The law of primogeniture and the transition from landed aristocracy to industrial democracy*

Graziella Bertocchi
Universita' di Modena e Reggio Emilia,
and CEPR

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ABSTRACT

This paper looks at the historical evolution of the relationship between an economy's structure and the corresponding political system, starting from feudal times. We show why, in an early agricultural phase, aristocratic political systems prevail, while democracies tend to emerge with the industrial phase, while at the same time the legal system regulating the intergenerational transfers of property rights evolves from primogeniture to equal partition. The model predicts a dynamic path for aggregate and individual income, the sectoral composition of aggregate output, class structure, wealth inequality, and political participation, which are consistent with the available historical evidence. While the main focus of the paper is the Old World, a comparative analysis allows to explain differential New World's developments.

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Key Words: Primogeniture, land, aristocracy, industrialization, democracy.

"But the law of inheritance was the last step to equality."

Alexis de Tocqueville, *Democracy in America* (1835).

1   Introduction

This paper looks at the historical evolution of the relationship between an economy's structure and the corresponding political system, starting from feudal times. In studying this connection, we start from the assumption that wealth is the principal source of political power and that, when there is a change in the primary source of wealth, political power will shift as well. We observe that, at least in the experience of Europe during the past ten centuries, agrarian societies tend to be inherently aristocratic, while industrialized societies, as capital replaces land, tend to move into the direction of democratization. At the same time, we observe an evolution in the legal system regulating the intergenerational transfers of property rights, with primogeniture being associated with land and aristocracy, and equal partition gaining ground as industrialization and democratization advance. Indeed, while land ownership cannot be divided up, capital, being reproducible and divisible, can be easily partitioned (and this is true for physical, and even more so for human capital). In this paper, we aim at establishing how the evolution of the law of inheritance is connected with the growth path of the economy, the sectoral composition of aggregate output, class structure, income and wealth inequality, and political participation.

A few historical coordinates are supplied here, even though they are fully explored only in Section 6, where we also relate them to our results. Up to the year 1000, after the fall of the Roman Empire and continuing through the phase of the barbaric invasions, Europe goes through a deep economic and political crisis. Income and population stagnate. In this scenario, feudalism is introduced by the Frankish kings as a system of military and political relationships aimed at maintaining external security and domestic order. In order to guarantee a stable flow of income to support, on the one hand, military expenses and on the other, an organized bureaucracy, the feudal lords were granted the income from great estates, in return for military service and for the local administration of justice (Cameron (1989)). By bringing political and economic stability, feudalism contributes to the solution of Europe's difficulties. During the 13th century, primogeniture, which was unknown in ancient times, emerges as a reaction to the intensified demographic

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transition and inefficient partition of land (Kelly, (1992)). It kept spreading across Europe up to the 16th and the 17th century, although marked differentiations in the local laws and in the actual customs were present (Le Roy Ladurie (1976)). For instance, in Italy primogeniture was only introduced in the early 16th century, while it was never adopted in Russia (Cooper (1976)). Generally speaking, it remained most common among the nobility (Thirsk (1976)), and whenever land constituted a dominant portion of wealth (Howell (1976)). The French revolution abolished entails, as so did Piedmont in the middle of the 18th century, but it is only with the 19th century that most European countries got rid of them, with some exceptions like Germany. This occurred despite all the controversies that the law of primogeniture provoked, and the fact that the demographic, social and economic reasons for it to emerge were already changing by 1800. The persistence of primogeniture indicates that the distinctive agrarian and rural institutions created in Europe in the Middle Age kept influencing economic activity until and even after the advent of industrialization. Eminent economists and political and social scientists, among them Smith, Montesquieu, De Tocqueville and Jefferson, contributed to the debate on the optimal law of inheritance, which spread from Europe to colonial America.

The relevance of the inheritance law is witnessed by Smith ([1776] 1937), who writes:

> "...when land was considered as the means, not of subsistence merely, but of power and protection, it was thought better that it should descend undivided to one... The security of a landed estate...depended upon its greatness. To divide it was to ruin it, and to expose every part of it to be oppressed and swallowed up by the incursions of its neighbors... But in the present state of Europe, when small as well as great estates derive their security from the laws of their country, nothing can be more completely absurd."

While from De Tocqueville ([1835] 1956) we read:

> "I look back for a moment on the situation of France seven hundred years ago, when the territory was divided among a small number of families, who were the owners of the soil and the rulers of the inhabitants; the right of governing descended with the family inheritance from generation to generation; force was the

only means by which man could act on man; and landed property was the sole source of power. As soon as land began to be held on any other than a feudal tenure, and personal property could in its turn confer influence and power, every discovery in the arts, every improvement in commerce of manufactures, created so many new elements of equality among men... But the law of inheritance was the last step to equality... When framed in a particular manner, this law unites, draws together, and vests property and power in a few hands; it causes an aristocracy, so to speak, to spring out of the ground. If formed on opposite principles, its action is still more rapid; it divides, distributes, and disperses both property and power."

The paper starts with a description of a static, purely agrarian economy which is associated with a stable aristocracy. There are two groups in the population, landlords and land-less workers. At this stage, wealth is land, power is wealth, so land is power. Next, we develop a dynamic model with an agricultural sector and a manufacturing sector, across which workers can migrate. We frame our analysis within an overlapping-generations model with bequests, where landed property is subject to primogeniture, while capital is partitioned among all children. There is a minimum wealth requirement for participation of workers in the political process, and the political majority sets a tax rate on agricultural workers. Initially, the aristocracy is in power and sets a positive tax rate. Our analysis not only incorporates agriculture and land into a neoclassical growth model, but also takes property rights on land seriously, and allows to address explicitly the role of the evolution of relative factor prices.

Our economy evolves as follows: As capital accumulates, workers migrate towards the manufacturing sector, while the agricultural sector shrinks. Wages are increasing, while rents and interest rates are declining. The income gap between landlords and workers is gradually reduced, and can reverse its sign if net rents become negative. The capital bequest of the landlords is higher than the capital bequest of the workers, at least until negative net rents kick in. As workers' capital bequests increase, the process of democratization begins. Once the tax is abolished by a workers' majority, income and wealth equalization will accelerate, together with political participation. Moreover, capital accumulation and income growth speeds up because the tax constitutes a distortion with respect of the output-maximizing sectoral allocation. Finally, the importance of land as a portion

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of total wealth declines, implying a reduction of the incidence of primogeniture. In particular, primogeniture is shown to produce the following effects: It restricts land ownership to a stable minority. It limits the decline of individual agricultural rents, and in doing so it delays the demise of the aristocracy despite the fact that its economic and political supremacy will eventually be eroded. By excluding the younger children from landed property, it affects the composition of the emerging middle class and its chances of upward social mobility. To sum up, the model establishes a connection between the evolution of society from an aristocratic political system into a democracy, the process of capital accumulation and of sectoral reallocation from agriculture into manufacturing, and the economic impact of primogeniture, thus generating a theory of endogenous franchise extension based on the sectoral evolution of the economy.

Our work is primarily connected with the research program which has focussed on the connection between growth, development and political institutions in a long-term perspective. Examples from this literature are Bertocchi and Spagat (1998, 2001), Acemoglu and Robinson (2000, 2002), Bourguignon and Verdier (2000) and Gradstein and Justman (1999). Closely connected, another stream of the literature has build a unified theory that captures the historical evolution of population, technology and output from Malthusian stagnation to Solowian growth (see Galor and Weil (2000) and Hansen and Prescott (1999)). Galor and Moav (2002 a, b) are also closely related for their analysis of the evolution of class structure.

There is also a literature on inheritance rules and the family, with some contributions attempting at finding an endogenous explanation of primogeniture (see Becker (1981) for a general introduction, Chu (1991), Bergstrom (1994) and Faith and Tollison (2001) for the lineage survival approach, and Guner (1990) and Botticini and Siow (2201) for a contract-theory approach).

On the role of land, we were inspired by the work of Eaton (1987) and Drazen and Eckstein (1988), from whom we take the basic structure of the model, although they assume constant population. Laitner (2001) and Koegel and Prskawetz (2001), in similar setups, allow for population growth, but not for capital accumulation. Recent work on the role of agriculture in development includes Caselli and Coleman (2001), Gollin, Parente and Rogerson (2002) and Parente (2000). See also Matsuyama (1992), Galor (1992) and Kongsamut, Rebelo and Xie (2001), for more on the dynamics of two-sector models. Classic papers on dualism are Jorgenson (1961) and Ranis (1988). On the related issue of land relations and reform, see

Horowitz (1993), Grossman (1994), Binswanger, Deininger and Feder (1995), and Conning and Robinson (2002). On the historical role of aristocracies, beside the collective essays in Goody, Thirsk and Thompson (1976), see Labatut (1978), Dewald (1996), and Werner (1998). Bendix (1978) is a source for data on enfranchisement, Kuznets (1955) and Lindert and Williamson (1985) on growth and inequality, and O'Rourke and Williamson on the evolution of relative factor prices.

The rest of the paper is organized as follows. Section 2 describes a static agrarian economy as an introduction to the fully-developed dynamic, two-sector model. Section 3 describes the main model for the analysis, with both an agricultural and a manufacturing sector. Section 4 analyzes the model and derives the main results. Section 5 considers a number of extensions of the basic model. Section 6 looks at the historical evidence and provides for it an interpretation in light of our results. Section 7 draws some conclusions and indicates lines for future research.

2   A static agrarian economy

As an introduction to the fully-developed model, we start presenting the pre-existing static agrarian economy with an aristocratic political system, before capital accumulation begins.

We consider an overlapping-generations model where production takes place in the agricultural sector. There are only two factors of production, land and labor. There is no capital. Land is in fixed supply, and equal to L. The labor force is also constant, since population growth equals 0. At each t, the output of the agricultural sector, A, is therefore constant and given by

$$A = L^{\alpha} N^{1-\alpha} \tag{2.1}$$

The agricultural good is not storable and can be used only for consumption. There are two groups of individuals: landlords $\mathcal{L}$ and land-less workers W. We assume that landlords also work. Each landlord owns an equal share e of the total amount of land, where e represents the minimal size of an estate. The costs of protecting and administering an estate, inclusive of the costs of maintaining a court, are infinite if its size is smaller than e. Such costs, to be covered out of the agricultural rents, are constant and equal to $\xi \geq 0$ if the estate is equal or larger than e. The size of the landlords'

group is small if compared to the size of the workers' group. Land is passed on from parent to child. Since $e\mathcal{L} = L$, setting $e = 1$ we obtain $\mathcal{L} = L$. In this model, wealth is the only determinant of political power. Since the only form of wealth is land, landed property is the sole source of power. The landlords therefore constitute an aristocracy, i.e., literally, a political system that exclusively assigns power to a few. Accordingly, as we shall see, they are in a position to charge workers a tax on their labor income. We shall refer to the resulting tax rate as to a voting equilibrium, even though at this stage the structure of the political system is rudimentary.

Individuals live for two periods. In the first period of life, they are born with one unit of labor that they supply inelastically. In their first period of life, the children of the aristocracy also receive their land inheritance. Production takes one period to be completed, so during the next period individuals receive their wage and rental income, where rental income of course only accrues to the landlords. In the second period of their life individuals optimally choose their level of second-period consumption, c_{t+1}, and the land inheritance for their children, e_{t+1}. Preferences are given by

$$u_{it} = \log c_{it+1} + e_{t+1} \tag{2.2}$$

for $i = L, W$, where u_{it} has standard properties. There is no market for land since land is never put for sale. For expositional convenience, for the determination of factor prices we will assume perfect competition, and that there is a tax on wages unilaterally imposed by the landlord. For his estate each landlord receives a rent which is given by

$$\rho = \alpha(\frac{N}{L})^{1-\alpha} \tag{2.3}$$

The individual wage is

$$w = (1 - \alpha)\,(\frac{L}{N})^{\alpha} \tag{2.4}$$

Wages are subject to a proportional tax at a rate τ, such that $0 < \tau < 1$, and tax revenues are collected by the landlords. Therefore, each landlord receives a constant after-tax rent which is given by

$$\rho^{\tau} = [1 + \frac{\tau(1-\alpha)}{\alpha}]\alpha(\frac{N}{L})^{1-\alpha} \tag{2.5}$$

and the individual after-tax wage is

$$w^{\tau} = (1 - \tau)\,(1 - \alpha)\,(\frac{L}{N})^{\alpha} \tag{2.6}$$

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Alternatively, we could have derived the same factor prices by assuming that workers do not receive their marginal product, but an average of what is left after landlords appropriate a fraction $\lambda = [\alpha + \tau(1-\alpha)]$ of the agricultural product. In other words, according to this interpretation factor prices in agriculture are determined on the basis of a sharing rule λ, where $\lambda > \alpha$ for $\tau > 0$, while $\lambda = \alpha$ for $\tau = 0$, and λ is determined by the relative strength of the landlords' group.

Let y_i, $i = L, W$, denote individual $i's$ total income exclusive of land inheritance at time t . Therefore we have $y_L = w^\tau + \rho^\tau - \xi$ and $y_W = w^\tau$. Each individual will maximize utility (3.3) subject to the constraints

(i) $c_{it+1} \leq y_i$, and

(ii) $e_{t+1} \geq e$

for $i = L, W$. The first constraint is standard, while the second captures the indivisibility of estates due to our assumptions about maintenance costs. The solutions will be $c_i = y_i$, $i = L, W$, and $e_{t+1} = e$, i.e., a stationary level of consumption, with landlords consuming more than workers as long as $\rho^\tau > \xi$, and a time-invariant estate size. In their second period, landlords also set the tax rate τ (or, equivalently, the sharing rule λ) to be imposed at $t+1$.

No savings are allowed in this model, and the entire agricultural output is divided between consumption and estate costs, according to

$$A = c_L L + c_W W + \xi L \qquad (2.7)$$

A perfect-foresight political equilibrium is a constant sequence $\{c_{LA}, c_{WA}, A\}_{t=0}^{\infty}$ such that at each t utility and profits are maximized, the agricultural good market clears, and the tax rate τ is a voting equilibrium. Given the constant size of the population, the absence of technological progress, and the absence of capital accumulation, consumption is constant for each social group, as is their income and the society's income and wealth distribution. A stable aristocracy naturally arises given the structure of property rights on land.

Even though the analysis of the transition from the static agrarian economy and the dynamic two-sector economy is beyond the scope of the present paper, we can think of the transition as being originated by an exogenous event. Indeed the appearance of technical progress in agriculture, due to a new political and economic order, may have come from the expansion and the improvement of cultivated land. In a Malthusian framework, this event allows constant or increasing wages and consumption, pushing to-

wards a permanent increase in the rate of population growth. In turn, the resulting agricultural surplus may have caused, at some point of the development process, the start of the process of capital accumulation. [1] The newly-determined economic conditions, characterized by technical progress in agriculture, population growth, and an initial condition for capital, are fully explored in the following analysis.

3 A dynamic model

3.1 Production

We consider an overlapping-generations model with bequests and two specific-factors technologies producing an agricultural and a manufacturing good using three factors, land, capital, and labor. At time t, production of the agricultural good, A_t, uses labor N_{At} and a fixed amount of land L, according to

$$A_t = (G_t L)^\alpha N_{At}^{1-\alpha} \tag{3.1}$$

where G_t is the level of technological progress in the agricultural sector and $G_{t+1} = (1+g)G_t$. The quantity of effective land is therefore $G_t L$. Production of the manufacturing good, M_t, uses labor N_{Mt} and capital K_t according to

$$M_t = K_t^\alpha N_{Mt}^{1-\alpha} \tag{3.2}$$

The agricultural good is not storable and can be used only for consumption, while the manufacturing good can either be used for consumption or bequeathed to children, who will in turn employ it as capital in the manufacturing sector. Labor is perfectly mobile between sectors at no cost.

3.2 Population

Total population grows at a rate n, and consists of two groups: landlords $\mathcal{L}$ and land-less workers W. As in the static agrarian economy, we assume that landlords also work and that each landlord owns an equal share e of the total amount of land L, where e represents the minimal size of an estate, with associated costs $\xi \geq 0$. However, the costs now grow with the level of effective

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[1]Maddison (2001) indeed attributes the increase in the rate of growth of population in Europe after the year 1000 to an increase in the area of rural settlement and the gradual incorporation of technological changes that raised land productivity.

land, i.e., at a rate g. The size of the landlords' group is initially small and cannot increase over time, given our assumptions on minimal estate size. Therefore, land is passed on to one child only (unigeniture). It is natural to assume that the heir of the estate is always the first child (primogeniture). The younger, land-less children become part of the workers' group.

Each individual also receives a capital bequest. Being a reproducible, divisible resource, capital can be divided up among all children in equal parts without restrictions (partition). Capital is subject to partition even among the landlords' class, in fact we assume that compensatory capital transfers are ruled out.[2] We assume that all individuals start with an identical level of initial bequest, b_0, and that the relative size of e is larger than b_0, so that at the start capital represents a negligible portion of the landlords' wealth. Moreover, the aggregate size of the initial capital bequests, $B_0 = \sum_j b_0$, where j is a representative individual, is also small, so that aggregate initial wealth in the economy is composed mostly of land.

3.3 Political system

In this model, wealth is the only determinant of political power. When wealth consists primarily of land, landed property is the sole source of power. The landlords therefore still constitute an aristocracy. Initially, capital plays no role in the political equilibrium of the model. In fact, we assume there is a minimum wealth requirement, $\tilde{b} \geq b_0$, for participation of workers in the political process. It is only when all workers will reach a level of wealth $\tilde{b}$ that the political system will turn into a full democracy, i.e., literally, a political system that assigns power to all the people. However, for workers to play a role in the political process, a partial degree of enfranchisement will suffice. And, since we assume that political decisions are made through majority voting, workers will be in a position to determine the outcome of elections as soon as enfranchised workers outnumber the members of the aristocracy. As we will see, enfranchisement in this model will be gradual and will progress at an endogenously-determined speed, even if all workers start with an identical initial capital bequest.

Landlords and workers are assumed to have different voting preferences regarding tax policy. In particular, under aristocracy, landlords impose a proportional tax τ on agricultural wages, while the tax is abolished when the median voter is a worker, i.e., as society evolves towards democracy.

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[2]In an extension we introduce the possibility of compensatory bequests for younger children.

3.4 Preferences

Individuals live for two periods. In the first period of life, they are born with one unit of labor that they supply inelastically, and they receive their land and capital bequests, which are employed in the production processes together with their labor. Production takes one period to be completed, so during the next period individuals receive their wage, interest, and rental income. As previously clarified, rental income and land bequests are exclusively reserved for the aristocracy. In the second period of their life individuals optimally choose their level of consumption and a capital bequest for their children. The landlords also bequeath their estate to their first children. Second-period consumption of an individual born at t is given by $c_{t+1} = c_{t+1}^A + c_{t+1}^M$, where c_{t+1}^A and c_{t+1}^M are the individual consumption levels of the agricultural and of the manufacturing goods, respectively. The agricultural and the manufacturing goods are assumed to be perfect substitutes in consumption, i.e., their relative prices are fixed. Preferences are given by

$$u_{it} = \delta \log c_{it+1} + (1 - \delta) \log b_{it+1} + e_{t+1} \tag{3.3}$$

for $i = L, W$, where u_{it} has standard properties., $0 < \delta < 1$ is a preference parameter, c_{it+1} is consumption, and b_{it+1} and e_{t+1} are the capital and the land bequests to the children, respectively.

3.5 Factor prices

We assume that in the agricultural sector the labor market is competitive, while there is no market for land since land is never put for sale. For his estate, in terms of effective land units, each landlord receives a rent which is given by

$$\rho_t = \alpha (\frac{N_{At}}{G_t L})^{1-\alpha} \tag{3.4}$$

To be noticed is that the actual rent a landlord receives for his estate, is instead given by $\alpha G_t^\alpha (\frac{N_{At}}{L})^{1-\alpha}$, which grows with the agricultural technological progress while, were the land partitioned among all the landlords' children, each of them would receive $\alpha G_t^\alpha (\frac{N_{At}}{L_t})^{1-\alpha}$. The individual wage is

$$w_{At} = (1 - \alpha)(\frac{G_t L}{N_{At}})^\alpha \tag{3.5}$$

When our story starts and the society's political system is an aristocracy, agricultural wages are still subject to a proportional tax at a rate τ, such

that $0 < \tau < 1$, and tax revenues are collected by the landlords. Therefore, each landlord receives an after-tax rent which is given by

$$\rho_t^\tau = [1 + \frac{\tau(1-\alpha)}{\alpha}]\alpha G_t^\alpha (\frac{N_{At}}{L})^{1-\alpha} \qquad (3.6)$$

The individual after-tax wage therefore is

$$w_{At}^\tau = (1-\tau)(1-\alpha)(\frac{G_t L}{N_{At}})^\alpha \qquad (3.7)$$

Again, the relative shares of the agricultural output could alternatively be interpreted as the outcome of a sharing rule $\lambda = [\alpha + \tau(1-\alpha)]$, where $\lambda > \alpha$ for $\tau > 0$, while $\lambda = \alpha$ for $\tau = 0$.

In the manufacturing sector both the capital and the labor market are competitive. Profit maximization yields the following wage and interest rate:

$$w_{Mt} = (1-\alpha)(\frac{K_t}{N_{Mt}})^\alpha \qquad (3.8)$$

$$r_t = \alpha(\frac{N_{Mt}}{K_t})^{1-\alpha} \qquad (3.9)$$

The capital stock is subject to full depreciation. Note that migration ensures the equality of the wage between the two sectors, i.e., $w_{At}^\tau = w_{Mt} = w_t$. Equating (3.7) and (3.8), we obtain the following expression for N_{At} :

$$N_{At} = G_t L (1-\tau)^{\frac{1}{\alpha}} \frac{N_{Mt}}{K_t} \qquad (3.10)$$

which shows that the number of workers in agriculture is a decreasing function of the level of the capital stock.

We will use the notation y_{it}, $i = L, W$, to denote individual $i's$ total income inclusive of capital inheritance but exclusive of land inheritance at time t. Therefore we have $y_{Lt} = b_{Lt}r_t + \rho_t^\tau - \xi G_t + w_t$ and $y_{Wt} = b_{Wt}r_t + w_t$.

4 Analysis of the model

4.1 Utility maximization

Each individual will maximize utility (3.3) subject to the constraints
    (i) $c_{it+1} + b_{it+1} \leq y_{it}$,
    (ii) $e_{t+1} \geq e$, and

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(iii) $\sum_j b^j_{it+1} = (1+n) \, b^j_{it+1}$,

for $i = L, W$, where b^j_{it+1} is the individual capital bequest received by child j. The first constraint simply states that the individual's consumption and capital bequest have to be less or equal to total income inclusive of the capital bequest received by the individual. The second constraint captures the indivisibility of estates due to our assumptions about maintenance costs. The third constraint imposes identical capital bequests to all children, i.e., rules out compensatory capital bequests. The solutions will be $c_{it+1} = \delta y_{it}$, $b_{it+1} = (1 - \delta)y_{it}$, $i = L, W$, $e_{t+1} = e$, and $b^j_{it+1} = \frac{b_{it+1}}{1+n}$. Note that, independently on which sector individuals receive their income from, they can consume both goods since they can trade intragenerationally at the unit price.

In their second period, those individuals whose capital holdings are higher than $\tilde{b}$ vote on the tax policy to be implemented at $t + 1$.

4.2 Market clearing

Given the above results, the market-clearing condition for the capital market is

$$K_{t+1} = (1 - \delta)y_{Lt}L + (1 - \delta)y_{Wt}W_t \qquad (4.1)$$

Aggregating over individual incomes, we obtain

$$K_{t+1} = (1 - \delta)(M_t + A_t) \qquad (4.2)$$

where the employment level in each sector is given by (3.10), and by the following condition for market clearing in the labor market

$$N_{At} + N_{Mt} = N_t \qquad (4.3)$$

The agricultural and the manufacturing goods markets must also be cleared at each t, implying

$$A_t = c^A_{Lt}L + c^A_{Wt}W_t + \xi L G_t \qquad (4.4)$$

$$M_t = c^M_{Lt}L + c^M_{Wt}W_t + K_{t+1} \qquad (4.5)$$

As previously explained, no market for land exists since land is never put for sale under our assumptions.

Note that at the aggregate level the unit price assumption, together with our preferences, implies that some manufacturing goods must be consumed, otherwise the price of the manufacturing good would have to be higher than the price of the agricultural good. In other words, $K_{t+1} < M_t$ and the saving rate $(1 - \delta) = \frac{K_{t+1}}{Y_t}$ is therefore bounded above by $\frac{M_t}{Y_t}$, where $Y_t = M_t + A_t$. Another feature of the model is that, while the aggregate saving rate $(1 - \delta)$ is constant over time, the portion of the manufacturing output which is invested at each t must of course vary over time, being given by $\frac{K_{t+1}}{M_t} = (1 - \delta)(1 + \frac{A_t}{M_t})$ which is larger than $(1 - \delta)$ and, as we will show, will decrease over time as $\frac{A_t}{M_t}$ declines.

4.3 Political equilibrium

A perfect-foresight political equilibrium is a sequence
$\{c_{Lt}^A, c_{Wt}^A, c_{Lt}^M, c_{Wt}^M, K_t, A_t, M_t, G_t, N_{At}, N_{Mt}\}_{t=0}^{\infty}$ such that at each t utility and profits are maximized, all markets clear, and the tax rate τ is a voting equilibrium, starting from given initial values of K_0, N_0, and G_0, and given the set of parameters $n, g, \alpha, \delta, L, \xi$, and $\tilde{b}$. The equilibrium path solves simultaneously equations (3.6)-(3.9) and (4.2)-(4.5), plus the wage-equalization condition (3.10).

The dynamic evolution of the system can be analyzed using the capital market clearing condition (4.2), starting from an initial condition K_0, where K_0 is assumed to be small. Given the available number of workers and the available amount of land, the distribution of workers across sectors will be determined by (3.10). For the resulting levels of N_{A0} and N_{M0}, the output levels A_0 and M_0 will in turn be determined. Out of resulting income levels, consumption will be chosen optimally, together with the level of capital to be used in the following period, K_1. From (3.10), it is clear that, along the equilibrium path, workers migrate to the manufacturing sector as the capital stock grows, while the agricultural sector shrinks. Therefore, the agriculture share of output varies inversely with the level of development.

Moreover, employment and output in agriculture will be lower, and employment and output in manufacturing higher, the higher the tax rate. For $\tau = 0$, the process of structural adjustment therefore slows down, implying that democratization, and the associated shift in the distribution of income within the agricultural sector, is associated with a larger, albeit still declining, agricultural sector. Finally, the change in tax policy also affects the process of capital accumulation and income growth, because it removes the distortion associated with the tax on sectoral allocation.

4.4 The balanced-growth path

In the long run, the dynamical system will evolve towards a unique and stable balanced-growth path, where all the relevant variables, and in particular K_t and Y_t, must grow at a rate n. It is clear now that the rate of growth of technological progress in agriculture, g, has to be equal to n in order to sustain such a path. With land as a fixed factor, population growth has to be balanced by an identical growth of effective land.

As previously noted, the abolition of the tax affects the speed of the capital-accumulation process and leads to higher balanced-growth levels of K_t and Y_t, and this occurs through its effect on the structural-reallocation process, which induces higher long-run levels of N_{At} and A_t and lower N_{Mt} and M_t.

4.5 Evolution of income and wealth distribution

We shall keep track of the evolution of income and its distribution as time goes and as sectoral reallocation progresses, taking into account the impact of a change in tax policy.

Let us start with the agricultural wages. Their evolution is given by

$$\frac{w_{At+1}}{w_{At}} = (\frac{1+n}{1+n^A})^\alpha \tag{4.6}$$

where n^A is the rate of growth of employment in agriculture. Before the system settles down along the balanced-growth path, $n^A < n$, since $n^A < 0$, so wages increase over time. In balanced growth, they will be constant, since agricultural employment grows at the same rate as population. The same pattern applies to manufacturing wages, which are equalized to those in agriculture, and evolve according to

$$\frac{w_{Mt+1}}{w_{Mt}} = (\frac{K_{t+1}/K_t}{1+n^M})^\alpha \tag{4.7}$$

where n^M is the rate of growth of employment in manufacturing. Together with the condition for wage equalization, (4.7) implies that $\frac{K_{t+1}}{K_t} = \frac{1+n^M}{1+n^A}(1+n)$.

Examine now the evolution of rents per unit of effective land, which is given by

$$\frac{\rho_{t+1}}{\rho_t} = (\frac{1+n^A}{1+n})^{1-\alpha} \tag{4.8}$$

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which implies declining rents until they settle at a constant balanced-growth level. However, it is important to notice how rents per unit of actual land show, of course, a different pattern, given by $(1+n)^\alpha \left(1+n^A\right)^{1-\alpha}$, with rents always growing, at a rate slower than n before balanced growth is reached, and at a rate n in balanced growth. Therefore, the actual rental income of each landlord grows, while the size of the landlords' group is kept constant by primogeniture. Moreover, were primogeniture replaced by partition, the rate of growth of actual rent per landlord would be lower, and given by $\frac{(1+n)^\alpha\left(1+n^A\right)^{1-\alpha}}{(1+n)^{1-\alpha}}$, which reduces to $(1+n)^\alpha$ in balanced growth. Finally, the interest rate will follow a pattern similar to that of effective rents, according to

$$\frac{r_{t+1}}{r_t} = \left(\frac{1+n^M}{K_{t+1}/K_t}\right)^{1-\alpha} \qquad (4.9)$$

Notice that all of the above relationships, from (4.6) to (4.9) are not affected by the presence of taxes, which only affect the levels, but not the time-evolution of the variables we have examined.

Let us turn now to the between-classes evolution of income distribution, taking into account the estate maintenance cost ξ. The difference between the after-taxes level of income of a landlord and a worker is given by $y_{Lt} - y_{Wt} = (b_{Lt} - b_{Wt})r_t + \rho_t^T - \xi G_t$. Since rents and interest rates decrease outside balanced growth, the gap is gradually reduced. Notice that, at least initially, interest income is a larger portion of landlords' income, since accumulation for them has been faster despite an identical initial capital condition. Moreover, at the same time, the wage component is increasing. At some point, however, if given the parameters of the model the unit rent per estate becomes smaller than the maintenance costs, the net rent will become negative, and the sum of wage and rental income will become smaller for landlords than for workers. As the process intensifies, eventually the capital bequest of the landlords will become lower than the capital bequest of the workers. To keep track of the distribution of total wealth, land has to be considered as well. Even though land remains the exclusive property of the landlords, its weight as a portion of total wealth declines, since before balanced growth is reached capital is growing more than effective land. With the decline of the incidence of land out of total wealth, we also observe a reduced impact of primogeniture on the transmission of the economy's wealth. So the economic importance of primogeniture declines with capital accumulation and sectoral reallocation towards manufacturing. De facto,

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partition will regulate intergenerational transfers for most of existing wealth and for most families in the long run.

We should now go back to the impact of taxes. Clearly, with taxes, the income gap between landlords and workers is amplified, so the abolition of the tax would contribute to income equalization, since with a positive tax rate, wages are lower in both sectors, rents and interest rates are higher. In addition, from the previous section, we know that the presence of taxation affects the allocation of workers across sectors, with a smaller N_{At} being associated with a tax, and this in turn affects capital accumulation and income growth. [3] With taxes affecting income distribution, wealth distribution will also be affected, with taxes amplifying the gap between capital bequests of the landlords and of the workers. To sum up, tax policy affects income and wealth distribution, as well as sectoral allocation and income growth.

The most interesting aspect in the evolution of distribution is the fact that the model endogenously creates multiple income and wealth classes, as new cadet lines are created at each t. By cadet lines, we mean generations of younger children of the aristocracy that at each t are excluded from land ownership and join the workers' class, starting with a capital bequest which differs from that of the original workers lines, as well as from that of the previously-created cadet lines. In other words even assuming, as we did, identical initial capital bequests, at each time t we will observe $t + 1$ types of individuals defined by the different level of the capital bequest they receive. The first type characterizes individuals who come from the original aristocracy (at each t, we have a line of landlords, i.e., of first born at each t of the original landlords, for each original landlord). A second type characterizes individuals who come from the original workers (again, we have a line of "pure" workers, expanding at the rate n, for each original worker). The remaining $t - 1$ types come from subsequent generations of cadets who are expelled from the landlords' class at each t. In turn, given the $t + 1$ types of bequests received at time t, there will be $t + 2$ types of bequests left for, and received by, generation $t+1$, since the younger children of the landlords will not receive any net rent, so their income will be different from the income of their oldest sibling, even thought they received identical bequests.

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[3]Note that the impact of tax on accumulation depends on sectoral reallocation and not on intergenerational redistributionn (as, for example, in Drazen and Eckstein (1988)) since in our model all sources of income accrue to individuals in the same period of thei lives.

The workers' group, including the constant inflow of cadets, grows over time at a rate $\tilde{n}_t \equiv n\frac{N_t}{N_t-L} > n$ and will include, besides the children of the original workers, first-generation workers, i.e., cadets just coming from the aristocracy, as well as previous-generation workers, i.e., children of cadets who came from the aristocracy at earlier times.

For example, for simplicity assume that $n = 1$ and that at $t = 0$ we have only one landlord and one worker, with $b_{L0} > b_{W0}$. At $t = 1$, there will be one first-born of the landlord, receiving a certain capital bequest, a second-born of the landlord, receiving an identical capital bequest but moving into the workers' group, and two children of the original worker, receiving an identical bequest. So indeed at $t = 1$ there are two types of bequests being received, three types of bequest being left - since the cadet will receive a different income if compared with his older brother - and $\tilde{n}_1 = \frac{4}{3} > 1$. At $t = 2$, there will be again one first-born of the landlord, a second-born of the landlord, with an identical bequest and moving into the workers' group, four grand-children of the original worker, and two children of the previous-generation cadet. This adds up to three kinds of bequests being received, four being left, and $\tilde{n}_2 = \frac{8}{7}$, with $n < \tilde{n}_2 < \tilde{n}_1$, i.e., the growth rate of the workers' group remains higher than n, but decreases over time as the landlords' group represents a smaller and smaller fraction of total population.

[INSERT Figure 1. The inheritance tree.]

Figure 1 maps the pattern of population growth, group by group, for $t = 0, 1, 2$, and for the case of $n = 1$ and only one individual per group at $t = 0$, l_0 and ω_0. The subscript indicates the period in which each individual is born, while the superscript is introduced only for individuals for whom a change of group has occurred during their family history. The difference between the subscript and the superscript indicates how many generations have past since the change occurred so, for example, ω_1^0 denotes a worker born at time 1 whose father was a cadet (i.e., the second-born of the landlord), while ω_2^0 denotes a worker born at time 2 whose grand-father was a cadet.

4.6 Evolution of political participation

Given the evolution of net effective rents previously examined, the time at which the richest group of workers reaches $\tilde{b}$ will determine the composition of the newly-enfranchised group of workers, call it the newly-formed middle class. Consider the following two cases. If $\tilde{b}$ is reached when net rents are

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still positive and the aristocracy is not yet impoverished, the middle class will be composed of cadets, i.e., cadets are going to be the first to be able to vote since they are at the top of the workers' income distribution. If that is the case, enfranchisement is going to be gradual. In addition, assuming that workers remain poorer than the cadets for another while, since at each t there are nL new cadets, it will take $\frac{1}{n} + 1$ subsequent generations of enfranchised cadets before the middle class reaches a voting majority. If instead, in the meantime, some workers reach $\tilde{b}$, than the process will be speeded up.

Otherwise, if $\tilde{b}$ is reached when the aristocracy is already impoverished significantly by the process of erosion of net rents, it could even be that it is the children of the original peasants, or else the children of previous cadet lines, that will make it first. In this case, a much larger number of individuals will be enfranchised at once. In addition, while in the former case enfranchisement will not immediately imply that the median voter is a member of the middle class, in the latter it will, because the children of the original workers will outnumber the landlords at once.

Therefore, the composition of the middle class, and the time at which it constitutes a majority, is crucially determined by the way inheritance is distributed in the model. After the middle class has conquered political power over tax policy, and the tax is abolished, the decline in the income and wealth gap between the two groups is accelerated, and political participation is furtherly expanded.

4.7 Summary

To sum up, we will reorganize the discussion from the previous sections, stage by stage. The first stage is defined by the presence of the tax, while the second stage starts when the tax is abolished. For each stage, we summarize the evolution of the model, in all its dimensions, i.e., capital accumulation, sectoral allocation, income and wealth distribution, the incidence of primogeniture, the composition of the middle class, and political participation.

In the first stage, as capital accumulates, workers start migrating towards the manufacturing sector, while the agricultural sector shrinks. Wages are increasing, while rents and interest rates are declining. The income gap between landlords and workers is gradually reduced, and can reverse it signs if net rents become negative. The capital bequest of the landlords is higher than the capital bequest of the workers until negative net rents kick in. The importance of land as a portion of total wealth declines, implying a reduction

of the incidence of primogeniture. As the workers' capital bequests increase, the richest workers - whose identity is determined by the degree of impoverishment the aristocracy - will reach $\tilde{b}$, and the process of democratization begins.

The second stage is reached when enough workers have reached $\tilde{b}$, and the median voter belongs to the middle class. With the abolition of the tax, the agricultural sector will be larger than under the tax, even though it will continue its reduction, while manufacturing will be smaller but will continue its expansion. Capital accumulation and income growth accelerate. The time evolution of factor prices is not affected by the change in policy, even though their levels are, with democratization pushing towards income and wealth equalization. The importance of land as a portion of total wealth keeps declining, together with the economic impact of primogeniture. Therefore, we observe an association between the evolution of society from an aristocratic political system into a democracy, on the one hand, and the sectoral reallocation between agriculture and manufacturing, on the other.

In the above discussion we have implicitly assumed that balanced growth is not reached until the second stage. But balanced growth can actually be reached by the system even in the first. If that is the case, the change in tax policy constitutes a shock that causes the system to move to a different balanced-growth equilibrium, with a larger agricultural sector, a larger level of capital and income, and reduced inequality.

Finally, we can briefly perform a comparative-statics exercise, by examining the impact of the parameters which are special to this model. For a larger ξ, the impoverishment of the aristocracy starts earlier so, for a given $\tilde{b}$, cadets are more likely to fall at the bottom of the wealth distribution among workers. This will delay enfranchisement, but will shorten the distance between the start of the democratization process and the abolition of taxes. On the other hand, a higher $\tilde{b}$ implies a delay in democratization, which could come only at a late stage of the sectoral reallocation process, i.e., for an economy which has already industrialized. A larger L implies a larger $\bar{n}$. Predictably, a higher τ means a smaller agricultural sector and higher inequality, and a larger α goes into the same direction. Ceteris paribus, a higher δ slows down capital accumulation, while a larger n requires a larger g for a balanced-growth path to exist.

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5 Extensions

5.1 Compensatory bequests

The historical literature documents the wide-spread use of non-land, at least partially compensatory bequests for cadets, as well as dowries for daughters. In the present model, these provisions would amount to a distribution of the capital bequests among children in an unequal way, with the first-born getting a smaller share, in order to compensate his primogeniture on the land.[4] Note that, when capital is still a small portion of family's wealth, i.e., in a relatively early phase of the development process, this would imply the absence of a capital bequest for the first-born while, in a later phase, the first-born would simply receive a smaller capital bequest. In any event, compensatory bequests reduce wealth inequality between landlords and the cadets and, as a consequence, income inequality, and thus tend to accelerate democratization.

5.2 An agrarian aristocracy

To capture a widely-shared perception of the aristocracy as a group that does not contribute to industrialization, and remains attached to the landed estates as its only source of wealth, consider the following variant of the basic model. Landlords have no initial capital b_0, only workers do. Moreover, the aristocracy is prevented from purchasing capital at later dates, and can simply consume its entire rental and labor income. This implies that cadets are left with their own labor to supply, and no capital, so they will always enter the workers' class from the bottom. The predictions of this variant of the model are the emergence of an association between an early, conspicuous level of consumption for the aristocracy, its rapid and drastic impoverishment as rents decline, and the emergence of a middle class consisting of children of low social extraction, which quickly gains political power.

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[4]A rigorous comparison between land and capital would of course require to consider the price of the two assets. However, the price in this model would be given by the present discounted value of the income accruing to each asset, i.e., rents and interests, respectively. Since both prices would decline through time, we can abstract from their explicit consideration, without affecting the qualitative results.

5.3 Universal primogeniture

In some periods, and in specific regions, the law of primogeniture was imposed on capital as well, typically under the pressure of the aristocracy, or the Church. However, forcing capital to be distributed unequally actually does not advantage the aristocracy, at least within the present model, since concentration of property means that only the first-born among workers will eventually be able to vote but, on the other hand, these first-born will be in a position to vote more quickly, and to gain power at once since by assumption they outnumber the aristocracy. Under this scenario, society could evolve towards the establishment of a newer aristocracy founded on capital wealth, rather than on land, which would coexist with a large "under-class" of workers with forever-limited political power.

5.4 The voting preferences of the middle class

So far we have assumed that the form of tax policy is a binary choice between the presence or the absence of a set tax rate. Instead, let tax policy under democracy be a function of the composition of the middle class. It is not implausible that its voting preferences depend on its social origins, with most recent cadet lines being closer to the preferences of the aristocracy. In other words, the higher the social distance between the middle class and the aristocracy, the higher is the absolute value of a tax that is imposed on land, and accrues to workers. To simplify, assume that the tax rate can take three possible values: $\tau = \theta$ when the aristocracy is in power, $\tau = 0$ when a middle class which is closer to the aristocracy has gained power, and $\tau = -\theta$ when power is gained by a middle class with lower social origins. The size of the manufacturing sector relative to agriculture, as well as income and wealth inequality, are increasing in the tax, and are therefore highest in the first regime, and lowest in the third. Capital and income on the other hand are highest under the second regime, because taxes - of either sign - distort the output-maximizing sectoral allocation.

5.5 The evolution of the estate maintenance technology

As democracy progresses, lands loses its role as a source of political and military power, and the estate protection and maintenance technology changes dramatically. The economy evolves towards a situation in which the minimum estate size disappears, and costs are simply proportional to the estate size. The constraint on utility maximization is removed, the political

and economic justification for primogeniture disappears, and land is divided among all children as capital is. Note that this is no land reform yet, because the property of the land is spread only among the children of the original landlords, who still constitute a small fraction of the population. This implies that the income advantage of the landowners becomes smaller and smaller as land keeps being divided. At the same time, if landed property no longer plays a special political role, there is no reason why land should not be traded. This makes land property even more fragmented, as workers can purchase it. The economy evolves towards a standard factor-specific model whose dynamic evolution is determined by capital and the price of land, partition dominates and social classes disappear because anybody can own either land or capital. The pressure of urbanization on land prices, and the emergence of capitalistic farming, would constitute the next step but, at least for now, at this point we lose interest.

6 Historical evidence (to be added)

7 Conclusion (to be added)

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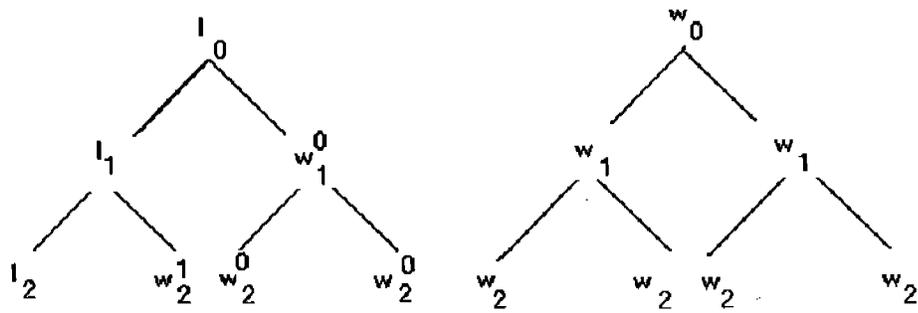Werner, K.K., 1998, Naissanse de la Noblesse. L' Essor des Élites Politiques en Europe, Librairie Arthème Fayard, Paris.

Figure 1. The inheritance tree