A theory of the optimal amount of public ownership of land

Bertrand CRETTEZ
C.R.E.S.E., Université de Franche-Comté
et C.E.M.E, Université de Paris I
Claire LOUPIAS
Université de la Rochelle et C.E.B.I., Université de Paris I
Philippe MICHEL(*)
I.U.F, GREQAM, Université de la Méditerranée II

1 Introduction

A major issue in reforming previously planned economies is the creation of assets markets. Indeed, Calvo and Frenkel [1991] and Blanchard et alii [1991] point out the importance of assets markets for increasing the propensity to save, for sustaining private investment and for providing correct valuations of firms\(^1\). Privatisation is a necessary preliminary step toward the creation of assets markets and there is an ongoing debate about whether they should be mass-based or not (see e.g. Roland and Verdier [1991], Checci [1993]). Roland and Verdier [1991] suggest that there is a strong argument in favour of mass-based privatisation, because the share of private ownership must reach a certain critical mass in order to fully enjoy the benefits of an established market economy\(^2\) (see also Grosfeld [1990]). On the contrary, Checci [1993] argues that a mass-based privatisation will bring about a wealth effect, induce a rise in consumption and a reduction of available savings.

One could also oppose mass-based privatisation on the ground that countries in transition from socialism to capitalism lack of proven entrepreneurial talent. As shown by Uhlig [1993], this could result in financial collapse.

But one should also take into account the mere characteristics of the assets to be privatised. Indeed, a market economy with both land

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\(^{1}\) One should add: consumption smoothing, government deficit financing, risk diversification and speculation enhancing (see Checci [1993]).

\(^{2}\) However, Roland and Verdier recognise that the benefits of mass-based privatisations could be in jeopardy due to coordination problems.
and capital may exhibit either under- or over-saving with respect to the golden rule (see e.g., Allais [1947], Homburg [1991], Malinvaud [1987], Rhee [1991]).

In an economy with land and capital and a constant population, private property in land prevents the economy from reaching the golden rule-zero interest rate. Indeed, as the value of land is the discounted sum of future rents, if this value is to be well-defined, interest rates must be strictly positive. Moreover, private ownership of land diverts resources from more productive activities and could put growth in jeopardy.

These remarks suggest that, for a given economy, there might exist an optimal amount of public ownership of land. For instance, in a (stationary) economy with land and capital and a constant population, the optimal rate of public ownership of land could be 100%. However, for an economy with a constant (endogenous) growth rate, the optimal rate of public ownership of land could be strictly less than 100%: even if private ownership of land has a negative effect on growth, a very high growth rate is not always desirable — at least from a social point of view.

In this paper, we look for an optimal rate of public ownership of land under the assumption that rents for public lands are redistributed to agents and capital is always privately held. It is our opinion that this optimal rate should be taken into account when devising privatisation of land in previously planned economies.

To derive this optimal rate of public ownership of land, we make use of a two sectors model with labour, land and capital as inputs and with non-altruistic overlapping generations of agents (the basic ingredients of the model are presented in section two).

Section three is devoted to the study of the command optimum of our model. In section four, we analyse the competitive equilibrium of an economy with mixed-ownership of land. It is proven that the latter is Pareto-optimal. A version of the second welfare theorem is then presented in section five: we show that under certain conditions, the command optimum can be decentralised using one and only one instrument: the rate of land which is publicly owned (capital being fully privately owned). This is what we call an optimal rate of public ownership of land for our model. Our results are discussed in section six which ends the paper.

2 The model

We make use of an overlapping generations model à la Allais [1947]-Diamond [1965]. The economy consists of agents and firms. Agents are non-altruistic in the sense that they do not take care of the well-beings of
future generations. An important feature of our framework is that there is a fixed non reproducible endowment of land noted \( X \) the services of which may be consumed by agents or used as inputs by firms.

2.1 Agents

In each date \( t \) a constant number of identic non-altruistic agents is born. Without loss of generality, their number is normalised to one. Each individual lives for two periods, supplies inelastically his labour in youth age and consumes in both periods.

An agent born in \( t \) has a lifetime utility function:

\[
U_t = \gamma_1 \ln C_{1,t} + \gamma_2 \ln X_{1,t} + \gamma_3 \ln C_{2,t+1} + \gamma_4 \ln X_{2,t+1}
\]

with \( \sum_{i=1}^{4} \gamma_i = 1 \) and \( 0 < \gamma_i < 1, i = 1, \ldots, 4 \).

\( C_{1,t} \) and \( C_{2,t+1} \) are respectively the amounts of consumption good consumed during youth and old age; \( X_{1,t} \) and \( X_{2,t+1} \) stand respectively for the land produced services consumed by an agent during both youth and old age\(^{(3)}\). These land produced services are supposed to be proportional to the amount of land rented (e.g. Dusansky and Wilson [1993]). Without loss of generality, this coefficient of proportion is set to be one.

2.2 Firms

There are two sectors of production. In each sector firms act competitively. For simplicity we consider that there are two representative firms, one in each sector.

The representative firm in the first sector produces a capital good with capital good \( (K_{1,t}) \) and uses a Rebello [1991] like production function:

\[
Y_t^k = K_{t+1} = aK_{1,t}.
\]

The representative firm in the second sector produces a consumption good according to a Cobb-Douglas function with three inputs: capital \( (K_{2,t}) \), labour \( (N_t) \) and land \( (X_t) \):

\[
Y_t^c = K_{2,t}^\alpha N_t^\beta X_t^{1-\alpha-\beta}.
\]

We assume that \( 0 < \alpha < 1, 0 < \beta < 1, \alpha + \beta < 1 \). Once more we suppose that services produced with land are proportional to the amount which is rented (the coefficient of proportion is one).

\(^{(3)}\) See also Homburg [1991] for a similar modelling strategy.
The main reason for using the Rebello production function is simplicity. Indeed this is the simplest set-up in which there are constant returns to scale with respect to all reproducible and non reproducible factors. A more general set-up could be used in which the inputs of the production function of the reproducible factors would be precisely the reproducible factors. Land would only be used in the production of the consumption good. Using such a framework would make the analysis more intricate without changing the results qualitatively.

3 The command optimum solution

As will be seen in the sequel, the competitive equilibrium of our economy is Pareto-optimal. In usual overlapping generations model agents are selfish, i.e. they do not take care of the well-beings of future generations. Life-cycle savers are usually unable to achieve the path of capital accumulation which maximises per capita consumption in the long-run.

On the opposite, the command optimum problem is merely a problem of optimal intergenerational allocation of resources, i.e. of achieving equity across generations.

It will be shown that when the redistribution of the rents of public land does not give rise to distortions, it is a “good” policy instrument for implementing the social optimum.

Let us assume that the social intertemporal preferences can be represented by the following intergenerational welfare function:

\[ \sum_{t=-1}^{+\infty} \delta^t U_t \]  \hspace{1cm} (4)

where \(0 < \delta < 1\).

This welfare function is a weighted sum of the life-cycle utility functions of all generations.

The objective of the social planner is to maximise (4) subject to the physical constraints:

\[ Y^C(K_{2,t}, N_t, X_t) = C_{1,t} + C_{2,t} \]  \hspace{1cm} (5)

\[ X = X_{1,t} + X_{2,t} + X_t \]  \hspace{1cm} (6)

\[ N_t = 1 \]  \hspace{1cm} (7)

\[ K_t = K_{1,t} + K_{2,t} \]  \hspace{1cm} (8)

\[ K_{t+1} = \alpha K_{1,t} \]  \hspace{1cm} (9)

with respect to

\(\{C_{1,t}, C_{2,t}, X_{1,t}, X_{2,t}, X_t, K_{1,t}, K_{2,t}, K_{t+1}, N_t\}_{t=0}^{\infty}\)
given $K_0$ and $C_{1,-1}$.

In order to ease the analysis of the command optimum solution it is useful to re-write the utility function as follows:

$$U_t = U_1^t + U_2^{t+1}$$

where:

$$U_1^t = \gamma_1 \ln C_{1,t} + \gamma_2 \ln X_{1,t}$$

and

$$U_2^{t+1} = \gamma_3 \ln C_{2,t+1} + \gamma_4 \ln X_{2,t+1}$$

so that the social planner objective boils down to maximise:

$$\sum_{t=0}^{\infty} \delta^t (U_1^t + \frac{1}{\delta} U_2^t)$$

(10)

under the constraints:

$$Y^C_t(K_{2,t}, 1, X - X_{1,t} - X_{2,t}) = C_{1,t} + C_{2,t}$$

(11)

$$K_{t+1} = a(K_t - K_{2,t}).$$

(12)

Let us now characterise the command optimum solution. Let $u_t$ be the lagrangian of the problem:

$$L_t = U_1^t + \frac{1}{\delta} U_2^t + \delta \omega_{t+1} a(K_t - K_{2,t}) - \omega_t K_t + \lambda_t [Y^C_t - C_{1,t} - C_{2,t}]$$

(13)

One can apply the necessary and sufficient conditions for optimality of Michel [1990]. These conditions give the following property: the lagrangian at date $t$ reaches a maximum with respect to $(K_t, K_{2,t}, C_{1,t}, C_{2,t}, X_{1,t}, X_{2,t})$:

$$\frac{\partial L_t}{\partial K_t} = 0 \Leftrightarrow \delta \omega_{t+1} a = \omega_t$$

(14)

$$\frac{\partial L_t}{\partial K_{2,t}} = 0 \Leftrightarrow \delta a \omega_{t+1} = \lambda_t \frac{\partial Y^C_t}{\partial K_{2,t}}$$

(15)

$$\frac{\partial L_t}{\partial X_{1,t}} = 0 \Leftrightarrow \frac{\gamma_2}{X_{1,t}} = \lambda_t \frac{\partial Y^C_t}{\partial X_{1,t}}$$

(16)

$$\frac{\partial L_t}{\partial X_{2,t}} = 0 \Leftrightarrow \frac{\gamma_4}{\delta X_{2,t}} = \lambda_t \frac{\partial Y^C_t}{\partial X_{1,t}}$$

(17)

$$\frac{\partial L_t}{\partial C_{1,t}} = 0 \Leftrightarrow \frac{\gamma_1}{C_{1,t}} = \lambda_t$$

(18)

$$\frac{\partial L_t}{\partial C_{2,t}} = 0 \Leftrightarrow \frac{\gamma_2}{\delta C_{2,t}} = \lambda_t$$

(19)
One must add equations (11)-(12) and the transversality condition:

$$\lim_{t \to +\infty} \delta^t \omega_t K_t = 0. \quad (20)$$

**Proposition 1** The command optimum solution exists: it is the unique growth path at which the capital stock grows at the constant rate $a \delta$ and the consumption grows at the constant rate $(a \delta)^\alpha$.

**Proof.** Let us consider the uniqueness part of the proof and suppose that there exists at least one solution. The problem is concave, and the intra-period utility function of the social planner is strictly concave. Then, if there is a solution, it is a unique one.

Now, let us consider the following allocation:

$$
\begin{align*}
K_{2,t+1} &= a \delta K_{2,t} \\
K_{t+1} &= a \delta K_t \\
K_{2,0} &= (1 - \delta) K_0 \\
X_t &= \eta_1 X \\
X_{1,t} &= \frac{\gamma_2 \eta_1 X}{(1 - \alpha - \beta) \eta_0} \\
X_{2,t} &= \frac{\gamma_3 \eta_1 X}{\delta (1 - \alpha - \beta) \eta_0} \\
\lambda_t &= \frac{\eta_0}{K_2^\alpha (\eta_1 X)^{1-\alpha-\beta}} \\
Y_t &= \frac{\eta_0}{\lambda_t} \\
C_{1,t} &= \gamma_1 \lambda_t \\
C_{2,t} &= \gamma_3 \delta \lambda_t \\
\omega_{t+1} &= \frac{\alpha \eta_0}{\delta a K_{2,t}}
\end{align*}
$$

where

$$
\begin{align*}
\eta_0 &= \frac{\delta \gamma_1 + \gamma_3}{\delta} \\
\eta_1 &= \frac{1}{\gamma_2 + \gamma_4 \delta^{-1}} \cdot \frac{\eta_0 (1 - \alpha - \beta) + 1}{\eta_0}
\end{align*}
$$

As one can readily check, this allocation solves the necessary and sufficient conditions. This ends the existence part of the proof. \qed
An important feature of the command optimum solution is that the growth of consumption \((\mu \delta)^*\) is lower than the growth of capital \((\delta^\alpha)\) which is the engine of growth\(^\text{(4)}\). This stems from the fact that the production of consumption good uses a non reproducible factor.

One can note that the lower the social discount rate the higher the command optimum growth rate of capital (and consumption). Indeed, as the social planner give more weights to later generations it is socially optimal to reduce the consumption of earlier generations in order to increase capital accumulation and to produce more consumption goods in the future.

Finally, two other facts characterise the command optimum solution. First, the optimal growth rate of capital is an increasing function of the productivity of capital in the capital good sector. Second, the services of land consumed by agents and used by firms are proportional to the total amount of land in the economy.

After having characterised the command optimum solution, we now turn to the analysis of the competitive equilibria with both private and public property of land. The motivation of this analysis is as follows: we will show that one can decentralise the command optimum solution by correctly choosing the amount of public land.

4 Competitive equilibrium with private and public property of land

In this section, we study the competitive equilibria of an economy where capital is privately held, but land is in part \((1 - \mu)\) owned by private individuals, the remainder part \(\mu\) being publicly owned \((0 < \mu < 1)\).

Savings at date \(t\) may be invested in both capital and land. The latter will be rented to both firms and households, and then sold to the new born generation. The proceeds of the sales, together with rents will be paid in to the landowners, i.e. the old generation in period \(t + 1\). Rents of public land are redistributed to the young generation. This is an important assumption as increasing the rate of public ownership of land will amount to redistribute resources from old to young agents. This will result in an increase in the national rate of savings.

The capital good is the numéraire. Let \(P_t\) denotes the price of the consumption good, and \(W_t, \Pi_t, Q_t\) be respectively the wage, the rent,

\(^\text{(4)}\)The fact that the growth rates of capital and consumption are constant stems from the linear production function in the capital good sector and the log-linear form of the lifetime utility function.
and the price of land. \( S_{k,t} \) is the part of savings invested in capital, \( Q_tS_{x,t} \) is the remainder part invested in land.

### 4.1 Agents

An agent born at date \( t \) is faced with two budget constraints. The first is the budget constraint an agent is faced with during youth age:

\[
P_tC_{1,t} + \Pi_tX_{1,t} + S_{k,t} + Q_tS_{x,t} = W_t + \Pi_t\mu X. \tag{21}
\]

Two comments are in order. First, a part of savings \((Q_tS_{x,t})\) is invested in land; second, agents are given public rents the amount of which is \(\Pi_t\mu X\). The second is the budget constraint an agent is faced with during old age:

\[
P_{t+1}C_{2,t+1} + \Pi_{t+1}X_{2t+1} = (1 + r_{t+1})S_{k,t} + (Q_{t+1} + \Pi_{t+1})S_{x,t}. \tag{22}
\]

\(Q_{t+1} + \Pi_{t+1}\) is the total return of savings invested in land (resales and rents).

If agents are to invest in both land and capital, it must be true that the total return in land equalises that on capital. Hence:

\[
Q_t = \frac{Q_{t+1} + \Pi_{t+1}}{1 + r_{t+1}}. \tag{23}
\]

Under (23), the two budgets constraints reduce then to:

\[
P_tC_{1,t} + \Pi_tX_{1,t} + \frac{P_{t+1}C_{2,t+1} + \Pi_{t+1}X_{2,t+1}}{1 + r_{t+1}} = W_t + \Pi_t\mu X. \tag{24}
\]

The optimal life-cycle consumption choices are:

\[
C_{1,t} = \frac{\gamma_1(W_t + \Pi_t\mu X)}{P_t} \tag{25}
\]

\[
X_{1,t} = \frac{\gamma_2(W_t + \Pi_t\mu X)}{\Pi_t} \tag{26}
\]

\[
C_{2,t+1} = \frac{(1 + r_{t+1})\gamma_3(W_t + \Pi_t\mu X)}{P_{t+1}} \tag{27}
\]

\[
X_{2,t+1} = \frac{(1 + r_{t+1})\gamma_4(W_t + \Pi_t\mu X)}{\Pi_{t+1}}. \tag{28}
\]

\(C_{2,0}\) and \(X_{2,0}\) are respectively equal to:

\[
C_{2,0} = \frac{\gamma_3((1 + r_0)K_0 + (Q_0 + \Pi_0)(1 - \mu)X)}{(\gamma_3 + \gamma_4)P_0} \tag{29}
\]
$$X_{2,0} = \frac{\gamma_4((1 + r_0)K_0 + (Q_0 + \Pi_0)(1 - \mu)X)}{(\gamma_3 + \gamma_4)\Pi_0}.$$  \hspace{1cm} (30)

### 4.2 Firms

The profit of the representative firm producing the capital good is

$$B_t^k = Y_t^K - (1 + r_t)K_{1,t} = (a - (1 + r_t))K_{1,t}.$$ \hspace{1cm} (31)

It will produce any amount of capital whenever:

$$1 + r_t = a.$$ \hspace{1cm} (32)

The profit of the representative firm producing the consumption good is

$$B_t^C = P_tY_t^C - (1 + r_t)K_{2,t} - W_tN_t - \Pi_tX_t.$$ \hspace{1cm} (33)

The first order optimality conditions are (under (32)):

$$P_t\alpha \frac{Y_t^C}{K_{2,t}} = a$$ \hspace{1cm} (34)

$$P_t\beta \frac{Y_t^C}{N_t} = W_t$$ \hspace{1cm} (35)

$$P_t(1 - \alpha - \beta) \frac{Y_t^C}{X_t} = \Pi_t.$$ \hspace{1cm} (36)

### 4.3 Competitive Equilibrium

**Definition 1** A perfect foresight competitive equilibrium for an economy with private property of capital and mixed property of land is a sequence of prices:

$$\{P_t, W_t, \Pi_t, Q_t, r_t\}_{t=0}^{t=\infty}$$

a sequence of decisions

$$\{C_{1,t}, C_{2,t}, X_{1,t}, X_{2,t}, K_t, K_{1,t}, K_{2,t}, N_t\}_{t=0}^{t=\infty}$$

such that:

a) given the sequences of prices, decisions are given by equations (2, 25 - 30, 34 - 36);
b) given the sequences of decisions, the sequence of prices clear all the markets (consumption good, capital good, land services, land sales):

\[ Y_t^C = C_{1,t} + C_{2,t} \]
\[ S_{x,t-1} + \mu X = X_t + X_{1,t} + X_{2,t} \]
\[ K_t = K_{1,t} + K_{2,t} \]
\[ 1 = N_t \]
\[ S_{k,t} = K_{t+1} \]
\[ S_{x,t} = (1 - \mu)X. \]

(37)  (38)  (39)  (40)  (41)  (42)

Note that (23) must also be satisfied.

In a standard overlapping generations model à la Diamond [1965], competitive equilibria may not be Pareto optimal. This prevails when the economy exhibits over-accumulation with respect to the golden rule capital stock. In our economy, things are quite different. Indeed, as states in the next proposition, competitive equilibria are always Pareto-optimal.

**Proposition 2** A perfect foresight competitive equilibrium with private property of capital and mixed property in land and constant rate of growth is Pareto-optimal.

**Proof.** The proof amounts to show that there is a social discount rate \( \delta \) such that the private decisions taken in equilibrium are the same as those which would be taken by a social planner with this particular rate \( \delta \).

Under our assumption, the growth rates of \( K_t \) and \( K_{2,t} \) are equal \((\gamma_K)\). We define \( I_t \) as

\[ I_t = W_t + \mu \Pi_t X. \]

One finds that\(^{5}\):

\[ W_t + \mu \Pi_t X = \frac{aK_{2,t}}{\alpha} (\beta + \mu \frac{\gamma_4 + \gamma_3(1 - \alpha - \beta) - \beta \epsilon}{\gamma_3 + \mu \epsilon}) \]

with:

\[ \epsilon = \gamma_1 \gamma_4 - \gamma_3 \gamma_2. \]

Then, \( I_t \) grows at the rate \( \gamma_K \). Let us define:

\[ \lambda_t = \frac{P_t}{I_t} \]

(43)

\(^{5}\)This follows after combining equations (37)-(38), (42), using (25)-(28) and (34)-(36).
\[
\omega_{t+1} = \frac{1}{\delta I_t} \\
\delta = \frac{1 + \gamma_K}{a}
\] (44) (45)

One can then check that (43)-(45) together with (25)-(28) and (34)-(42) satisfy (11) -(12) and (14)-(20).

Note that we can use proposition 1 in order to prove the existence of a competitive equilibrium.

Indeed, let us consider any equilibrium with mixed-ownership of land. It is clear that:

\[
\frac{K_{t+1}}{K_t} = 1 + \gamma_K = \frac{aK_{1,t}}{K_t} < a.
\]

This implies that:

\[
\delta = \frac{1 + \gamma_K}{a} < 1
\]

and it follows from proposition 1 that a perfect foresight equilibrium with mixed property of land exists and is unique.

Let us now discuss proposition 2. We make use of a model in which there are no externalities and in which there are constant returns to scale with respects to all inputs. Hence there is no room for inefficiencies which would prevent competitive equilibria from being Pareto-optimal.

However, while being Pareto-optimal, competitive equilibria do not necessarily realise the optimal intergenerational allocation of resources, i.e. equity across generations. What will be shown in the next section is that the social optimum may be decentralised by correctly choosing the proportion \( \mu \) of land which is publicly owned.

5 The optimal rate of public ownership of land

In this section we aim at decentralising the command optimum. We will show that the optimal path can be decentralised by using one instrument i.e. the proportion \( \mu \) of land which remains publicly owned.

The particular value of \( \mu \) which decentralises the command optimum will be called “optimal” because it implements the optimal intergenerational allocation of resources. In this sense we indeed have a version of the second welfare theorem.

There is however a restriction which is linked to the following function \( f(\cdot) \) of \( \delta \), the discount factor of the social planner:

\[
f(\delta) = \frac{\delta(1 - \beta \gamma_1) - \gamma_3 \beta}{((1 - \alpha - \beta) \gamma_1 + \gamma_2) \delta + (1 - \alpha - \beta) \gamma_3 + \gamma_4}
\]
Our main result is as follows:

**Proposition 3** Let the social discount factor $\delta$ verifies $0 \leq f(\delta) \leq 1$, then if $\mu = f(\delta)$, the corresponding mixed-ownership equilibrium decentralises the command optimum solution.

**Proof.** The proof is constructive.

In a competitive equilibrium, we have:

$$I_t = K_{2,t} \left( \frac{a\beta}{\alpha} + \pi\mu X \right)$$

where $\pi = \Pi_t / K_{2,t}$. We will look for $\mu$ such that:

$$I_t = \frac{1}{\delta \omega_{t+1}}. \quad (46)$$

From equation (15), we have:

$$\delta \omega_{t+1} = \lambda_t \alpha \frac{Y^c_t}{K_{2,t}}.$$

From the solution to the command optimum problem, this reduces to:

$$\delta \omega_{t+1} = \alpha (\gamma_1 + \frac{\gamma_3}{\delta}). \quad (47)$$

In equilibrium, we also have (36):

$$\pi = \frac{\Pi_t}{K_{2,t}} = \frac{a(1 - \alpha - \beta)}{X_t \alpha}.$$

From the solution to the command optimum problem, we know that:

$$X_t = \eta_1 X.$$  

Substituting for $X_t$ in the equation of $\pi$ gives:

$$\pi X = \frac{a}{\alpha} \left( 1 - \alpha - \beta + \frac{\gamma_2 + \gamma_4 \delta^{-1}}{\eta_0} \right).$$

Substituting in the definition of $I_t$ one finds:

$$m\mu = \frac{\delta (1 - \beta \gamma_1) - \gamma_3 \beta}{((1 - \alpha - \beta) \gamma + \gamma_2) \delta + (1 - \alpha - \beta) \gamma_3 + \gamma_4} \quad (48)$$

This defines a function $\mu = f(\delta)$. It is easy to see that $\mu$ is an increasing monotone function of $\delta$. Also, one has:

$$f(0) = \frac{-\gamma_3 \beta}{(1 - \alpha \beta) \gamma_3 + \gamma_4} < 0,$$

$$f(1) = \frac{1 - \beta (\gamma_1 + \gamma_3)}{1 - (\alpha + \beta) (\gamma_1 + \gamma_3)} > 1.$$
So, if \( 0 \leq \mu = f(\delta) \leq 1 \), the mixed-ownership of land equilibrium and the command optimum solution are the same. This ends the proof.

Proposition 3 shows that it is possible under a certain assumption to implement the optimal intergenerational allocation of resources by using one instrument: the rate of public land.

This rate may seen as an optimal rate of privatisation in previously planned economies. At date zero, privatisation would amount to give capital and \((1 - \mu) X\) land to old agents. The resulting competitive equilibrium would exactly duplicate the command optimum solution.

Of course, it is always possible to decentralise the command optimum with lump-sum taxes and transfers if they are available. In fact this may not be the case and public ownership of land could be — under the assumption given in proposition 3 and abstracting from any kind of public sector inefficiency — a useful instrument.

Now let us note two important insights to be drawn from the properties of function \( f(.) \).

First, we saw in proposition 1 that the growth rate of capital is an increasing function of the discount factor used by the social planner. Then, as \( f(.) \) is increasing with respect to the discount factor \( \delta \), this means that the higher the growth rate of capital of the command optimum solution, the higher the proportion of land which should be publicly owned.

Indeed, if this were not the case, an important part of the savings of the young would be devoted to buying lands. This would cause a drop in savings invested in "productive" assets (i.e. capital which is the engine of growth). Also, increasing the rate of publicly owned land has an effect to redistribute income from the old to the young. By giving more income to the young one can raise national saving rate and fuel capital accumulation\(^{(6)}\).

Second, if the growth rate of the command optimum \( (\delta a) \) is too strong, or too weak, then one cannot uniquely rely on the choice of \( \mu \) to decentralise the command optimum. A second instrument could be used. For instance one could use the proportion of public rents given to young and old agents in case where \( f(\delta) < 0 \). Indeed, in such a case, the optimal rate of growth of capital is very low and one could discourage capital accumulation by decreasing the proportion of public rents accruing to young agents (a policy which would result in a drop in

\(^{(6)}\) We are grateful to a referee who noticed the importance of this point.
savings). However, this could not be enough and one could have to rely on other kinds of policy instruments.

6 Conclusion

In this paper, we tried to illustrate the idea that the nature of the assets to be privatised in the (previously) planned economy matters. There is a fundamental distinction between land and capital in that capital is reproducible whereas land is in fixed supply. Moreover, full private property in land diverts savings away from investment in capital. This should be taken into account when devising any privatisation programme.

Because of the complex nature of the problem at hand, we were forced to use special assumptions as to the production function used in the production sectors and the utility function and as to the ways land is modelled.

Within that framework, we showed, that, providing the rate of growth of the command optimum is nor too low and neither too high, there is an optimal rate of public ownership of land, i.e. a rate which permits to realise the optimal intergenerational allocation of resources. We also showed that this rate is increasing with the growth rate of the command optimum solution. So there should be generally a superior limit to the amount of land being publicly held even when one abstracts from any kind of public sector inefficiency.

Let us close on one issue which characterises the present analyse and the solution on which is on the agenda of future research. First it was assumed that agents are non altruistic. If they were altruistic they could make gifts of lands to their children reducing the need of the latter to invest in land. One may wonder if public property in land would still be useful in order to achieve the optimal intergenerational allocation of resources.
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