) and INDIVID are presented. Again the results from the base specification were maintained and the impact of both REFORM and INDIVID was positive and statistically significant. It is noteworthy that the significance (at conventional levels) of AGREFORM disappeared suggesting that individualization of land use was the most important component of agricultural reforms. Furthermore, other agricultural reform components reflect the impact of general economic reform – a result in line with findings by Rizov (2005b). The rate of

convergence to steady state (*C*) more than doubled when both economic reforms and restructuring of farms through individualization had been implemented. This result is robust to alternative treatments of INDIVID as exogenous or endogenous.

Previous studies (Macours & Swinnen, 2000a, b; Falcetti *et al.*, 2002) have emphasized the importance of initial conditions in determining performance during transition. Their results show that the impact of initial conditions was stronger with respect to gross output whereas it was weak with respect to labour productivity. In a similar manner a test for the impact of country-specific initial conditions on productivity growth was conducted in a second (auxiliary) step of our analysis. Keeping in mind the caveats made earlier about possible inconsistency of second-step ordinary least squares (OLS) estimates we analysed relationships by using Spearman correlations. For our purpose this approach is sufficient to shed light on a relationship where the magnitude of correlation is of main interest, as causality is known *a priory*.

The country-specific characteristics were measured, using two synthetic indices that summarize a number of variables describing the inherent institutional and economic conditions in the former communist countries at the beginning of transition.[16] The first index can be interpreted as a measure of inherited distortions and institutional constraints. The second initial-conditions index reflects the degree of development of the economy. When correlating each index with either actual (labour) productivity growth or with the residuals of productivity growth estimates from the specification in Table 2 [column (5)] no statistically significant relationships ($r < 0.2$) were found. Correlations were also calculated with the Freedom House measures of democracy and governance as discussed earlier, instead of the initial condition indices. However, again no statistically significant relationships were found. This may suggest that the main impact of initial conditions and institutions that they embody is indirect and channelled via the choice of reform policies, as argued earlier.

Discussion and conclusions

This paper aimed to explain the heterogeneity in performance of agricultural sectors in 15 former communist countries. The analysis specifically focused on (labour) productivity growth as a measure of performance and on the importance of reform policy choices largely determined by inherent institutions. The main conclusion, i.e., that individualization of land use accompanied by a successful general (as opposed to agriculture-specific) economic reform positively affects (labour) productivity growth, is robust to alternative treatments with respect to endogeneity assumptions. The advantage of the approach is that the relationship was analysed within the well-defined theoretical framework of the augmented neoclassical growth model. Furthermore, when panel data and a GMM-IV first-difference estimator were used, consistent regression coefficient estimates were obtained by controlling for endogeneity and unobserved country-specific effects.

The results of the paper have a number of important policy implications. First, it was confirmed that agricultural policy aiming at individualization of agricultural land use leads to (labour) productivity growth. Second, reducing excess labour and

increasing investment, which are associated with passive and active restructuring, respectively, were found to be very important determinants of the (labour) productivity growth in former communist countries' agriculture. Third, general economic reforms positively affected (labour) productivity growth whereas differences in initial conditions did not have an important (direct) impact during the first ten years of transition. As discussed, initial conditions and particularly inherent institutions appeared to have significantly affected reform policy choices and outcomes. Furthermore, on the basis of our econometric analysis and the discussions throughout this paper, one can reasonably argue that success in agricultural transition is strongly correlated with advancement in general economic reform, which appeared to be a very important condition for (labour) productivity growth in agriculture.

The general results reported in this paper are in agreement with the findings of studies that used more recent and extended samples of aggregate data (e.g., Falcetti *et al.*, 2006) or micro-data generated from household and farm surveys (e.g., Swinnen & Vranken, 2006; Feng, 2008). Main finding of Falcetti *et al.* (2006) was the positive and significant link between progress in market-oriented reforms and cumulative growth in a sample of 27 transition countries, even though their analysis was not specifically aimed at agriculture. Falcetti *et al.* (2006) also confirmed the already established result that the importance of initial conditions as a determinant of growth had declined over time. Interestingly, factors such as stabilization and oil prices were also found to affect growth to some extent but they did not mitigate the importance of reforms, which is similar to our findings. In a study specifically aimed at agriculture, Swinnen & Vranken (2006) calculated farm-level efficiency indicators for five East European countries and linked the indicators to various measures of reforms over the period 1997–2001. For these five countries they found a positive correlation both between the advancement of reforms and productivity in agriculture, and between the share of efficient agricultural producers and the stages of reform. Feng (2008) estimated the technical efficiency in rice production and examined the effect of land rental market participation and off-farm employment on efficiency in rural China during the period 2000–2003. Again, the general finding was that technical efficiency improved when reforms were implemented that facilitated participation in land renting and development of individual farming.

Acknowledgements

References

Anonymous, 2002. Transition Report: Agriculture and Rural Transition. European Bank for

Reconstruction and Development (EBRD), London, 217 pp.

Arellano, M. & S. Bond, 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies* 58: 277–297.

Barro, R., 1991. Economic growth in a cross section of countries. *Quarterly Journal of Economics* 106: 407–443.

Barro, R. & X. Sala-i-Martin, 1995. Economic Growth. McGraw-Hill, New York, 539 pp.

Battese, G. & T. Coelli, 1995. A model of technical efficiency effects in a stochastic frontier production function for panel data. *Empirical Economics* 20: 325–332.

Bezlepkina, I., A. Oude Lansink & A. Oskam, 2005. Effects of subsidies in Russian dairy farming. *Agricultural Economics* 33: 277–288.

Blanchflower, D., A. Oswald & P. Sanfey, 1996. Wages, profits and rent-sharing. *Quarterly Journal of Economics* 111: 227–251.

Blundell, R. & S. Bond, 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87: 115–143.

Caselli, F., G. Esquivel & F. Lefort, 1996. Reopening the convergence debate: a new look at cross-country growth empirics. *Journal of Economic Growth* 1: 363–389.

Conning, J. & J. Robinson, 2002. Land reform and the political organization of agriculture. Working Papers in Economics No 341, Boston College, Newton, Massachusetts, 30 pp.

Coricelli, F. & S. Djankov, 2001. Hardened budgets and enterprise restructuring: theory and an application to Romania. *Journal of Comparative Economics* 29: 749–763.

De Soto, H., 2000. The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else. Basic Books, New York, 276 pp.

Deininger, K., 1995. Collective agricultural production: a solution for transition economies? *World Development* 23: 1317–1334.

Falcetti, E, M. Raiser & P. Sanfey, 2002. Defying the odds: initial conditions, reforms and growth in the first decade of transition. *Journal of Comparative Economics* 30: 229–250.

Falcetti, E, T. Lysenko & P. Sanfey, 2006. Reforms and growth in transition: re-examining the evidence. *Journal of Comparative Economics* 34: 421–445.

Fazzari, S., R. Hubbard & B. Petersen, 1988. Financing constraints and corporate investment. *Brookings Papers on Economic Activity* 1: 141–195.

Feng, S., 2008. Land rental, off-farm employment and technical efficiency of farm households in Jiangxi Province, China. *NJAS – Wageningen Journal of Life Sciences* 55: 363–378.

Hall, P. & D. Soskice, 2001. Varieties of Capitalism: The Institutional Foundations of Comparative Advantage. Oxford University Press, Oxford, 562 pp.

Hansen, L., 1982. Large sample properties of generalized method of moments estimators. *Econometrica* 50: 1029–1054.

Hsiao, C., 1986. Analysis of Panel Data. Cambridge University Press, Cambridge, 246 pp.

Gorton, M. & S. Davidova, 2004. Farm productivity and efficiency in the CEE applicant countries: a synthesis of results. *Agricultural Economics* 30: 1–16.

Islam, N., 1995. Growth empirics: a panel data approach. *Quarterly Journal of Economics* 110: 1127–1170.

Lerman, Z., 1998. Does land reform matter? Some experiences from the former Soviet Union. *European Review of Agricultural Economics* 25: 307–330.

Lerman, Z., 1999. Land reform and farm restructuring: What has been accomplished to date? *American Economic Review* 89: 271–275.

Lerman, Z., 2000. From common heritage to divergence: why the transition countries are drifting apart by measures of agricultural performance. *American Journal of Agricultural Economics* 82: 1140–1148.

Lerman, Z., 2001. Agriculture in transition economies: from common heritage to divergence. *Agricultural Economics* 26: 95–114.

Lerman, Z., C. Csaki & G. Feder, 2004. Agriculture in Transition: Land Policies and Evolving Farm Structures in Post-Soviet Countries. Lexington Books, Lanham, Maryland, 254 pp.

Macours, K. & J. Swinnen, 2000a. Causes of output decline in economic transition: the case of central and eastern European agriculture. *Journal of Comparative Economics* 28: 172–206.

Macours, K. & J. Swinnen, 2000b. Impact of initial conditions and reform policies on agricultural performance in central and eastern Europe, the Former Soviet Union, and east Asia. *American Journal of Agricultural Economics* 82: 1149–1155.

Mainwaring, S. & M. Shugart, 1997. Juan Linz, presidentialism, and democracy: a critical appraisal. *Comparative Politics* 29: 449–471.

Mankiw, G., D. Romer & D. Weil, 1992. A contribution to the empirics of economic growth. *Quarterly Journal of Economics* 107: 407–437.

Mathijs, E. & J. Swinnen, 2001. Production efficiency and organization during transition: an empirical analysis of East German agriculture. *Review of Economics and Statistics* 83: 100–107.

Nickell, S., 1981. Biases in dynamic models with fixed effects. *Econometrica* 49: 417–1426.

Olley, S. & A. Pakes, 1996. The dynamics of productivity in the telecommunications equipment industry *Econometrica* 64: 1263–1297.

Olson, M., 2000. Power and Prosperity: Outgrowing Communist and Capitalist Dictatorships. Basic Books, New York, 244 pp.

Rizov, M., 2003. Endogenous production organization during market liberalisation: farm level evidence from Romania. *Economic Systems* 27: 171–187.

Rizov, M., 2005a. Human capital and the agrarian structure in transition. *Economic and Industrial Democracy* 26: 119–149.

Rizov, M., 2005b. Does individualization help the productivity of transition agriculture? *Agricultural Economics* 33: 215–227.

Rozelle, S. & J. Swinnen, 2004. Success and failure of reforms: insights from transition agriculture. *Journal of Economic Literature* 42: 404–456.

Sala-i-Martin, X., 1997. I just run two million regressions. *American Economic Review* 87: 178–183.

Slangen, L., G. Van Kooten & P. Suchanek, 2004. Institutions, social capital and agricultural change in Central and Eastern Europe. *Journal of Rural Studies* 20: 245–256.

Solow, R., 1956. A contribution to the theory of economic growth. *Quarterly Journal of Economics* 70: 65–94.

Swinnen, J., 1999. Political economy of land reform choices in central and eastern Europe. *Economics of Transition* 7: 637–664.

Swinnen, J. & L. Vranken, 2006. Causes of efficiency change in transition: theory and cross-country survey evidence from agriculture. LICOS Discussion Paper No 172. LICOS Centre for Institutions and Economic Performance, Leuven, 30 pp.

Notes

[1] The analysis in this paper covers 15 former communist countries: Albania, Belarus, Bulgaria, Czech Republic, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Poland, Romania, Russia, Slovak Republic, Slovenia and Ukraine. The reason for including these countries in the sample is twofold. First, availability of comparable data limits the set of countries. Second, with respect to agricultural

transition most of the former Soviet Union countries can be grouped together, so that using data from the four largest countries allows us to form a reliable picture of the agricultural transition in the region (Lerman, 2004; Rozelle & Swinnen, 2004). Specifically, similar to Belarus only in Tajikistan and Uzbekistan private ownership of land has not yet been recognized. Physical distribution of farmland on an equal per capita basis to farm workers or rural households, similar to the process in Albania, is very rare and occurred only in Armenia and Georgia. Most former Soviet Union countries fall into the intermediate reformer group that includes Armenia, Azerbaijan, Georgia, Kyrgyz Republic, Moldova, Ukraine, Kazakhstan and Russia. The group of slow reformers – Belarus, Tajikistan, Turkmenistan, and Uzbekistan – is characterized by autocratic regimes with weak or non-existent civil societies, frail democratic institutions and highly centralized political power. In this group of countries private property rights are very limited. For detailed classification of the countries with respect to progress in agricultural transition see Anon. (2002).

[2] Agriculture in Poland and Slovenia was already based on individual farms and private ownership or usufruct rights prior to the reform (Swinnen, 1999).

[3] This is the most important method of land reform in the CIS countries. In addition, outsiders who were not entitled to land shares could receive land for private farming from a special state reserve established for this purpose covering 15 to 20% of total agricultural land (Lerman *et al.*, 2004).

[4] Our approach follows advances in the mainstream growth modelling literature and is an improvement on previous agriculture-specific studies. There are several previous aggregate country studies of agricultural sector performance that apply pooled or cross-section regressions (Lerman, 2000; 2001; Macours & Swinnen, 2000a, b). There are also several studies analysing technical or total factor productivity across farm types but only in a few transition countries and using only partially representative data (e.g., Mathijs & Swinnen, 2001); Gorton & Davidova (2004) offer a review of such studies.

[5] The analysis is inspired, in part, by the recent literature on varieties of capitalism (VoC) represented by Hall & Soskice (2001) amongst others. Institutional complementarity is a key concept of the VoC perspective. Specifically, for the case of agricultural transition and accession to the EU, Slangen *et al.* (2004), following ideas in the spirit of VoC, point to the need of complementarity between protection of private property, freedom of exchange, trust, consistency in monitoring environmental laws, and governments that act neutrally and are not corrupt, in order the transition process to succeed.

[6] Bezlepkina *et al.* (2005) studied the effect of subsidies on the dairy producers in the Moscow region and found a low responsiveness to market signals. They also found that subsidies have a distorting effect on the input–output mix. At the same time the study shows that subsidies relieve the credit constraints on dairy farms and have an important positive influence on short-term farm profit.

[7] Freedom House (<http://www.freedomhouse.org/template.cfm?page=1>) was founded in 1941 by Eleanor Roosevelt and other prominent individuals concerned with the mounting threats to peace and democracy. Freedom House is a non-profit, non-partisan organization that through a vast array of international programmes and publications is working to advance the worldwide expansion of political and economic freedom.

[8] Performing similar analyses of correlations between the reform indicators and two synthetic indices of initial conditions, one measuring inherent distortions and institutional constraints and the other the degree of development of the economy (see further), also confirms the positive relationship between success in reforms and good inherent institutions.

[9] Mankiw *et al.* (1992) and Barro & Sala-i-Martin (1995) augment the Solow model with investment in human capital as an additional determinant of growth in output per worker. Note that the variables that we use measure the progress in reforms and reflect the impact of changes due to reform policies.

[10] See Chapter 2 of the EBRD Transition Report (Anon., 2002) for detailed definitions of these indicators.

[11] Arellano & Bond (1991) suggest a first difference GMM-IV estimator and Blundell & Bond (1998) improve the performance of the estimator by extending the instrument set used. An alternative approach to estimate productivity (at firm level) suggested by Olley & Pakes (1996) deals with both simultaneity and selection biases due to the presence of unobservable heterogeneity across firms. However, the GMM-IV estimator is more appropriate in cases where the impacts of several endogenous variables are estimated and selection does not play an important role.

[12] In order to evaluate the impact of country-specific observed characteristics on GAO^w that are eliminated from the first-difference equation a second step estimation can be added up, similarly to Blanchflower *et al*. (1996) and Battese & Coelli (1995). The consistent GMM estimates from the first-difference equation are used to calculate the residuals of Equation (3). In the second step these residuals are regressed on the measured country-specific characteristics, w_i. The ordinary least squares levels estimation of the second-stage equation generates a consistent coefficient estimate if all w_i characteristics are uncorrelated with v_i, which is a strong assumption and we treat such estimates with caution. The estimation results, which show no statistically significant impact of w_i on (labour) productivity growth, can be obtained from the author upon request.

[13] Results reported are under the assumption that all right-hand-site variables are predetermined. Versions of the regressions where investment and growth in labour force are assumed endogenous were also run but the results were not statistically different. The results from these alternative treatments are available upon request.

[14] In a second (auxiliary) step of the analysis direct correlations between initial conditions and productivity were further explored. However no statistically significant relationships were found.

[15] In a base specification augmented only with REFORM and AGREFORM variables we found that the statistical significance (at conventional levels, $P < 0.10$) of AGREFORM disappears. A similar result with respect to the significance of AGREFORM is also observed in a specification augmented with AGREFORM and INDIVID. The regression results are available upon request.

[16] The indices are based on a principal component analysis. See the Technical Note to Chapter 4 of the EBRD Transition Report (Anon., 2002) for more details.