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Abstract

International Financial Institutions have advocated the privatization of integrated agricultural monopsonies in developing countries with the hope that competition between private firms under a contract farming system would reduce inefficiencies in production and enable farmers to obtain a higher share of world commodity prices. Using a very simple theoretical model, this paper shows however that the impact of privatization and contract farming may not be positive for all farmers.

Keywords: Privatization, Cotton, Africa, Welfare

JEL Codes: O13, L1, D42

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1 Introduction

In 1990, John Williamson coined the term “the Washington Consensus” to describe a set of core policies advocated in developing countries by International Financial Institutions – mainly the International Monetary Fund and the World Bank. These policies included a push towards the privatization of state-owned enterprises, with the aim of improving productive efficiency, reducing the risk of corruption, and promoting competition.

In Sub-Saharan Africa, the move towards privatization has affected (among others) the production of key commodities such as cotton, cocoa, and coffee. Consider cotton production in Benin. Until the late 1980s, the provision of inputs to farmers (seeds, fertilizers, etc.), the purchase of cotton from farmers, the transportation of the raw cotton to ginneries (the factories that produce cotton lint), and the exportation of cotton lint to industrialized countries all remained under the control of the parastatal company SONAPRA. To reduce inefficiencies in the system, the International Financial Institutions encouraged Benin’s Government to privatize the sector. The provision of inputs to farmers was privatized in the first half of the 1990s. The ginning of cotton (i.e., the transformation of the raw cotton produced by farmers into cotton fiber) was also privatized, albeit partially, in the second half of the 1990s. Today (in 2004), the privatization of the ten ginneries that remain under the control of SONAPRA, as well as a move towards contract farming, are under consideration¹. Such a move could possibly imply that at some future point, instead of benefiting from a nationally guaranteed purchase price uniformly applied to the whole national territory, farmers would need to negotiate at the beginning of each campaign the price of their production with ginners. Input prices, until now maintained uniform throughout the national territory, might also be fully liberalized at some future point².

¹For a review of contract farming in Africa, see Porter and Phillips-Howard (1997).

²Cotton production is also been privatized in other West African countries. In Ivory Coast for example, the Compagnie Ivoirienne pour le Développement du Textile (CIDT) was broken up into three independent companies in 1998, with two of the three companies acquired by Ivoire Coton for the Northern and Western areas of the country, and by LCCI (Aiglon Ltd Group) for the Northern and Eastern areas. And in 2002, a new structure was created for the management of

In Benin as elsewhere, the rationale for privatization has relied in large part on the need to promote transparency in the management of large parastatal firms which controlled the production, transformation, and exportation of basic commodities (i.e., the proceeds from exports were often used in the past by elites for political purposes and corruption was rampant). But privatization was also motivated to some extent by the hope that competition between firms would ensure that production costs in ginneries would be reduced and that local farmers would obtain a higher share of world commodity prices.

The jury is still out in practice as to whether these goals have been achieved (e.g., Goreux, 2003; Badiane et al., 2002; Akiyama et al., 2003; Poulton et al., 2003). For example, in the case of Zimbabwe which privatized its cotton sector earlier on, the impact of competition has been mixed despite initial success, in part due to difficulties in coordinating the actions of the various actors and maintaining quality (e.g., Gibbon, 1999; Larsen, 2002 and 2003).

In this paper, our objective is fairly limited, but it may nevertheless help to clarify some of the theoretical issues in the debate on the pros and cons of privatization in the cotton sector and by extension in other similar sectors. Our aim is to provide a simple comparative statics analysis of the determinants of the price received by farmers for their crop, and the price paid by farmers for their inputs, under the two stylized systems under consideration. The first system is the integrated firm that supplies inputs to farmers and purchases their crop (the so-called “*filière intégrée*” in French; see for example Raikes et al., 2000) under guaranteed prices fixed at the beginning of the campaign and identical for all farmers (because the political context does not enable the monopsony to price discriminate). The second system is the fully privatized system with contract farming under which each farmer (or group of farmers) must negotiate its own contract, with the possibility of different farmers paying different prices for their inputs and receiving different prices for their crops.

Our model suggests that the shift from a state-controlled integrated production inputs (SOFICOCI, Société de Financement des Intrants de Coton en Côte d’Ivoire). Steps towards privatization have also been taken in Burkina Faso, Cameroon, the Central African Republic, Mali, and Senegal.

system with uniform prices to a privatized system with price discrimination may be beneficial to some farmers, while being detrimental to other (and possibly poorer) farmers. Specifically, on the input side, whether a farmer will benefit or not from privatization depends essentially on the farmer's elasticity of demand for inputs and the number of input providers. Similarly, on the output side, the farmer's elasticity of supply of cotton and the number of cotton purchasers will determine whether the farmer will benefit from privatization. Farmers with a low elasticity of demand for inputs and a low elasticity supply of outputs are more likely to be hurt by privatization than farmers with higher elasticities.

Sections 2 and 3 provide our simple model of the potential impact of the privatization of cotton transformation (Section 2) and input provision (Section 3). A brief conclusion follows in section 4.

2 Impact of privatizing cotton transformation

In order to simplify the optimization problem, we will assume that the integrated firm is managed by two bureaucrats, one for the transformation sector and one for the supply of inputs sector. We thereby assume that the two bureaucrats maximize the profit of their branch independently. In this section, we consider the transformation sector.

Let $C_T(Q_N)$ be the cost function of the transformation branch. This cost function depends on the quantity produced Q_N and the price paid to farmers which is determined by the inverse aggregate supply function of the crop $P^s(Q_N)$. We assume a particular functional form

$$C_T(Q_N) = F_T + c_T Q_N + P^s(Q_N) \cdot Q_N, \quad (1)$$

where F represents fixed costs, c_T is the marginal cost of transforming the crop and marketing cotton lint, which is assumed to be constant³, and $P^s(Q_N) \cdot Q_N$ is the cost of purchasing raw cotton from farmers. If we denote by P^w the price of cotton on the

³In practice, while the marginal cost of transformation may well be constant, the marginal cost for transporting seed cotton and lint may be decreasing, but we will not consider this here.

world market, and by Q_F the quantity of cotton lint produced in foreign countries, the objective of the public firm is

$$\max_{Q_N} P^w(Q) \cdot Q_N - F_T - c_T Q_N - P^s(Q_N) \cdot Q_N, \quad (2)$$

where $Q = Q_N + Q_F$, is the total quantity of cotton produced in the world. Maximization behavior leads to the following first order condition

$$P^w + \frac{\partial P^w}{\partial Q} Q_N - c_T - P^s - \frac{\partial P^s}{\partial Q_N} Q_N = 0. \quad (3)$$

Dividing both side by P^w leads to

$$1 + \frac{\partial P^w}{\partial Q} \frac{Q}{P^w} \frac{Q_N}{Q} - \frac{c_T}{P^w} - \frac{P^s}{P^w} - \frac{\partial P^s}{\partial Q_N} \frac{Q_N}{P^s} \frac{P^s}{P^w} = 0. \quad (4)$$

If we denote by $\rho = P^s/P^w$ the ratio of the price received by farmers to the international price, by $\gamma_T = c_T/P^w$ the ratio of the marginal cost of transformation to the international price, by ε the price elasticity of the international demand for cotton, by η the elasticity of the aggregate national supply of cotton by farmers, and by s the market share of the firm on the international market, we obtain from (4)

$$\rho = \frac{1 - \gamma_T + s/\varepsilon}{1 + 1/\eta}. \quad (5)$$

Inspection of (5) leads to the following observations. First, if the national monopsony has market power on the international market (i.e. if $s > 0$), the farmers will be hurt by this market power (ε being negative). The reason for this is simple. Because of its market power, the national firm tends to reduce its production. This reduction in production implies that the quantity purchased from farmers and the price paid to them are both lower than otherwise would be. In the case of cotton production in Benin however, this is not likely to occur since the country accounts for only a very small share of world production (if we were applying the model to, say, cocoa production in Ivory Coast, there could be real market power since the country accounts for roughly 40 percent of world exports). Second, a higher transformation cost from raw cotton to cotton lint reduces the price paid to farmers. Third, the price received by farmers is increasing in the aggregate elasticity of supply. For example,

if it is easy for farmers as a group to shift to another crop when the price of cotton falls, then the monopsony will have to pay a higher price to farmers.

Let us now assume that the transformation market is liberalized, so that crops are purchased by private firms. Free entry in the transformation market leads to J firms or ginneries which we assume to be identical for simplicity. We also assume that those firms are not subject to political constraints, which means that they can price discriminate between I types of farmers. In this new competitive environment, the objective of firm j is

$$\max_{\{Q_{ij}\}_{i=1}^I} P^w(Q) \cdot Q_j - F_T - c_T Q_j - \sum_{i=1}^I P^i(Q_i) \cdot Q_{i,j} \quad (6)$$

$$\text{subject to } \sum_{i=1}^I Q_{ij} = Q_j,$$

where Q_j is quantity transformed by firm j , Q_{ij} is the quantity of raw cotton bought by firm j from farmers of type i and $Q_i = \sum_{j=1}^J Q_{ij}$. Maximization behavior leads to the following first order conditions

$$P^w + \frac{\partial P^w}{\partial Q} Q_j - c_T - P^i - \frac{\partial P^i}{\partial Q_i} Q_{ij} = 0 \text{ for } i = 1 \text{ to } I \quad (7)$$

The firms being all identical, (7) may be rewritten as

$$P^w + \frac{\partial P^w}{\partial Q} \frac{Q_N}{J} - c_T - P^i - \frac{\partial P^i}{\partial Q_i} \frac{Q_i}{J} = 0 \text{ for } i = 1 \text{ to } I \quad (8)$$

Dividing both side by P^w leads to

$$1 + \frac{\partial P^w}{\partial Q} \frac{Q}{P^w} \frac{Q_N/J}{Q} - \frac{c_T}{P^w} - \frac{P^i}{P^w} - \frac{\partial P^i}{\partial Q_i} \frac{Q_i}{P^i} \frac{1}{J} \frac{P^i}{P^w} = 0. \quad (9)$$

Let $\rho_i = P^i/P^w$ be the ratio of the price received by farmers of type i to the international price, and let η_i be the elasticity of supply for farmers of type i . From (9), we find

$$\rho_i = \frac{1 - \gamma_T + s/J\varepsilon}{1 + 1/J\eta_i}. \quad (10)$$

Inspection of (5) leads to the following observations. First, if all farmers have an identical elasticity of supply equal to the aggregate supply elasticity, they will gain from privatization since $\rho_i > \rho$ if $\eta_i = \eta$. Second, if the privatization leads to a

privatized monopolist (i.e. if $J = 1$), farmers whose supply elasticity is lower than the aggregate supply elasticity under the public monopsony described earlier will lose from the liberalization, while farmers whose elasticity is lower than the aggregate elasticity will gain. Third, even if several firms enter the ginning market, substantial differences in supply elasticities among farmers may lead to losses for the farmers with the smaller elasticities. It could well be that the farmers with the smaller elasticities are poorer, with few alternative crops or occupations apart from cotton production on which to rely for making a living (which is why their elasticity of supply is likely to be low). Hence our simple model suggests that privatization and contract farming need not necessarily be poverty reducing. However, there is a critical value J_i^c given by

$$J_i^c = \frac{s(\eta + \eta\eta_i + \eta_i) - \varepsilon(1 - \gamma)\eta}{s\eta\eta_i - \varepsilon(1 - \gamma)\eta_i} \quad (11)$$

such that, if $J \geq J_i^c$, farmers of type i will gain from privatization. This leads us to assert that if the privatization process leads to a large number of firms, everyone may well gain. The number of firm in the industry under free entry is in turn linked to the importance of the fixed cost F_T which determines how many firms can survive in the long term under the Cournot equilibrium. Policies aiming at reducing this fixed cost would help to ensure that a larger share of farmers, and possibly all of them, gain from privatization.

3 Impact of privatizing input supply

We now consider the privatization of the supply of inputs to farmers. For simplicity, assume that the production of cotton requires only one input⁴. Let $C_I(x)$ be the cost function of the input branch. This cost function depends on the quantity produced of input x . We assume a particular functional form

$$C_I(Q_N) = F_I + c_I x, \quad (12)$$

⁴This assumption is made for analytical tractability, i.e. to avoid cross-price elasticities of factor demand to appear. The argument developed in the paper would remain valid under multiple inputs use. However, it would be impossible to derive an explicit function for the price of inputs without specifying an explicit functional form for the production function of cotton.

where c_I represents the marginal cost of producing the input. If we denote by w the price at which the monopoly sells the input, the objective of the firm is

$$\max_x [w(x) - c_I] \cdot x \quad (13)$$

Maximization leads to the following first order condition

$$w + \frac{\partial w}{\partial x} x - c_I = 0. \quad (14)$$

Dividing both side by P^w leads to

$$\frac{w}{P^w} + \frac{\partial w}{\partial x} \frac{x}{w} \frac{w}{P^w} - \frac{c_I}{P^w} = 0 \quad (15)$$

If we denote by $\phi = w/P^w$ the ratio of the price paid by farmers for the input to the international price of their output, by $\gamma_I = c_I/P^w$ the ratio of the marginal cost of production of the input to the international price, and by ξ the price elasticity of demand of input, we obtain from (15)

$$\phi = \frac{\gamma_I}{1 + \frac{1}{\xi}}. \quad (16)$$

Inspection of (16) leads to the following observations. First, a higher production cost of the input increases the price paid by farmers. Second, the price paid by farmers is decreasing in the aggregate elasticity of demand for the factor.

Let us now analyze the potential impact of privatizing the input production industry. Suppose that free entry has led to K firms which we again assume to be identical for simplicity. As for the case of transformation, we also assume that those firms are not subject to political constraints, which implies that they will price discriminate if they can between L types of farmers. The objective of firm k is

$$\max_{\{x_{lk}\}_{l=1}^L} \sum_{l=1}^L w^l(x_l) \cdot x_{lk} - c_I \cdot x_k \quad (17)$$

$$\text{subject to } \sum_{l=1}^L x_{lk} = x_k,$$

where x_k is quantity of inputs produced by firm k , x_{lk} is the quantity of input bought by farmers of type l from firm k and $x_l = \sum_{k=1}^K x_{lk}$. Maximization behavior leads to

the following first order conditions

$$w^l + \frac{\partial w^l}{\partial x_l} x_{lk} - c_I = 0. \quad (18)$$

The firms being all identical, (18) may be rewritten as

$$w^l + \frac{\partial w^l}{\partial x_l} \frac{x_l}{K} - c_I = 0. \quad (19)$$

Dividing both side by P^w leads to

$$\frac{w^l}{P^w} + \frac{\partial w^l}{\partial x_l} \frac{x_l}{w^l} \frac{1}{K} \frac{w^l}{P^w} - \frac{c_I}{P^w} = 0 \quad (20)$$

Let $\phi^l = w^l/P^w$ be the ratio of the price paid by farmers of type l for the input to the international price of their output and let ξ_l be their factor demand elasticity. From (20), we obtain

$$\phi^l = \frac{\gamma_I}{1 + \frac{1}{K\xi_l}}. \quad (21)$$

Inspection of (21) leads to the following observations. First, if all farmers have an identical elasticity of demand for input, they will gain from privatization since $\phi_l > \phi$ if $\xi_l = \xi$. Second, if the privatization leads to a privatized monopolist (i.e. if $K = 1$), farmers whose elasticity is lower than the elasticity of the aggregate demand for the input will lose from the privatization, while farmers whose elasticity is higher will gain. Third, even if several firms enter the input production market, substantial differences in factor demand elasticities among farmers may lead to losses for the farmers with the smaller elasticities. However, there is a critical value K_l^c given by

$$K_l^c = \frac{\xi}{\xi_l} \quad (22)$$

such that, if $K \geq K_l^c$ farmers of type l will gain from the privatization. Thus, as was the case for the transformation industry, if the privatization leads to a sufficiently large number of firms, all farmers may gain. Again, the number of firm will depend on the magnitude of the fixed costs F_I , with a reduction in fixed costs helping to increase the share of farmers gaining from the privatization.

4 Conclusion

The privatization of integrated agricultural production systems in developing countries has been advocated by International Financial Institutions in part on the assumption that reducing inefficiencies in the transformation of crops and in the provision of inputs to farmers should enable farmers to obtain a higher share of world commodity prices, and pay a lower price for their inputs. Using a very simple model, we have shown in this paper that the share of the world price obtained by farmers under privatization and price discrimination may in some cases be lower than under a monopsony with uniform purchase prices for all farmers. The same holds for inputs provision: moving from a monopoly with uniform pricing to a privatized industry with price discrimination may lead to gains for some farmers, and losses for other farmers.

In line with basic economic theory, our model suggests that farmers with a low elasticity of supply for their crop and low elasticity of demand for inputs are more likely to be hurt by privatization than farmers with higher elasticities, at least if the number of firms entering the market is small, for example due to relatively high fixed costs. It could very well be that the farmers with the smaller elasticities are also those who have smaller areas under plantation, are poorer, live in more remote areas, and have fewer alternative ways of making a livelihood. For such farmers, the logic of contract farming, if it were to lead to the abandonment of guaranteed national prices for inputs and crops without any alternative way of protecting them or providing them with some negotiation power, could have negative impacts.

A number of extensions could be integrated into the model for future work. For example, one impact of increased competition between ginners could be to put pressure on the selling price of cotton lint, as buyers (spinners) always take advantage of competing offers from several sellers to buy at the cheapest. This would put additional pressure to decrease payments to farmers. Other extensions could relax some of the assumptions used here, for example regarding the constant marginal cost of transformation/transportation for ginners. While our theoretical results suggest that privatization may be beneficial for all farmers if a sufficiently large number of

firms compete, this may not be the case if economies of scale or efficiency gains are important under a higher concentration of firms (on these issues in industrialized countries, see for example Whitley, 2003, and Lopez and Liron-Espana, 2003). For example, a larger number of firms could lead to higher overhead/fixed costs in the sector as a whole, which may reduce the competitiveness of the country's exports on the world market. Competition among privatized firms may also down the road lead to consolidation, with larger firms backed up by foreign capital gaining control, which could again lead to losses for farmers. The same could be said for the privatization of input supply if it is also subject to economies of scale.

It is important in concluding to highlight the fact that the model proposed in this paper is very simple, and therefore cannot fully reflect what has actually happened with the privatization and liberalization process in African countries. Consider again the case of Benin. As of the mid 1980s, the country renounced Marxism and embarked on a series of structural adjustment reforms, which included cotton privatization but went far beyond that. On the whole, the reforms have been a success, with sustained per capita GDP growth since the early 1990s. But some reforms have been less successful than others. In the cotton sector specifically, serious difficulties have been encountered in making the new system work smoothly. For example, some private operators have not observed the rules of the game in terms of providing in a timely manner quality inputs to farmers, or in terms of paying their debts to other operators. These difficulties, which have not been modelled here, have also generated concerns among farmers. Still, despite the limits of the model presented here, the exercise has the merit of illustrating some of the risks of full price liberalization (and thereby the risk of price discrimination) under the privatization process now underway in many countries.

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