**The development of the rural nonfarm sector in transition economies-
Implication of capital intensity on labor productivity and employment**

Introduction

In most transitional countries a sizeable part of the population, more than 30%, still lives in rural areas. Overall, agriculture's share of employment in many transition countries has increased since 1989 due to the voluntary return of laid off urban workers of rural origin; the agricultural sector has taken the role of an employment buffer (Köster). Considering that the privatized farm structure in various transition countries continues to cope with diseconomies of scale and little specialization and that land property rights continue to be unclear defined and not tradable and, thus, a more efficient reparcelling is still to come, the private agricultural sector is stressed up to its limits to provide a decent livelihood to its "workforce". Given this situation, the rural labor force can not be productively absorbed in the agricultural sector and poverty is on the rise. For the rural population, this is where the rural non-farm sector has to step in. Therefore, this paper focuses on the rural non-farm sector in transition countries as a possible engine of economic growth and buffer for unemployment.

Thus, the hypothesis is that the rural non-farm sector in transition countries could significantly increase its labor demand under the prevailing wage structure through an augmentation of capital intensity and thus of labor productivity. Data from 34 Romanian non-farm enterprises, collected in 1997 are analyzed using a recursive econometric model with three regressions. The first regression models output, the second labor productivity. Based on the average return to labor the dependent variable of the last regression, labor demand, is modeled and estimated using the wage rate and the estimated labor productivity from the second regression.

Rural development strategies and policy

Since the 1940s when the World Bank and the International Monetary Fund (IMF) took up their operations, various development strategies have been implemented and again dismissed. Earlier strategies focused on building up the industrial sector to buffer the labor force pressure or on the agricultural sector to secure basic needs. Today, rural development strategies aim at incorporating the civil society and at improving the socio-economic situation of the rural population in all economic sectors in a sustainable manner. Besides the agricultural sector that dominated rural development strategies in the past, the nonfarm sector plays an important role for rural development, too. The nonfarm sector includes all economic activities in rural areas except agriculture, livestock, fishing and hunting. Since it is defined negatively as non-agriculture, it is not in any sense a homogenous sector. Regarding the focus of this paper which is on rural development, a community is classified as rural if the population density per square kilometer is less than 150 persons. Rural is often also defined to include localities of 5,000 or fewer inhabitants (Lanjouw and Lanjouw).

Socio-economic reforms and structural adjustment are pertinent for the socio-economic transformation of the rural regions in transition countries. At the beginning of the transformation process in transition countries, economic policies were mainly attached to macroeconomic problems. The increasing income disparity between rural and urban regions was ignored. Now, it becomes clear that the increasing inter-regional divergence in the transition economies is one of the major transformation problems (Bachtler). However, the question has to be raised whether indigent regions are worthy of preferential socio-economic strategies to reduce welfare gaps. From an economic point of view the principle of inter-regional competition will lead to convergence. If one assumes perfect and competitive markets, inter-regional welfare gaps would be balanced by factor movements and a subsequent adaptation of factor remuneration. If the assumptions of the neoclassical model are

removed, namely complete factor mobility and homogeneity or if uncertainty, information asymmetries and risk are included, then inter-regional economic convergence through competition may quickly reach its limits. Under such circumstances, direct and indirect instruments to transfer income or reduce the TCs of production and thus achieve better intra-national income equity may make sense (Pohlan).

The single most promising way of achieving greater equity is to put emphasis on employment creation (Lanjouw and Lanjouw). Especially in rural areas, disguised unemployment in the agricultural sector should lead to a move into the rural nonfarm sector if wages are competitive there. The new structural programs and policy recommendations by the European Union (EU) and the Organization for Economic Cooperation and Development (OECD) promote on the one hand, the creation of an enabling institutional environment and, on the other hand, the rural nonfarm sector by actively financing measures that go in this direction.[1] Because it is not costless to transact as neoclassical theory suggests, the existence or creation of an effective enabling institutional environment plays a crucial role for the formative and expansionist process of small and medium enterprises (SME) because of the transaction cost (TC) reducing effect of an efficient institutional environment. For a detailed theoretical discussion of the nonfarm sector's role in development see Breitschopf and Schrieder (1999).

Data and Model Specification

Already in the 1950s and 1960s, lessons for agricultural growth were summarized in the so called five 'Is': innovation, infrastructure, inputs, institutions, and incentives (Streeten). Tomich, Kilby, and Johnston (1995) added the sixth 'I', namely initiative. Recently, Hazell (1998) stressed the five 'Is' again for rural economic growth and added that, since the 1970s

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[1] The financial volume of Phare (Poland, Hungary Assistance for the Restructuring of the Economy), SAPARD (Special Accession Program for Agriculture and Rural Development), and ISPA (Instrument for Structural Policies for Pre-Accession) pre-accession instruments comprises EURO 3 billion per year from 2000 to 2006.

and 1980s, additional 'equity modifiers' have been promoted. Among other measures, the rural nonfarm sector should be actively encouraged, as it benefits from powerful income and employment multiplier effects as agriculture grows. Similarly, as the nonfarm sector grows, it produces multiplier effects for the agricultural sector especially in view of the disguised employment problem. This work applies the five 'Is' in an econometric model to explain the development of the nonfarm sector. The five 'Is' are used because they harmoniously combine the quest of the neoclassical and new institutional economics for explaining growth. Furthermore, a developing nonfarm sector could then take up the initiative (sixth 'I') and expand its labor force while the agricultural sector gains in productivity. The model below integrates the 'Is' as variables to explain the development of the nonfarm SME in rural Romania.

The data

The overall population density in Romania is presently 100 persons per square kilometer while in Brasov and Dolj a population density of 102.0 and 119.5 people/km² prevailed in 1995, respectively. Therefore, the two counties are defined as rural regions according to the OECD definition. The enterprises are classified as MSEs and not as SMEs, because the official definition of SMEs in Romania comprises enterprises with more than 50 and less than 250 staff members. The sample at hand has, on average, staff numbers below 50 with an average of eleven. The MSEs' size with respect to capital input ranges from 4.2 million to 2.8 billion Lei (7,168 Lei=1US$ in 1997). The interviewed MSEs comprise processing and production activities as well as retail, trade, repair, equipment shops and bakeries. It is clear that the nonfarm MSE sector is very heterogeneous, thus, the data are aggregated at the level of input factors. 34 observations of MSEs were used for the econometric analysis (from

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Rural development measures by the EU and OECD now follow a regional, multi-sectoral, and multi-dimensional approach.

Brasov and Dolj); the reminder were skipped due to missing values or incomplete information. The observed level of remuneration in the nonfarm sector was 910 USD in 1997.

Model specification

This paper evaluates the five 'Is' specified above as possible contributing factors to the growth of the rural nonfarm sector. MSEs with access to institutions, innovations, infrastructure, as well as with access to inputs such as capital, contribute to the creation of employment, to a higher and more diversified supply of commodities and to rural economic growth through investments. Thus, the central hypothesis of this study is, that nonfarm enterprises with a sufficient endowment of capital and access to other factors, relevant for production, have a positive impact on employment through a higher demand for labor. This hypothesis is analyzed in three steps:

First, the assumption is that an appropriate physical infrastructure, vocational training, availability of inputs and access to capital as well as to information play an important role for entrepreneurial activities and thus for the output level of MSEs. The impact of infrastructure, information and innovation on the output level of MSEs is analyzed. The production function should show positive marginal yields in particular with respect to capital and labor input. The estimated output level represents the base for the labor and capital productivity and thus links this first assumption with the second assumption below.

Second, theory suggests that the labor productivity is positively related to capital intensity, to the availability of information, infrastructure, human capital, and to access to inputs. Thus, an increase of capital intensity and productivity as well as access to good infrastructure and information increases the labor productivity. The estimates for labor productivity received by this model represent an explanatory endogenous variable for the labor demand function discussed next.

Third, labor productivity and wages determine labor demand. The marginal labor demand with respect to labor productivity minus wage rate is expected to be larger than zero. Thus, an increase of labor productivity increases the demand for labor while in increase of wages is expected to involve a decrease in labor demand.

The econometric model applied to verify the hypothesis and thus the three assumptions above is a recursive multiple regression analysis. It uses first, the 'revenues' as production output in monetary units, second, the 'labor productivity' which is output per labor unit and third, the labor demand of an enterprise as endogenous variables. It is assumed that labor has zero opportunity costs due to the high unemployment rate for unqualified workers as they are commonly found in and outside the agricultural sector. Further, the capital costs were considered to be zero since in Romania the real interests rates were highly negative and the use of capital would cause in this context a reduction of costs which is misleading.

Empirical analysis

In this section, the data of the Romanian nonfarm sector is analyzed, first, using explorative statistics and then econometric models. The descriptive statistics comparatively evaluate characteristics of the rural regions' demographic composition and the entrepreneurs such as education of the manager, legal status of the enterprises and size of the enterprises. The econometric analysis estimates the contribution of capital and labor input, infrastructure, institutions and innovation on the output level, second, the impact of capital intensity, infrastructure, institutions, human capital on productivity and third, the influence of labor wages and labor productivity on labor demand.

Explorative data analysis of the nonfarm sector

Between 1990 and 1995, the level of employment went down by 25% in Romania. At the same time, the private agricultural sector experienced a growth of the labor force. The level of employment in 1997 reached in the agricultural sector 108.7% and in the industrial sector

60.4% of its level in 1990. The indices of agricultural production indicate an increase by 5.6% from 1990 to 1997, while the increase of employees in the agricultural sector amounts to 8.7% in the same period (National Commission for Statistics). Thus, agricultural labor productivity decreased. The same tendency is indicated by the high percentage of people employed in the agricultural sector (37% in 1997) compared to the low contribution of agriculture (18.8%) to the GDP (EBRD). These figures show that a large proportion of the industrial labor force moved into the private agricultural sector, creating high levels of disguised unemployment, an issue still unsolved.

Among the interviewed nonfarm MSEs in the counties Brasov and Dolj, the nonfarm entrepreneurs have more often a high school degree and quite often an university degree, compared to the national average. Thus, the fact that the education and vocational training level of the entrepreneurs are lying distinctly above the counties' level (National Commission for Statistics), emphasises the importance of human capital for entrepreneurial and economic activities. About 87% of the interviewed MSEs in Brasov and Dolj reported that they have little problems to identify staff with the required qualification.

Besides education and qualified personnel, further factors such as access to capital, infrastructure and other institutional conditions affect the development and performance of MSEs. As generally acknowledged, the limited access to formal credit markets represents a constraint for liquidity and thus a constraint for investment, commodity supply and employment creation. Possible factors affecting the access might be the size of the enterprise measured in number of employees, the legal status, education, and the managerial skills of the entrepreneurs. With reference to formal credit access, the education level, the employment structures and legal status of the MSEs have been analyzed. While in Dolj about 35% of the interviewed MESs have access to formal credit, the share of MSEs with access is much lower in Brasov (13%). A slight correlation of better education and credit access can be observed. Surprisingly, smaller enterprises seem to have better credit access than larger enterprises in

Brasov. In Dolj, however, the size (in terms of labor force) does not seem to influence credit access. Furthermore, the legal status of an enterprise does not play a significant role for the access to credit markets, as the random distribution of credit access among the different legal statuses indicates (Breitschopf and Schrieder).

Econometric analysis of the nonfarm sector

This analysis includes three equations. First, the production function is expected to show positive marginal yields with respect to the explanatory variables, and with respect to capital and labor input even marginal yields larger than one. Second, it is anticipated that the factors such as infrastructure, capital intensity, institution, training, capital productivity display a positive contribution to the labor productivity. Finally, it is expected, that the wages and the labor productivity highly influence the labor demand, and thus the employment level.

The first equation describes the impact of the explanatory exogenous variables on the output level of non-farm MESs measured in revenues (REV). The second equation represents the relationship between labor productivity (PL) and the explanatory endogenous variables capital productivity (because it represents technical progress) and other exogenous variables such as capital intensity. The third equation is a labor demand function with wage as exogenous and labor productivity as endogenous explanatory variable. Since this system of equations is not a simultaneous model but includes endogenous variables from the first and second equations in the right hand side of the second and third equations, respectively, a recursive regression model can be applied. The variable capital productivity (PC) in the second regression is based on the ratio of the estimated revenues (REV) from the first regression and the observed operating capital (OCAP). In the third regression, the estimated labor productivity (PL) from the second regression is applied as explanatory variable. The assumption of the linear stochastic regression model are verified and hold (randomness and normality distribution of the error term, homoscedasticity, no multicollinearity). For a number

of the above socio-economic characteristics, the quadratic and logarithmic values were included in preliminary runs but not reported here because they were not significant. The results of the analyses are presented in Table 1 and the model specification is given in the following:

(1)   **OLS** (I1=REV) = f(I2, I3, I4, I5) + v

(2)   **OLS** (I1=PL) = f(I2, I3, I4, I5,) + u

(3)   **OLS** (I1=LABD) = f(I2, I5) + w

u,v,w = independent and normally distributed random variable with 0 mean

The Vector of the dependent variables are:

I1=   Vector of incentives for rural development

REV   Revenues in thousand Lei (gross output)
PL   Labor productivity measured as a ratio of observed REV and LAB in thousand Lei
LABD   Potential labor demand as ratio of observed (REV-OCAP)/WAGE

The complete vectors of the explanatory variables follow below. Clearly, not all explanatory variable in one vector will be included in each model specified above.

I2 =   Vector of inputs

LAB   Number of staff members (including manager);
OCAP   Operating capital (variable production costs) in thousand Lei without labor costs;
CAIN   Capital intensity measured as ratio of OCAP in thousand Lei and LAB;
CRE   Dummy for credit access, 1= access to external funds, 0 = otherwise;
WAGE   Wage in thousand Lei per staff member and year ;

I3 =   Vector of institutions

INS   Number of informative visits to institutions in 1997;
SAV   Dummy for savings facility, 1= dispose of savings, 0 = otherwise;

I4 =   Vector of infrastructure

INF   Dummy for quantity & quality of infrastructure, 1 = high quality, 0 = otherwise;

I5 =   Vector of innovation

TRAI   Dummy for employee training, 1 = training took place, 0 = otherwise;
PC   Capital productivity as a quotient of estimated REV & OCAP as proxy for technical progress;
$\hat{PL}$ Estimated labor productivity measured as a ratio of REV and LAB in thousand Lei

For the purpose of this analysis the linear functional form of the production function (REV) was preferred over the exponential form (Cobb-Douglas) because of the possibility to include explanatory dummy variables, the overall greater number of significant parameters, and the higher R-square. Nevertheless, the Cobb-Douglas function proved to be homogeneous of

degree one with constant returns to scale. Given that the base of the analysis are cross-sectional primary data, the adjusted R2 are considerably high (see Table 1). Although the marginal output with respect to capital input is larger than one the value is rather low and corresponds just to a 1.12 units increase of revenues (REV) when increasing capital input by one unit. Further, the increase of around 117 million Lei by one more unit labor input is unexpectedly high, especially in situations where high unemployment and disguised underemployment in the agricultural sector prevails. The significance of the infrastructure variables shows that enterprises surrounded by good infrastructure have on average a higher output level in terms of revenues of about 295 million Lei. Contrary to the above anticipations, it can not be shown that the other variables have an impact on the output level of a nonfarm MSE.

The regression of labor productivity (PL) on seven explanatory variables gives three significant parameters. The infrastructure variable indicates that enterprises with access to a good infrastructure display on average a higher labor productivity of about 79 million Lei per laborer. Besides, the capital intensity reflecting the capital input per labor input is significant and emphasizes the importance of the work places' capital endowment. However, the observed level of capital intensity is on average 98 million Lei and an increase of one unit more capital intensity increases the labor productivity of about 1.16 units which is rather high. The institutional variable is not significant at the 15%-level, but its p-value is rather high ranging around 0.22 (22%-level). Finally, enterprises using savings facilities display in general a higher labor productivity of around 60 million Lei per staff member than those without any savings accounts.

Table 1 **Analysis of nonfarm MSEs in Romania, 1997**

N = 34	OLS of I1						
	REV[1]		PL[1]		LADB		
	Parameter	t-Test	Parameter	t-Test	Parameter	t-Test	Mean
Inputs							
OCAP[1]	1.12	7.64***	…	…	…	…	4.7E+5
LAB	1.17E+5	2.58**	…	…	…	…	4.6
CAIN[1]	…	…	1.16	10.12***	…	…	9.8E+4
CRE	…	…	-1.8E+4	-0.44	…	…	0.4
Institution							
INS	2.3E+3	0.53	1.1E+3	1.24	…	…	30.3
SAV	…	…	6.1E+4	1.82***	…	…	0.5
WAGE[1]	…	…	…	…	-2.1E-2	-2.46**	7.3E+3
Infrastructure							
INF	2.9E+5	1.50(*)	7.9E+4	1.94*	…	…	0.3
Innovation							
TRAI	8.6E+4	0.48	2.1E+4	0.56	…	…	0.7
PC	…	…	-1.0E+3	-0.46	…	…	4.2
PLhat	…	…	…	…	1.7E-4	1.92*	1.6E+5
Intercept	-4.7E-5	-1.82*	-4.5E+4	-0.90	178.3	2.86***	
R2 adjusted	0.84		0.79		0.16		
F-value	36.6		19.2		4.0		

Notes: The signs (*), *, **, and *** indicate significance at the 15, 10, 5, and 1 % level.

The dependent variable I1 (INCENTIVE) reflects the revenues, labor productivity and labor demand of the non-farm MSEs. The sample comprises 34 observations (N =34) from the counties Brasov and Dolj (Timis was not included due to data problems), the degree of freedom is 28.
The average number of LABD is 55, the observed value in the sample of 34 observations is 5. Using the complete sample of MSEs, not just the ones in the regression, then the average number of employees per SME is 11 persons.
1) Capital values in 1,000 Lei.

The regression results of the demand function (LABD) display significant values for all variables. Albeit of an average labor productivity of 162 million Lei per laborer, one unit more labor productivity would change the labor demand of about 0.0017 staff members. Thus the labor demand function seems to be rather inelastic with respect to labor productivity. Further, the relationship between wages and labor demand is rather elastic and as expected negative. However with a decrease of just 0.02 units (staff members) per increase of one unit of wages (1000 Lei) and an average wage level of about 7.3 million Lei, the impact on labor demand is not very notable.

Conclusion

In the past, it was always the large-scale urban industrial sector which was expected to be the real engine of economic growth in transition countries. There has been a move away from this view and new emphasis on more 'broad-based' qualitative growth, where the development of the agricultural sector in particular, and the rural economy in general is gaining importance. Interest in the nonfarm sector is part of this focus on rural development.

The empirical results support to some extent the hypothesis of this paper, namely that the nonfarm sector will increase its labor demand in line with an increase of capital endowment, and thus of capital intensity and labor productivity. As the empirical results show, the access and availability of production relevant factors such as infrastructure, labor and capital input, positively influence the output level which in turn affects productivity. Further, it became clear that the labor productivity depends largely on the capital intensity, the access to and availability of appropriate infrastructure and savings facilities. Finally, the labor demand is significantly affected by labor productivity and wages. However, the results are somehow puzzling, since although or even because the influence of capital intensity on labor productivity is obvious, the impact of labor productivity on labor demand is rather limited. As the wages are on a very low level, the average labor productivity on a high level and no lack of qualified labor prevails according to the descriptive empirical part, one would expect an elastic labor demand with respect to labor productivity and an inelastic labor demand with respect to wages. Moreover, the findings illustrate that, first, wages do not reflect labor productivity. Second, the estimated labor demand (55 staff members) is significantly larger than the observed number of employed persons in nonfarm MSEs. Econometric results indicate that the average nonfarm enterprise in rural Romania could even significantly expand its labor force based on the present employment of labor and capital. The difference between

the observed employment and the estimated labor demand as well as the non-symmetrical parameter values for wages and labor productivity reflect the existence of additional factors determining the demand and supply of labor in the nonfarm sector of transition economies. This may include socio-cultural and -economic factors. These factors include immobility of labor supply caused on the side of the employee through food security considerations and inflexible labor demand on the side of the nonfarm employer through risk aversion and behavior patterns embedded in traditional path dependencies.

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