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The impact of agricultural development on agricultural employment and rural labour markets: Evidence from Eastern Europe and Africa

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Abstract

Agricultural employment is the decisive factor for rural well-being in developing countries, like Africa, as well as in many eastern European transition countries. This is because, differently from Western Europe, there are, in many regions, almost no other employment opportunities than farming. Therefore, the decrease of agricultural employment opportunities yields social and economic distress, especially for the most vulnerable, the landless and the small scale farmers who have to seek supplementary income from working casually on other farms.

But agricultural employment is subject to many factors. Labour hiring is strongly affected by short term productivity developments. Structural adjustment in the agricultural sector decreases labour by substituting it with capital.

This contribution analyses the effects of agricultural development on agricultural labour markets and thus on rural employment. It gives evidence from two regions that may seem different at first glance, but show surprising similarities: Eastern Europe and Western Africa, especially Niger. Using different method of calculating short term and long term labour demand elasticity for the agricultural sector, effects of both short term distortions (e.g. price or yield declines) and long term adjustments are assessed.

For both regions, it can be shown that short term distortions in agricultural productivity, mainly caused by price decline, lead to a sharp decrease in hired labour employment. The following structural adjustment mostly leads to a substitution of labour through capital, or, where available, land. Consequently, when the initial productivity losses are compensated, less labour than before is employed at the same production level so that the net effect is a decline in agricultural employment over time.

Based on this knowledge, recommendations are given for both Eastern Europe and West Africa. It seems clear that with the knowledge of the negative impact of technological changes in agriculture on labour demand, rural development policies have to be re-considered. It is most important to establish a balanced structural policy that aims at both improving agricultural efficiency and creating off-farm labour, e.g. in the downstream sector.

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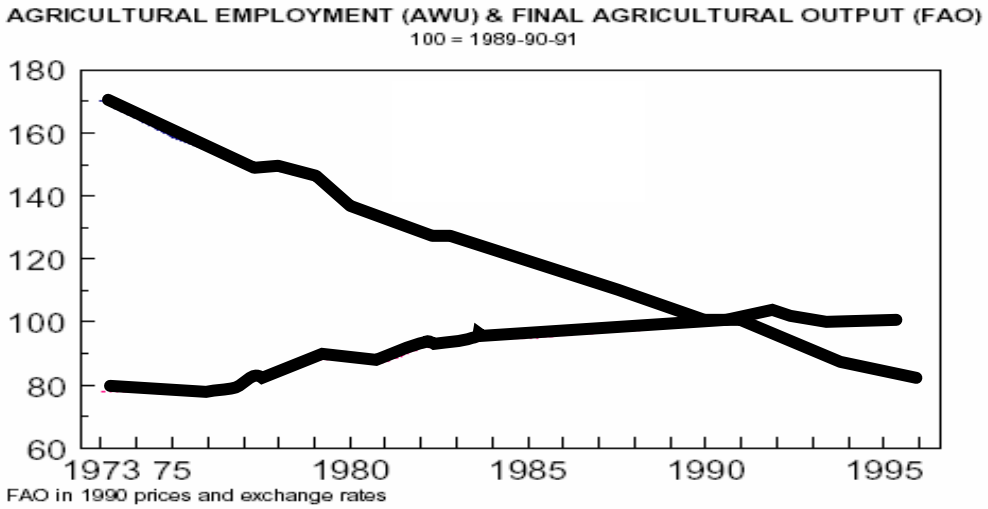
Introduction

The ongoing discussion of increasing efficiency of agricultural production systems around the globe implies that through this efficiency increase, income in rural areas is increased and thus the living conditions in these regions are improved. Yet, nothing is said about the distribution of such welfare gains. It is not clear whether all of those currently engaged in agriculture will benefit, be it equally or at least all positively, from such an improvement, or whether some will be left with less income opportunities in the process of agricultural development, while others will gain.

The present paper is trying to close that gap by assessing the impact of technical progress and higher efficiency in agriculture on the labour demand in this sector. The idea to do such an assessment came up when we were looking at the developments of agricultural production and labour force employment in Western Europe during the last decades of the 20th century. It can here be clearly seen that the increase in production was accompanied by a decrease of labour employment in the sector (Figure 1). This means that during the process of agricultural development and increasing efficiency in the sector, labour has been replaced by capital (e.g. new technologies) or land.

Figure 1: Agricultural employment and final agricultural output in the European Union



Source: European Commission (1997)

It is now in question whether these observations can also be made in other countries and regions around the globe. Regions of interest are many: In the developing countries, for example in Africa, the majority of people still depend on agriculture for their livelihoods; with desperate attempts being made to improve agriculture's efficiency. In Central and Eastern Europe, many countries equally rely on agriculture, and here also, research and policies aim at improving the efficiency and competitiveness of agriculture. In both cases, there seems to be little knowledge on the effects on income distribution caused by the probable economic success of such measures. The paper will attempt to close this gap by assessing the impact of both cyclical distortions, such as a decline of prices, and structural adjustment on the labour demand in agriculture and thus income distribution in rural areas. As such research has gained interest only recently, examples are rather sketchy and methodologies are not harmonized. The paper tries to handle this by highlighting case studies, based on different methodologies, from

different regions. Although not comparable in a methodological sense, the results should be able to show similar developments and give incentives for further research.
In the following section, another brief example from Africa, more precisely Eastern Africa, is displayed to show the potential impact of farm size adjustments in rural Africa. The subsequent section is dedicated to the observations made in the agricultural sector of Central Europe during the transition from former socialist economies to market economies, with special respect to the agricultural sectors in Eastern Germany and the Czech Republic. The following section discusses the potential impact of price fluctuations and structural adjustment in some of the most distressed farming systems in Africa, the millet based systems in semi-arid Western Niger.

Land adjustment and income distribution: A simple case study

The first case study is derived from a comparison of two farming systems in Eastern Africa (or more precisely, Western Uganda), a small scale system and a large scale system, both based on cooking banana production. Although there may be a certain singularity in this example, it shows a potential development path, especially for cases where policies of growth are not accompanied by appropriate distribution policies (Table 1), and gives an introduction to the problem.

Table 1: Income distribution in small and large scale farming systems in Uganda

	Small scale system	Large scale system
Planted area household^{-1}(ha)	0.8	30
Employees	0	10
Families depending on 30 ha	38	11
Av. no. of bunches per ha and year	2250	266
Average price per bunch (Ush)	1,500	6,000
Cash revenues (000 Ush per ha p.a.)	750	1,600
Food value (000 Ush per ha p.a.)	2,625	0
Total value of revenues (000 Ush per ha)	3,375	1,600
Gross revenues from banana production for farmer (000 Ush)[2]	1080	37,864
Household income from banana production for employees (000 Ush per family)	0	480

Source: Own calculation, data: Own survey

The numbers in the table show clearly that an increase in farm size bares many gains, yet it also bares many losses. The number of banana bunches harvested (and therefore soil productivity) is decreasing at the larger farm to one ninth, and monetary land productivity is less than half of the small scale system. The lower decrease of the monetary productivity is due to the higher bunch weight obtained through better management, but also due to higher prices gained on the market, as the large scale farmer has the means to market the bananas directly on the retail markets, without intermediates.
When it comes to distribution of the income gains, the whole picture changes. While the large scale farmer gains more than 43 mio. Ush, and his employees' salaries are considerably lower than the revenues of the small scale farmer, we also have to state that from the initially 38 farmers that made their living out of the 30 hectares, after the (in this case virtual) land consolidation, only eleven farmers are left. The other 27 would be, under the assumption of land scarcity, be landless and have to seek other employment opportunities. The increase in income (for the single farmer) by 327 percent yields to an employment decrease of 72 percent.

[2] Net of hired labor and transport costs to the markets of the large scale system

A more dynamic point of view: Production and productivity elasticity of employment in East Germany and the Czech Republic

Having introduced the problem by the example given in the previous section, we will now have a look at the dynamics of productivity change and employment impacts during a cost benefit change (the above mentioned cyclical problems) and a structural adjustment process induced by the change of the economic framework in- and outside the agricultural sector. This impact is measured through the productivity elasticity of employment, in other words, how labour demand and therefore employment in agricultural sectors of these countries is reacting on productivity changes that are induced by both short term productivity changes (through price or yield volatility) and longer term production adjustments.

Study regions are the Eastern part of Germany (the former German Democratic Republic) and the Czech Republic. For both regions, the demand for hired labor as a function of gross product and land productivity was estimated. The functional form is:

$$L = Y^{\beta} + \varepsilon$$

or linearized

$$\ln L = \beta \ln Y + \varepsilon$$

with

L	the demand (employment) for hired labor in the sector, and
Y	a production indicator calculated as the gross output (for long term adjustments assessments) and land productivity (for short term adjustment assessment),
β	the estimated coefficient that at the same time yields the elasticity of the dependend variable

and the disturbance term ε.

The data for the analysis are from the German agricultural report and the Czech agrocensus respectively (forcloser descriptions see REINSBERG ET AL. 2002).

Results of the analysis are displayed in Table 2. It seems that total production elasticity is rather small. For family farms in Eastern Germany, they value 0.33, in agro-enterprises 0.44. This means that by increasing the farm size (by one percent), the amount of hired labor is increased under-proportionally (by 0.33 or 0.44 percent respectively). It also means that when farm growth is induced by the acquisition of land from other farms, labor losses on the smaller farms may not be compensated by employment on the new farm (which shows a certain similarity to the first example). The Czech Republic shows a similar value of 0.5.

The reaction on short term land productivity changes (induced by price and yield variations) differs across German farm types. Family farms show a relatively high elasticity, they react on these changes with adaptation of hired labor employment. The respective value is 0.82, which means that a decrease of land productivity of one percent will induce a decrease of employment in 0.82 percent. The farm enterprises' reaction is weak, with the estimated value of only 0.0027. Explanations for this might be the long-

term employment contracts or even shareholder-ships in co-operatives. On the other side, short term adjustments effects might be disturbed by the long term decrease in agricultural employment.

In the Czech Republic, the situation differs: Here, the whole sector reacts rather heavily on short term productivity change, the elasticity value is at 1.27. This is probably due to the sharp adjustments at the beginning of the transition in the early nineties. We also have to point out that this adaptation process seemed to be still ongoing at the end of the decade.

Table 2: Elasticity of employment

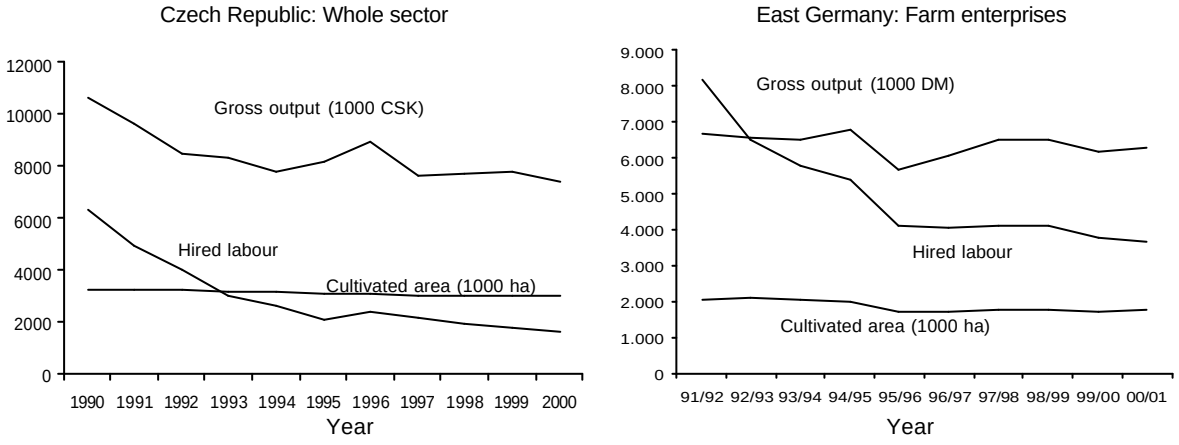
Country (region)	Farm type	Production elasticity*	Land productivity elasticity*
Eastern Germany	Family farms	0.330	0.8200
	Ag. enterprises	0.440	0.0027
Czech Republic	All	0.499	1.2700

*All values are above 90 % significance level, R^2 for all functions above 90 %.

Source: Own calculations, data: BMVEL, Czech Republic, various editions.

The above mentioned findings should be discussed briefly in order to interpret them in a context of structural change and relate them to the initially described employment losses. The coefficients estimated above show employment losses only for declining production, not for the increasing production as stated for Western Europe and the Ugandan case study. Yet, we have to consider two things: The first issue is that the sample is biased for the long term structural adjustment, as the statistics only cover the remaining farms and their employment structure, while the lost employment and the farms that have been given up and/or merged with larger farms is not covered. Consequently, there have been severe job losses in the agricultural sector, as Figure 2 shows.

Figure 2: Development of production and employment



Source: BMVEL and Czech Republic, various editions.

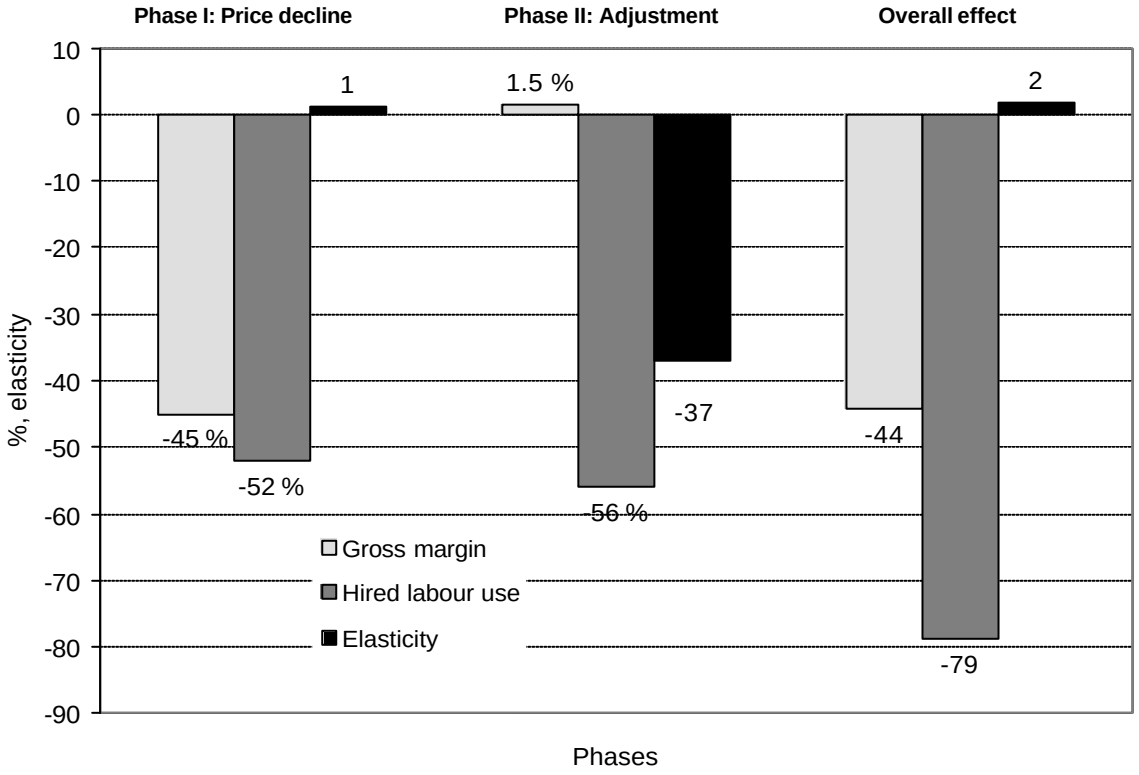
A linkage of interpretations could be to put the observations and elasticities in a sequence. Assuming that structural change is induced by changes in prices and therefore revenues from markets, we could say that the first value of the sequence is the short term elasticity, which would cost 1.27 percent of hired labour for the case of the Czech Republic. When structural adjustment is made, only 0.55 percent of the employment is regained for every percent of production gains through the adjustment, which ends up with a net loss of over fifty percent of employment per adjustment cycle, which is well explaining the developments in Figure 2.

A sequence of price and technology driven adjustment: The case of Southwestern Niger

The last example shows labour market implications from another region and takes us back to Africa. The model used here is a nonlinear programming model of the Markowiz portfolio-type that was originally used to asses the adoption potential of technical innovations in the respective systems under risk of yield hazards and price shifts (ABELE 2001). It is now evaluated with respect to the impact of hired farm labour in these systems under the same conditions, and it shows quite well the sequence of adjustments from cyclical to structural adjustment.

The first adjustment is price driven and based on the assumption that through the introduction of new yield improving technologies like fertiliser use and mulching (for a closer description of technologies see ABELE 2001, HAIGIS ET AL. 1998, as well as WEZEL ET AL. 1999), a production surplus is thrown on markets with limited capability of absorption. This leads to a sharp price decline, with negative impact on gross margins (- 45 percent) and hired labour use (-52 percent) and a respective elasticity of 1.15. When the model farmers are offered a labour saving technology, in the form of hiring a donkey-drawn weeding hoe, they apply this technology on about 30 percent of their land and thus, gross margin is increased by 1.5 percent but labour employment is further decreased by 56 percent. Figure 3 shows this sequence.

Figure 3: Gross margin and employment during price and technology adjustments



Source: Own calculations.

The overall effect is shown on the right hand side. The gross margin reduction is buffered a bit by the reduction of hired labour employment, yet it is still high. The effect of the output price shock on hired labour employment is disastrous, and the overall production elasticity of labour demand is as high as two.

Conclusions

The paper has shown various examples from different regions on the impact of productivity enhancement and structural change on employment in agricultural primary production. Although the examples are sketchy and methodologies used are not yet harmonized, it could be shown quite clearly that both cyclical shifts in prices and thus revenues, as well as long term production improvements through structural adjustments have severe negative impacts on employment. This means that by making agricultural primary production more efficient, labour is very likely to be substituted by new technologies and land consolidation.

This implies that it will not be enough for rural development to just increase agricultural production. Policies are required to consider off-farm employment opportunities as a target, much stronger than before. Opportunities for this would be to enhance the agro-processing sector in rural areas by appropriate structural policies from investment facilities to the improvement of infrastructure.

Without such policies, rural areas in developing countries as well as in Eastern Europe face a twofold problem:

First, agricultural development is most likely to increase overall income but have severe negative impacts on income distribution, as it might raise unemployment in rural areas and also increase the number of landless.

Second, structural adjustment will be hampered, as those inhabitants of rural areas who face unemployment and deprivation of resources will stick to their land and to subsistence agriculture, so that structural adjustment will be blocked and development will be hampered by this kind of vicious circle.

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