

Exercise¹: * it would be good to bring calculators*

The Economics of Land Reform in Transition Countries (relationship between farm size and productivity)

In this exercise we examine the relationship between farm size and productivity (where the latter is measured by TFP index based on the average cost of production). The objective of this exercise is to illustrate the thesis that while large farms may be more efficient under a system of distorted market prices, the allocation of resources as performed on medium-size farms corresponds better to the optimal choice when proper account is taken of social shadow costs and transaction and the eventual trade-offs between these two goals, are examined on that basis.

The data reported in the first part of Table 9E1 draw on a real-life case study on one transition economy. For each farm-size category, information is given on the output level (measured by average receipts pQ) and on the resources used: labour input L , capital measured by its value p_kK , and land. To take into account variability in quality, the land input is measured not by the area but by its estimated value p_aA , under the assumption that the value of land incorporates the relevant allocation and physical aspects of the land into a single measure of land quality.

1/ Analyse the variations in factor use according to farm size by computing the ratios pQ/L , pQ/p_kK , pQ/A and pQ/p_aA

Questions: Which farms are more productive, larger or smaller? Is productivity increasing with farm size or declining with farm size? Refer to all types of productivity (labour, capital and land). What is the meaning of the results?

2/ Compare the performance of the different farm sizes under market and social prices.

The costs of two assets, land and capital, are calculated by applying the cost of capital (interest rate) i to the asset value reported for each of these two inputs. If w is the cost of labour, the total cost of production is:

$$wL + i(p_kK + p_aA)$$

Then, define the index of total factor productivity, TFP, by the inverse of the average cost of production:

$$TFP = TFP = \frac{pQ}{wL + i(p_kK + p_aA)}$$

Compute TFP for each farm size for a set of 'market' prices (case I) in which the wage is the minimum wage ($w = \$/\text{man-year}$ ³⁴² and the interest rate is heavily subsidized at 3%).

Determination of the correct 'social price' or, opportunity cost, for labour and capital requires calculation of the equilibrium values for the whole economy, which is practically impossible.

¹ It is based on example given in Sadoulet and Janvry, 1995

Short of that, a range of values can be used for labour from 0 (case II) up to 171 (case III). For the social price of land and capital, an opportunity cost of 15% per annum is applied. With these values (cases II and III) compute TFP at social prices.

Question: Which farms are more productive under the 'market prices' and which under the 'social prices'?

3. Compare the performance of the different farm sizes under effective prices and effective social prices.

The previous analysis assumes that all farms face the same prices, with no differential access or transaction costs. We will now introduce two transaction costs, on labour and on capital, to more realistically reflect the prices effectively paid by each class of farm.

For calculating **labour costs**, assume that each household has $L_f = 1.7$ man-year units of family labour, the price of which is w_f . Hired labour, with employment equal to $L_{nf} = L - 1.7$ (when positive), is paid w_{nf} . Assume also that there is a unit supervision cost for this hired labour that increases with the size of the number people employed: $s(L) = s(L - 1.7)$. The total labour costs is thus:

$w_f L$ for the farms not hiring external labour (pure family farms)
 $w_f L_f + w_{nf} [1 + s(L - 1.7)](L - 1.7)$ for the larger farms, employing external labour

The two expressions can be combined into a single formula for LABOUR COST as follows:

$$w_f \min(L, L_f) + w_{nf} [1 + s \max(0, L - 1.7)] \max(0, L - 1.7)$$

For **interest rate**, we have to take into account the fact of distortions on the capital market, that greatly favour large farms. Assume that the interest rate varies linearly with the land value, which serves as the collateral for loans, in such a way that the large farms get credit at the subsidized rate $i_l = 3\%$, while the small farms pay $i_s = 25\%$. The exact formula to use is:

$$i = i_s + (i_l - i_s) p_a A / 17500$$

Given the formulas above and effective prices (case IV) compute for each farm size: (i) the cost of labour, and (ii) the cost of capital, and (iii) TFP.

Questions: Which farms occurred productive (of what size) under market distorted prices?

Now let assume that we can remove some distortions (but not transaction costs, which are structural characteristics of variability of access to factors of production for farms of different sizes). So, for effective social price of labour we keep the above formula that includes supervision costs. However, now both family labour and hired labour are valued at the social wage, so $w_f = w_{nf} = 171$.

As for the interest rates, only a small difference between small and large farms, reflecting the differential risk of default, prevails, which $i_s = 18\%$ and $i_l = 15\%$.

Given those changes, compute (i) labour cost, (ii) capital costs, and (iii) TFP at these effective social prices (case V).

Question: what is the difference in farm performance under these different sets of prices.

4. Compare the potential efficiency gains of each of the land reform programs. What are the efficiency costs of a welfare-oriented land reform?

TFP in the sector is a weighted average of the TFP_k by farm groups, with weights equal to the land areas in each group. With the distribution of number of farms N_k and the average farm size A_k compute the land distribution by group $N_k A_k$ and the average TFP:

$$TFP = \frac{\sum_k N_k A_k TFP_k}{\sum_k N_k A_k} \text{ fro different sets of prices (cases I – IV)}$$

Repeat this with two alternative land redistribution schemes: (i) in the first, an ‘efficiency’ oriented land distribution, all the land is attributed in farms of the most socially efficient size, that is to the 50-100 ha size; (ii) in a welfare-oriented distribution, all the land is distributed equally to all farms. This would mean a single farm size of 11.3 ha. As our size group do not correspond to this specific size, we simulate this ‘welfare’ scheme by giving 50% of the land to each of the two small size groups 1 and 2.

Questions: What are the efficiency gains of each reform under the actual prices (also effective) and social prices (also effective)? How the degree of distortion changes the results?

5. Compare the efficiency gains of Land reform after a drastic readjustment of the exchange rate with what you found in question 4.

Let’s assume now that a drastic readjustment of the exchange rate has taken place, which has revalued the prices of the tradable relative to the prices of non-tradables (our currency became stronger, as typically happened in case of transition countries). Consider labour as the only non-tradable and agricultural product and capital as tradables. Increase the value of output by 20% in the original data. Increase also the interest rates by 20% in the relevant places, Compute TFP at effective prices and at effective social prices. Compare the efficiency gains of land reform now to results obtained in question 4.

Questions: Which farms are favoured in such a situation? Compare the results with distortions on and off.