

# Income Distribution and Consumption Patterns in a Classical Growth Model\*

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## Abstract

In a multisectoral economy in which commodities are produced by different technologies, property rights distribution and consumption patterns affect both the possibility of industrialization and long-run growth. We elaborate a model to analyze this relationship and we trace out its classical origins, paying particular attention to Smith's and Malthus' contributions. We show that, when the economy is still in its agricultural stage, land distribution and the amount of expenditure out of rents are the key variables which determine the level of demand for industrial commodities. The resulting profits in the manufacturing sector provide the main incentive for industrialization. At a later stage, when the economy is already industrialized, expenditure out of wages may become the crucial variable to sustain long-run growth.

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# 1 Introduction

Mainstream textbook growth models typically consider saving decisions and the supply conditions of productive factors as the crucial elements determining the growth performance of an economy. By contrast, the analysis of demand factors and, in particular, the analysis of the relationship between income distribution, consumption patterns and growth does not stand high in contemporary research agenda. This neglect may turn out to be a serious lacuna: it may hinder a full understanding both of i) the causes which determine the long-run stagnation of an agricultural economy and of ii) some important features of a growing industrial economy.

Historians of Industrial Revolution have not failed to emphasize the role played by demand factors in the process of industrialization of an agricultural economy. Landes (1969), Chapter 2, focuses on the relation between income distribution, consumption patterns and the growth of the manufacturing sectors in the Eighteenth century England. In his view, middle classes flourished thanks to a favorable income and wealth distribution. The typical consumption pattern of these classes consisted in mass-produced commodities whose technology of production was characterized by considerable scale economies and a high capital/labor ratio. Moreover, English farmers were used to eat a superior kind of food, such as white bread, and to spend a smaller share of their income on food than their Continental counterparts. Thus English farmers had more money to spend on non-agricultural commodities such as those produced by the manufacturing sectors. Such a consumption pattern is, for Landes, one of the key elements which favored the industrialization of the English economy.

Landes' point of view is all the more intriguing when confronted with the one endorsed by some outstanding British classical economists who were direct witnesses of the historical facts studied many decades later by Landes. We refer in particular to Adam Smith and Thomas Robert Malthus (see Rosemberg (1968), Brewer (1998) and Marshall (2000)).

The 'core' of Smith's analysis of the process of industrialization of an agricultural economy may be found in Book III of *The Wealth of Nations* (hereafter *WN*). Smith reconstructs the progress of wealth in Europe since the fall of the Roman Empire and highlights the role played by landowners' consumption pattern. According to Smith, potential entrepreneurs expect that landowners are willing to spend their income on industrial commodities: expected profits from landowners' expenditure provide potential entrepreneurs with the incentive to introduce manufactures into the economy. Moreover, an increasing and widespread taste for industrial commodities is a powerful stimulus for landowners to raise their disposable income. Landowners are

led to implement more efficient agricultural techniques. Thus productivity in the key sector of the economy increases.

Malthus' analysis of the process of growth in an industrialized economy is carried on in Book II of his *Principles of Political Economy* (hereafter *PPE*). According to Malthus, the basic obstacle which may slow down growth in an industrialized economy is the lack of "an adequate stimulus to the continued increase of wealth" ( Malthus (1986), p. 288). This stimulus mainly consists in an adequate level of aggregate demand as determined by income distribution and the structure of property rights. For Malthus a wide class of wealthy farmers is able to generate a level of expenditure much higher than the one generated by few large landowners (when land property is too much concentrated) or by a multitude of poor peasants (when land property is too much fragmented). By the same token, the level of consumption from Smithian unproductive laborers need not be too low for aggregate demand and industrial production to grow *pari passu*.

Moreover, as real wages increase, workers may develop a taste for industrial commodities, usually referred to as "conveniences" or "comforts", which may induce them to control their fertility and to resist the temptation of indolence. As Gilbert (1980), p. 90, puts it:

When men are seen exercising a free choice not to marry at the first opportunity, it becomes more difficult to view them crudely as mere food-consumers and children-producers.

Workers' behavior may thus become a crucial variable affecting the long-run growth performance of an industrialized economy.

In what follows we analyze the relation between demand conditions and growth also in the light of Smith's and Malthus' insights sketched above. To avoid misunderstandings, it is worth stressing that our concern in this paper is not purely and not even predominantly historical. Rather, our basic aim is to develop a model in which income distribution and consumption patterns affect both the take-off and the long-run growth of an economy.

Our model is an extension of Murphy et al. (1989), heretofore unduly neglected in contemporary literature. The main differences (crucial to our findings) are the following:

1. agricultural productivity is a function of land distribution and of the availability of industrial goods,
2. workers' population is endogenous and
3. wage-earners may consume both agricultural goods and industrial goods.

Related papers which have inspired our work are Laitner (2000), Zweimuller (2000) and Kongsamut et al. (2001). Laitner analyzes the structural change of an economy with two goods and non-homothetic preferences focusing on the wealth effects involved by such transition. Zweimuller is interested into the relationship between demand composition and innovation and investigates the properties of the balanced growth path. Finally, Kongsamut et al. study a multisectoral economy which shows structural change and whose income grows at a constant rate.

The paper has 7 sections. Sections 2 and 3 briefly recall Smith's and Malthus' points of view on the role played by consumption expenditure (both its level and composition) in the various phases of the development process. Section 4 develops the formal model. The equilibrium conditions of the model are investigated in Section 5. In Section 6 we use our model to formalize three interesting stages in the development process of an economy. Finally Section 7 draws some concluding remarks.

## **2 Landowners' consumption and the take-off of a stationary agricultural economy**

According to Smith (1976), pp. 428-429, "no large country...ever did or could subsist without some sort of manufactures being carried on it. [...] This is even more universally the case in those poor countries which are commonly said to have no manufactures". Smith's examples of primitive manufactures carried on in all countries are clothing and housing. Of course, the presence of such manufactures does not imply that the economy is an industrial one. Thus a stationary agricultural economy may be defined as an economy where there is no manufacture of the industrial type, and where rent, earned by the landowners (the sovereign, the landlords and the clergy), is spent on the consumption of personal services or of commodities produced by foreign "finer manufactures" and imported from abroad:

In a country which has neither foreign commerce, nor any of the finer manufactures, a great proprietor, having nothing for which he can exchange the greater part of the produce of his lands which is over and above the maintenance of the cultivators, consumes the whole in rustic hospitality at home ( Smith (1976), p. 433).

Rent may be also partially saved and hoarded:

In a society where the finer manufactures are not available, opportunities for cultivating one's vanity are necessarily limited. In the absence of such commodities, large rental incomes are employed in hospitality, in the maintenance of a large group of retainers, and in acts of bounty to one's tenants. In spite of these acts of generosity, however, the typical behavior of large landowners as late as the time of European feudalism was reasonably frugal. Large landowners were not extravagant, and it was even common for them to save ( Rosemberg (1968), p. 367).

It goes without saying that in a stationary agricultural economy rent is the only kind of income which is not tied to the requirement of (re)production or of subsistence. Rent absorbs the whole surplus produced in the economy.

It is to be stressed that landowners' consumption behavior is not explained by Smith in subjectivistic terms, e.g. as the preference for a certain kind of commodities. Smith's explanation runs in objectivistic terms as it involves the absence in the economy under scrutiny of alternative commodities to consume. Thus landowners' consumption behavior is caused by the narrowness of the commodities' space at their disposal. That is a very important point in relation to the possibility of take-off of the economy.

Moreover, the absence of finer commodities to consume implies the absence of incentives for landowners to improve the organization of agricultural production in order to rise their disposable income. Given known technology, land resources are under-employed and technological innovation is neglected:

agriculture had been...under-performing because of indolence, caused by a lack of attractive manufactures. A taste for 'luxury', and an opportunity to gratify it, provides the incentives which are the key to economic development ( Brewer (1998), p. 81).

Hence in the economy under scrutiny idle physical resources exist to be devoted to the implementation of finer manufactures.

In a stationary agricultural economy the possibility of take-off is strictly tied to the creation of conditions favorable to the implementation and development of the increasing returns sector, the manufacturing sector. The availability of idle physical resources is not a sufficient condition for take-off. The industrialization process, in fact, starts if and only if there are agents within the economy who gain profits from the refinement of domestic primitive manufactures. (In the case of an economy characterized by a wide internal and external trade profits may derive also from the domestic production of the finer commodities previously imported from abroad.)

These agents take advantage from the fact that the taste for finer commodities has become so general as to occasion a considerable demand for them. According to Smith, in fact, finer manufactures are introduced into agricultural economies either through the gradual refinement of domestic primitive manufactures or through the imitation of foreign commodities (see Smith (1976), pp. 428-430).

Domestic manufactures need not crowd out foreign commodities. The development of a taste for finer commodities, in fact, creates incentives for landowners to rise their overall disposable income. On the one hand, landowners cut their expenditure on personal services and hospitality; on the other hand they take care to improve agricultural technique by changing the lease conditions to their tenants:

Farms were enlarged, and the occupiers of land, notwithstanding the complaints of depopulation, reduced to the number necessary for cultivating it, according to the imperfect state of cultivation and improvement in those times. By the removal of the unnecessary mouths, and by exacting from the farmer the full value of the farm, a greater surplus ... was obtained for the proprietor, which the merchants and manufacturers soon furnished him with a method of spending upon his own person in the same manner as he had done the rest. The same cause continuing to operate, he was desirous to raise his rents above what his lands, in the actual state of their improvement, could afford. His tenants could agree to this upon one condition only, that they should be secured in their possession, for such a term of years as might give them time to recover with profit whatever they should lay out in the further improvement of the land. The expensive vanity of the landlord made him willing to accept of this condition; and hence the origin of long leases ( Smith (1976), pp. 438-439).

The implementation and development of manufactures deriving from a widespread taste for finer commodities involve a series of interesting economic phenomena. The widening of the range of commodities available for consumption leads to a significant improvement of the efficiency of agricultural production and to an increase of both national income and consumption:

The expansion in the range of alternatives for the disposition of the economic surplus had the immediate effects of 1) shifting the composition of consumer expenditure flows away from

services and towards goods; 2) shifting upward the consumption functions of large property owners, who previously lived within their incomes because of the limited scope afforded for the exercise of personal vanity; and 3) the strength of the desire for these new goods provided a motive for efficient cultivation which was previously lacking. The increased incentive provided by the availability of new goods led to the elimination of known inefficiencies which had previously been tolerated and to legal and institutional changes which, by strengthening economic incentives, Smith regarded as indispensable to sustained economic growth ( Rosemberg (1968), p. 368).

Rents raise because landowners want to have more money to spend on finer commodities; manufactures grow because of a growing demand for their products; idle physical resources are diverted from agriculture, the decreasing returns sector of the economy, to manufactures, the increasing returns sector; the resources still invested in agriculture are more efficiently employed; and, finally, agricultural production grows. Put it briefly, economic development becomes a self-reinforcing cumulative mechanism.

### **3 Consumption patterns and income distribution in an industrialized economy**

In the stationary agricultural economy, examined in the previous Section, the level and composition of expenditure out of rents are the crucial variables for take-off to come true. Expected profits in the implementation of finer manufactures or in the refinement of domestic primitive manufactures depend on these factors. Once industrialization starts, the economic problem is constituted by the persistence of growth, that is, by the cumulative processes which may sustain or choke off growth.

Smithian economics, as is well known, locates the ‘fuel’ for growth in parsimony. It is the saving of income, that is, the expenditure of income in “productive consumption”, which determines the rate of capital accumulation and the share of “productive employment” on total employment (see the famous Chapter III of Book II of *WN*, *Of the accumulation of capital, or of productive and unproductive labour*). Emphasis is apparently put on the supply side. Yet, it is the extent of the market that, for Smith, limits the division of labor, the main source for increasing returns. As Young (1928), p. 530, remarked 152 years after Smith: “it would be wasteful to make a hammer to drive a single nail”.



Ricardian growth economics, rigorously founded on the so-called Say's Law, focuses unambiguously on supply factors. For Ricardo limits to growth are basically to be located in the conditions of supply of a factor of production, land, whose quantity and quality are assumed to be given and invariant: diminishing returns in agriculture lead to a decreasing rate of profits and, consequently, to a decreasing rate of capital accumulation.

By contrast, in Malthusian economics the rate of profits and the rate of capital accumulation may decline even if lands of first quality are still available. Limits to growth for Malthus are basically to be located in the demand side. Malthus concedes to Ricardo that the scarcity of lands of first quality is the limiting principle of profits; but he claims that the principle which actually regulates the rate of profits in the economies of his time is “the varying value of the produce of the same quantity of labour occasioned by the accidental or ordinary state of the demand and supply, by which a greater or smaller proportion of that produce falls to the share of the labourers employed” ( Malthus (1986), p. 219).<sup>1</sup> Malthus' argument is that a low level of demand for the commodities produced by the manufacturing sector may depress the rate of profits and the rate of capital accumulation long before the exhaustion of fertile lands:

But it appears to me perfectly clear in theory, and universally confirmed by experience, that the employment of capital may, and in fact often does, find a limit, long before there is any real difficulty in procuring the means of subsistence; and that both capital and population may be at the same time, and for a period of considerable length, redundant, compared with the effectual demand for produce ( Malthus (1986), p. 321).

For Malthus, a low level of demand may derive from three sources:

- 1) a “most unequal and vicious” distribution of land resources;
- 2) barriers to internal and external trade and
- 3) an insufficient amount of consumption from Smithian unproductive laborers (see Book II, Chapters VII, VIII and IX of *PPE*).

In Book II Chapter VII of *PPE* Malthus explicitly considers the distribution of land property as one of the main determinants of the level of effectual demand. In his view:

A very large proprietor, surrounded by very poor peasants, presents a distribution of property most unfavourable to effectual

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<sup>1</sup>The distinction between the “limiting principle of profits” and the “regulating principle of profits” is drawn by Malthus in Book I, Chapter V of *PPE*, *Of the profits of capital*. See also Costabile and Rowthorn (1985).

demand. [...] Thirty or forty proprietors, with incomes answering to between one thousand and five thousand a year, would create a much more effectual demand for the necessaries, conveniences, and luxuries of life, than a single proprietor possessing a hundred thousand a year ( Malthus (1986), pp. 298-299 ).

Yet, Malthus was not unaware that consumption expenditure may be depressed by going too far in the redistribution of land property. The final part of Chapter VII, in fact, discusses the economic consequences of the abolition of the right of primogeniture in England and France. A possible long-run outcome of this abolition may be an excessive fragmentation of land property which may have a negative effect on the development of a country.

The following Chapter VIII is devoted to scrutinize the relationship between the extension of internal and external trade and domestic prosperity. According to Malthus,

No country with a very confined market, internal as well as external, has ever been able to accumulate a large capital, because such a market prevents the formation of those wants and tastes, and that desire to consume, which are absolutely necessary to keep up the market prices of commodities, and prevent the fall of profits ( Malthus (1986), p. 309).<sup>2</sup>

Finally, the role of consumption from Smithian unproductive laborers is examined in Chapter IX. Unproductive laborers are those agents, engaged in personal services, who consume commodities but produce no commodities. Their incomes, once consumed, are part of the aggregate revenue of the manufacturing sector but do not constitute part of its aggregate costs.

Consumption expenditure out of wages (the income earned by productive laborers) and salaries (the income earned by unproductive laborers) may play for Malthus an important role to sustain long-run growth. In Book I, Chapter IV of *PPE (Of the wages of labour)* Malthus admits that growing real wages may induce workers to modify their concept of subsistence not only from a quantitative but also from a qualitative point of view. In a growing economy the price of the commodities produced by the increasing returns sector (usually referred to as “conveniences” or “comforts” by classical authors) falls in terms of the price of the commodities produced by the decreasing returns

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<sup>2</sup>As is well-known, Malthus’ overall position on foreign trade is many-sided and not easy to grasp. We shall not deal with it in greater details since in our paper we consider a closed economy. Needless to say, the analysis of foreign trade could be an interesting extension of our model.

sector (usually referred to as “necessaries” or more simply “corn”). Thus in a growing economy workers’ power of purchasing the commodities produced by the manufacturing sector increases even if workers receive an invariant “corn” wage. A taste for the conveniences produced by the manufacturing sector constitutes a strong incentive for workers to increase labor supply and to control fertility. Since “corn” consumption is proportional to the number of children to rear, a family of growing size obliges workers to reduce the share of their income devoted to the consumption of “conveniences”:

From high real wages, or the power of commanding a large portion of the necessaries of life, two very different results may follow: one, that of a rapid increase of population, in which case the high wages are chiefly spent in the maintenance of large and frequent families; an the other, that of a decided improvement in the modes of subsistence, and the conveniences and comforts enjoyed, without a proportionate acceleration in the rate of increase ( Malthus (1986), p. 183).

In this second scenario rising real wages provide an important source of demand for commodities produced by the increasing returns sector of the economy.

## **4 An extension of Murphy et al. (1989)**

In this Section we present an extension of Murphy et al. (1989) whose basic features are the following.

### **4.1 Goods and Factors of Production**

The economy has an agricultural sector, a manufacturing sector and a personal services sector. The former produces a homogeneous good, “food”, by means of a decreasing returns technology using land and labor. The manufacturing sector produces a continuum of goods by means of an increasing returns technology using labor: we call these goods “industrial goods”. We assume that the very same goods may be produced by a constant returns technology using labor in the personal services sector: we call these goods “personal services”. Such a partition of goods may be easily compared with the one generally endorsed by classical authors, that is, corn or necessaries, conveniences or comforts and luxuries.

## 4.2 Preferences

We assume that each agent maximizes the following:

$$U = \begin{cases} c & \text{for } c \leq z \\ z + \exp\left(-\int_0^1 (1-x(q))^{\frac{1}{q}} dq + \int_1^\infty x(q)^{\frac{1}{q}} dq\right) & \text{for } c > z, \end{cases} \quad (1)$$

where  $c$  is the food consumption,  $z$  is the threshold or the minimum amount of food consumption required before the consumption of non-agricultural goods begins,  $q$  is the index of the non-agricultural goods produced by the economy,  $x(q)$  assumes value 1 if good  $q$  is consumed or 0 otherwise. Since marginal utility is equal to  $\frac{1}{q}$ , agents prefer to consume goods with a lower index. The assumptions made on preferences imply that every agent consumes food first till she gets  $z$  units, then at most one unit of each other good. Thus the consumption pattern of each agent depends on her personal income; as far as income is lower than a certain threshold,  $z$ , total income is devoted to the consumption of food. Rich agents can consume both food and non-agricultural goods; richer agents consume a wider range of goods than poorer agents<sup>3</sup>.

## 4.3 Technology

### 4.3.1 Agricultural sector

Food is produced by land and labor. We assume a fixed coefficient production function and decreasing returns to scale. The assumption of decreasing returns to scale corresponds to the classical assumption that the various plots of land have different fertility. Moreover, we assume that the supply of land is overabundant in relation to labor supply. Employment in agriculture is thus the only factor which determines the aggregate production of food. We consider the price of food as numéraire, so that the following equality holds

$$F(L_F, a_F) = R + w_F L_F, \quad (2)$$

where  $R$  is the rent,  $F$  the production function in the food sector, with  $\frac{\partial F}{\partial L_F} > 0$  and  $\frac{\partial^2 F}{\partial L_F^2} < 0$ ,  $a_F$  is a productivity parameter ( $\frac{\partial F}{\partial a_F} > 0$ ) and  $w_F$  is the rate of wages in the food sector. We assume that  $w_F$  negatively depends

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<sup>3</sup>Agents care about current consumption; saving and investment in our model are carried on in the same period and there is no proper accumulation of capital stock as in standard growth models; as shown in Section 4.3.2, investment takes the form of payment of a fixed cost in terms of wages and has a depreciation rate equal to 1.

on  $L_F$ , and that  $R$  positively depends on  $L_F$ , that is

$$w_F = w(L_F, a_F) \tag{3}$$

$$R = R(L_F, a_F) \tag{4}$$

where  $\frac{\partial w_F}{\partial L_F} < 0$ ,  $\frac{\partial w_F}{\partial a_F} > 0$ ,  $\frac{\partial R}{\partial L_F} > 0$  and  $\frac{\partial R}{\partial a_F} > 0$ . We stress that the assumption  $\frac{\partial w_F}{\partial L_F} < 0$  alone does not imply by itself that  $\frac{\partial R}{\partial L_F} > 0$ .

### 4.3.2 Manufacturing and personal services sectors

Every good can be produced by two technologies. If a good is produced by the increasing returns technology we consider this good as an industrial good or a convenience; if the good is produced by the constant returns technology we consider it a personal service or a luxury good<sup>4</sup>. In particular,  $a_L$  units of labor are necessary to produce one unit of good when the constant returns technology is adopted, while  $a_M < a_L$  units of labor are necessary when the increasing returns technology is adopted. Yet, in order to use the latter technology firms have to pay a fixed investment equal to  $C$  units of labor. This cost can be considered as an activity of  $R\&D$  which allows firms to discover a new method of production and which provides them with a monopoly power<sup>5</sup>. On the contrary, luxury goods are sold in competitive markets.

## 4.4 Property rights distribution

Though agents' endowments of land and capital are different, for simplicity we assume that the share of land owned by each agent is the same as her share of capital. This implies that there is no difference between capitalists and landowners and that rents and profits distributions are the same.

Once agents are ranked according to their shares in increasing order,  $s_i$  is the share of agent  $i$  and  $G(s_i)$  the cumulative distribution of  $s$ . We assume that a large parte of population owns no property rights on land and/or firms. Let  $L$  be the total population and  $N = L(1 - G(\underline{s}))$  be the number

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<sup>4</sup>To clarify this point consider the following examples: someone willing to hear a Mozart's symphony either may buy a CD or may buy a ticket to hear an orchestra playing live music.

<sup>5</sup>The interpretation given in the text may be questionable, since generally the cost of innovation is payed once, while the return to investment is given by a flow of future profits. In our framework it is particularly difficult to model this aspect because future profits depend on the extent of demand, while the latter depends on future innovations, changes in income distribution, etc. *Zweimuller (2000)* provides an analysis of this case, though limited to balanced growth equilibria.

of shareholders, where  $\underline{s}$  is the minimum positive share:  $L - N$  is the number of agents having nothing but their labor<sup>6</sup>.

The generic agent's income is given by  $y = w + s(R + \Pi)$ , where  $s \in \{0, [\underline{s}, \infty)\}$  and  $\Pi$  are the aggregate profits. We assume that every shareholder can buy at least  $z$  units of food, that is

$$\underline{s}(R + \Pi) + w > z. \quad (5)$$

The value of  $N$  and the shareholders' distribution are crucial in order to determine the extent of demand for conveniences if  $w < z$ , that is, if wage-earners can buy only food; otherwise the demand for conveniences would depend on the size of population  $L$ .

## 5 Equilibrium analysis

In this Section we analyze the equilibrium characteristics of our model, given technology. In particular, we show that equilibrium in the labor market and in the agricultural sector determines the equilibrium employment in agriculture. Thus it is possible to determine the equilibrium rents and the equilibrium rate of wages. Finally equilibrium in the manufacturing sector determines equilibrium profits and employment for conveniences. Employment devoted to the production of luxuries is equal to the residual work force.

### 5.1 Equilibrium in the labor market

Murphy et al. (1989b) consider labor in agriculture and labor in manufactures as imperfect substitutes. According to historical observation, they suppose that  $w_M > w_F$  because of an indirect cost borne by laborers to work in a factory. Hence, if  $w_M > z > w_F$  then a flow of labor from agriculture to manufactures implies an increase of demand for industrial goods. (Remind that the ability of wage-earners to buy conveniences depends on the relationship between  $w$  and  $z$ .) Nonetheless, for the sake of simplicity, we assume that laborers can costlessly move across sectors and that every agent supplies one unit of labor inelastically. This implies that wages in all sectors are equal, that is

$$w_F = w_M = w_L = w. \quad (6)$$

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<sup>6</sup>Such a partition of the agents' set may be easily compared with the one based on incomes' sources typical of classical economists. In our framework we have only two classes because of our assumption that the class of capitalists coincides with that of landowners.

## 5.2 Equilibrium in the agricultural sector

The equilibrium condition in agriculture determines the level of employment in agriculture,  $L_F$ , together with conditions (3) and (6). It is worth remarking that  $L_F$  directly determines  $w$  as in classical authors, regardless of any other factor. In equilibrium the following relationship must hold

$$\min [w, z] (L - N) + Nz = F(L_F, a_F). \quad (7)$$

From the above equality it is possible to derive the equilibrium employment in agriculture (according to equation (3)  $w$  is a function of  $L_F$ ). Finally since the following relationship must hold

$$wL_F + R = \min [w, z] (L - N) + Nz$$

the level of rents in equilibrium is

$$R = \min [w, z] (L - N) + Nz - wL_F. \quad (8)$$

## 5.3 Equilibrium in the manufacturing and personal services sectors

In equilibrium the extent of industrialization is determined by the demand for conveniences, given technology and prices. Murphy et al. (1989) show that the equilibrium prices of all non-agricultural goods are the same and equal to the price which obtains when the good is produced by the constant returns to scale technology. In particular, since the markets for luxuries are competitive then the price of a luxury good is set to  $a_L w$  and profit for each monopolist is given by

$$\pi = (a_L w - a_M w) O - Cw,$$

where  $O$  is the market output. A good is produced if (expected) profits are positive, that is, if  $O \geq \frac{C}{(a_L - a_M)}$ . Therefore, the minimum quantity which makes profitable to produce a good is  $O^*$ , given by

$$O^* = \frac{C}{(a_L - a_M)}. \quad (9)$$

As already said, the higher the index  $q$  of a good the lower the demand for it. This implies that only the  $O^{*th} = N^{*th}$  richest agents consume this good. Hence the existence of a manufacturing sector strictly depends both on the productivity parameters  $a_L$ ,  $a_M$  and  $C$  and on property rights distribution.

To determine the number of goods produced by the manufacturing sector consider the share of profits of the  $N^{*th}$  richest consumer,  $s^*$ , given by

$$L(1 - G(s^*)) = O^* = N^*. \quad (10)$$

This consumer buys  $z$  units of food and spends all her residual income on conveniences, so that

$$Q^* a_L w = s^* (R + \Pi) + (w - z),$$

from which

$$Q^* = \frac{s^* (R + \Pi) + (w - z)}{a_L w}, \quad (11)$$

where  $Q^*$  is the number of available conveniences. In every sector but  $Q^*$  each monopolist gets positive profits. Finally consumers richer than the  $N^{*th}$  consumer spend their residual income on luxury goods.

To complete the description of equilibrium it is necessary to calculate total profits. The latter is equal to

$$\begin{aligned} \Pi = & \frac{(a_L w - a_M w)}{a_L w} \{ (L - N) \max[w - z, 0] + (R + \Pi) \int_{\underline{s}}^{s^*} s dG(s) + \\ & + (N - N^*) (w - z) + N^* s^* (R + \Pi) + N^* (w - z) \} - C w Q^*, \end{aligned}$$

where the first member in brackets is the demand (in nominal terms) from laborers (residual income from food); the sum of second and third members is the demand from middle class shareholders and the sum of fourth and fifth members is the demand from the richest agents;  $(a_L w - a_M w)$  is the difference between the price and the average (and marginal) cost of production and finally  $C w Q^*$  represents all the fixed costs paid in the economy. Notice that  $\frac{a_L w - a_M w}{a_L w}$  is the mark-up in the monopolistic markets; for the sake of simplicity we indicate this mark-up with  $\eta < 1$  (that is  $\eta = \frac{a_L w - a_M w}{a_L w}$ ) and the share of profits and rents owned by middle class with  $S^M$  (that is  $S^M = \int_{\underline{s}}^{s^*} s dG(s)$ ).

Substitution from (11) yields:

$$\Pi = \eta \{ (L - N) \max[w - z, 0] + (R + \Pi) S^M + (N - N^*) (w - z) \}$$

and solving for profits:

$$\Pi = \frac{\eta \{ (L - N) \max[w - z, 0] + R S^M + (N - N^*) (w - z) \}}{1 - \eta S^M}. \quad (12)$$



Aggregate profits are a positive function of aggregate rents  $R$ , of the level of wages  $w$ , of the aggregate share owned by the middle class  $S^M$  and of mark-up  $\eta$ . If  $w < z$  then aggregate profits are positive if rents are sufficiently high, that is, if  $R \geq \frac{(N-N^*)(z-w)}{S^M}$ . This condition always holds if  $\underline{s}(R + \Pi) + w > z$  (to prove it is sufficient to integrate in  $G(s)$ ), so that  $N^* \leq N$  is a necessary and sufficient condition for the existence of a manufacturing sector.

Finally, it is interesting to calculate the manufacturing sector employment

$$L_M = \frac{(L - N) \max[w - z, 0] + (S^M + N^*s^*) (R + \Pi) + N(w - z)}{a_L w}, \quad (13)$$

which positively depends on  $S^M + N^*s^*$  (the total share of profits plus rent spent in conveniences) and negatively on  $a_L$ .

To summarize: in our model equilibrium with a manufacturing sector is given by the following equations:

$$F(L_F, a_F) = \min[w, z](L - N) + Nz; \quad (14)$$

$$w = w(L_F, a_F); \quad (15)$$

$$R = \min[w, z](L - N) + Nz - wL_F; \quad (16)$$

$$O^* = \frac{C}{(a_L - a_M)}; \quad (17)$$

$$N^* = L(1 - G(s^*)) = O^*; \quad (18)$$

$$\Pi = \frac{\eta \{(L - N) \max[w - z, 0] + RS^M + (N - N^*)(w - z)\}}{1 - \eta S^M}; \quad (19)$$

$$L_M = \frac{(L - N) \max[w - z, 0] + (S^M + N^*s^*) (R + \Pi) + N(w - z)}{a_L w}; \quad (20)$$

$$Q^* = \frac{s^* (R + \Pi) + (w - z)}{a_L w} \quad (21)$$

$$L_L = L - L_F - L_M; \quad (22)$$

where  $\eta = \frac{a_L - a_M}{a_L}$ ,  $N = L(1 - G(\underline{s}))$  and  $S^M = \int_{\underline{s}}^{s^*} s dG(s)$ .

A manufacturing sector cannot arise if (i)  $w > z$  and  $O^* > L$  or if (ii)  $w < z$  and  $O^* > N$ . If a manufacturing sector cannot arise then only the first three equations and the last are the relevant ones, with  $L_M = 0$ .

## 6 Three interesting cases

In Sections 2 and 3 we have briefly recalled Smith's and Malthus' analyses concerning the relations among income distribution, demand conditions and growth. In the following Section we show that classical analysis may be easily formalized in terms of our model. In particular we discuss three cases which best fit our previous results. The first case concerns the factors which prevent development in an agricultural economy. The second case regards the transition from a stationary agricultural economy to an industrialized one and, finally, the third case concerns the conditions to satisfy for an economy to perform a positive long-run growth.

### 6.1 Case I: a stationary agricultural economy

Consider an agricultural economy (i.e. an economy with no manufactures of the industrial type) characterized by a low level of agricultural productivity, that is,  $w < \frac{F(L_F, a_F)}{L_F} < z$ .

In such an economy there is no demand for industrial goods if condition (5) does not hold, that is, if  $\mathfrak{s}(R + \Pi) + w < z$ . In this case income is entirely devoted to food consumption and the conditions for take-off do not come true.

This kind of poverty trap may happen if land property is too much fragmented. A certain degree of inequality in land distribution may create the conditions for take-off provided that it generates a sufficient expenditure out of rents for industrial goods (see equation (11)).

An increase in agricultural productivity may lead to  $w < z < \frac{F(L_F, a_F)}{L_F}$ . In this case, the increase in agricultural productivity may lead to an increase of aggregate rent and create the physical resources to be potentially employed in manufactures.

If equation (5) holds, then manufactures may develop provided that land distribution is such that the economy generates a level of demand able to cover the fixed and variable costs of production of industrial goods. Thus if  $N < N^*$ , that is, if land property is too much concentrated then demand for industrial goods is insufficient to make investment in manufactures profitable. In such a situation the increase of aggregate rent generated by the increase of agricultural productivity is spent on personal services and/or consumption of foreign "finer" commodities. Domestic manufactures do not arise.

At this regard it may be objected that an increase of agricultural productivity may lead to an increase of wages and rents and not just of rents. If an increase of  $\frac{F(L_F, a_F)}{L_F}$  leads to  $w > z$ , then wage-earners may become industrial goods consumers provided that the so-called Iron Law of wages

and population does not hold. As is well known, according to such a law any increase of the rate of wages above subsistence (historically determined by “habits and customs”) eventually leads to an increase of workers’ population. In our model this means that  $w$  would exceed  $z$  only temporarily. We further investigate this point in Section 6.3.

## 6.2 Case II: from a stationary agricultural economy to an industrial one

In *WN* a stationary agricultural economy is characterized by a class of landowners that consume only luxury goods and a class of wage-earners that consume only food. Smith (1976), pp. 413 ff, argues that a more egalitarian land distribution and different types of agricultural contracts may lead not only to a more egalitarian rent distribution among landowners but also to an increase of aggregate rent thanks to an increase of agricultural productivity. Both factors provide potential entrepreneurs with the incentives to invest in the manufacturing sector and may lead the economy out of long-run stagnation (see also Baldwin (1956) and Strassman (1956)). Moreover, as we have emphasized in Section 2, Smith claims that the availability of a wider range of goods provides landowners with further incentives to increase the productivity of their lands<sup>7</sup>.

To summarize: Smith describes the transition from a stationary agricultural economy to an industrialized one as a process in which an initial increase in agricultural productivity due to a change in institutional settings generates a sufficient level of demand for conveniences. Hence a manufacturing sector may develop. Furthermore, the availability of conveniences encourages landowners to increase agricultural productivity in order to increase

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<sup>7</sup> Malthus (1986), pp. 298-299, closely follows Smith’s argument: “Adam Smith has well described the slack kind of cultivation which was likely to take place, and did in fact take place, among the great proprietors of the middle ages. But not only were they bad cultivators/ and improvers; and for a time perhaps deficient in a proper taste for manufactured products; yet, even if they had possessed these tastes in the degree found to prevail at present, their inconsiderable numbers would have prevented their demand from producing any important mass of such wealth. We hear of great splendour among princes and nobles in every period of history. The difficulty was not so much to inspire the rich with a love of finery, as to break down their immense properties, and to create a greater number of demanders in the middle ranks of life who were able and willing to purchase the results of productive labour. This, it is obvious, could only be effected very gradually. That the increasing love of finery assisted considerably in accomplishing this object is highly probable; but these tastes alone, unaccompanied by a better distribution of property in other respects, would have been quite inefficient”. See also Maccabelli (1997).

their disposable income.

To model the relationship between productivity in agriculture on the one hand and land distribution and availability of industrial goods on the other hand we suppose that  $a_F$  positively depends on equality in land distribution and on the range of industrial goods, that is

$$a_F = a_F(\lambda, Q), \text{ with } \frac{\partial a_F}{\partial \lambda} < 0 \text{ and } \frac{\partial a_F}{\partial Q} > 0, \quad (23)$$

where  $\lambda$  is an index of inequality (e.g. Gini index) of land distribution.

A more egalitarian land distribution leads to an increase of  $N$  and, therefore, a decrease in  $\lambda$ . An increase of  $N$  may lead to  $N > N^*$  thus making investment in manufactures profitable. A decrease of  $\lambda$  positively affects  $a_F$  and thus leads to an increase of rents and wages (see equations (3) and (4) and the sign of the relevant derivatives). What above may be considered as the first phase of development. The second phase begins when manufactures start producing and thus industrial goods start being largely consumed in the economy. In this second phase the relation between  $a_F$  and  $Q$  becomes the crucial factor. The widening of the consumption set, that is, the increase of  $Q$  encourages landowners to raise their disposable income. Landowners are thus willing to accept the introduction of more efficient agricultural techniques (even if this involves a partial loss of power on their tenants). Agricultural productivity increases and this leads to an increase of rents and wages. Finally the increase of labor and property incomes leads to an increase of the number of industrial goods produced in the economy (see equation (11)). The growth of agricultural production and the growth of industrial production sustain each other: a virtuous circle of growth starts.

To conclude this Section, it is worth remarking that the development of a new productive sector requires a shift of labor force from the traditional sectors of the economy, that is, a shift from agriculture and personal services to manufactures. We have argued that manufactures start developing as soon as a decrease of  $\lambda$  causes an increase of  $a_F$  and, consequently, an increase of  $R$  and  $w$ . Given total population and the related total demand for food, an increase of  $a_F$  implies an excess of labor force in agriculture. Labor resources are thus set free to move to the new developing manufactures.

### 6.3 Case III: long-run growth

In the previous Section we have shown how a stationary agricultural economy characterized by a low level of agricultural productivity may start its process of industrialization. Land redistribution and/or an increase of agricultural

productivity may encourage shareholders to boost their demand for industrial goods. Provided that such a demand reaches a critical level, it becomes profitable for some agents within the economy to become entrepreneurs, that is, to invest resources in the refinement of the primitive domestic manufactures or in the domestic production of those “finer” commodities previously imported from abroad.

Shareholders’ demand, thus, plays a fundamental role in the take-off of an agricultural economy. Yet the explanation of long-run growth must include other factors. As highlighted by modern literature on growth, technological progress is surely one of the crucial elements affecting long-run growth. While we leave the analysis of technological progress to future research, in what follows we focus on the level of wages and the related consumption choices of wage-earners. In Section 4.4 we have assumed that shareholders constitute only a small fraction of total population. Thus, in the long-run, profits and employment in the manufacturing sector of the economy may be supposed to depend heavily on wage-earners’ expenditure on industrial goods. In terms of our model this means that in the long-run  $(L - N)(w - z)$  becomes the crucial addendum in equations (12) and (13).

Apparently, our model neglects a crucial element of classical economics. We refer to the so-called Iron Law of wages and population (also called Malthusian Law of population) according to which a rate of wages above subsistence ( $w > z$  in our model) or below subsistence ( $w < z$ ) leads to an increase (a decrease) of total population and of agricultural employment. Formally:

$$\dot{L} = L(w - z), \quad (24)$$

where  $\frac{\partial \dot{L}}{\partial w - z} > 0$ .

Thus any  $w - z$  gap is supposed to be a short-run phenomenon. *Rebus sic stantibus*, the economy described in our model would not be able to perform a long-run growth (see Section 6.1).

Yet, in Section 3 we have argued that Malthus, whose name is usually tightly associated to the Iron Law, was perfectly aware that the availability of conveniences and luxuries may affect wage-earners’ behavior: wage-earners may devote (at least partially) the excess of their income over subsistence to the consumption of conveniences, given the size of their families. Thus, workers’ population and workers’ consumption of food may stay almost stationary or may grow not too fast in the face of increases in agricultural productivity and real wages.

In terms of our model we must modify equation (24) and consider the change in labor force also as a function of the range of conveniences:

$$\dot{L} = L(w - z, Q), \quad (25)$$

where  $\frac{\partial \dot{L}}{\partial w-z} > 0$  and  $\frac{\partial \dot{L}}{\partial Q} < 0$ .

In our model an increase of  $a_F$  implies an increase of  $w$  (see equation (3) and the relevant derivative) and, possibly, an increase of  $w$  over  $z$ . Wage-earners start consuming industrial goods. But according to the Iron Law, a positive  $w - z$  gap fosters a rise of total population,  $L$ . An increase of  $L$  implies an increase of food consumption (every agent in the economy consumes a positive amount of food, see equation (1)). Accordingly, agricultural production and  $L_F$  raise. But an increase of  $L_F$  implies a decrease of  $w$  (see equation (3) and the relevant derivative) and thus a decrease of the positive  $w - z$  gap. This fact would have negative effects on the growth performance of the economy since it is just  $(L - N)(w - z)$  which mainly supports long-run growth if  $N$  is little in relation to  $L$ . To put it in a nutshell, total population should not increase too much in the face of an increase of agricultural productivity and of a positive  $w - z$  gap.

According to equation (25) an increase of the variety of conveniences and luxuries,  $Q$ , may at least partially balance the growth of population,  $\dot{L}$ , driven by the excess of wage over subsistence,  $w - z$ . Total population may grow at a lower rate than the one predicted by the Iron Law. Thus a positive  $w - z$  gap may become persistent and may display its positive effects on long-run growth.

## 7 Final remarks

The paper has tried to fill what appears to be a lacuna in contemporary growth literature: we refer to the lack of a systematic analysis of the relation between income distribution, consumption patterns, development and growth. We have elaborated a simple model, basically an extension of Murphy et al. (1989), to examine:

1. some of the causes which force an agricultural economy into a situation of long-run stagnation,
2. some of the basic forces driving an economy during its transition from the agricultural stage to the industrial one and, finally,
3. some of the conditions to fulfil for an industrial economy to perform a long-run growth.

An agricultural economy may not escape from a poverty trap if agricultural productivity is too low. One of the possible causes of a low agricultural productivity is an excessive fragmentation of land property. Since in our

model agents spend the whole of their income on food if income is lower than a certain threshold, neither wage-earners nor shareholders buy industrial goods. If agricultural productivity raises, rents and/or wages raise. The economy may thus be able to generate a level of expenditure for industrial goods which makes their production profitable. Yet an increase of agricultural productivity does not necessarily lead the economy out from its poverty trap. If only rents raise and land property is too much concentrated, then extra-income may be spent on the consumption of personal services and/or of foreign luxury goods. If only wages raise and the Iron Law of wages and population holds, then extra-income is spent on extra-consumption of food in order to rear a growing family. In both cases domestic manufactures do not develop.

By contrast, if landowners acquire a strong taste for industrial goods they would strive to increase their disposable income. Thus they may be willing to implement a change in the agricultural technique which raises agricultural productivity. In such a scenario a virtuous circle of development may start: the growth of the agricultural sector, led by the growing availability of (and desire for) industrial goods, releases new resources for the growth of the manufacturing sector. Similarly, if wage-earners acquire a strong taste for industrial goods they would not strive to increase the share of their income devoted to food consumption. Thus they resist the temptation to increase the size of their family and/or to reduce their labor supply. We have shown that if shareholders constitute only a little portion of total population, then the long-run growth performance of an economy depends on wage-earners' consumption pattern.

An important source of inspiration for our work has been classical economics, in particular Smith's *WN* and Malthus' *PPE*. Both authors focus on the distribution of property rights as a key factor influencing the relation between the level and composition of aggregate demand, development and growth. Our model has not been elaborated with a view to present a rational reconstruction of past economic doctrines. Yet we believe that it is able to render (at least) the 'core' of Smith's and Malthus' points of view in plain algebra.

To conclude, we are well aware of several serious drawbacks of our work. To mention a few: the model here presented is static and its dynamic properties are still to be carefully studied. Moreover, we have not analyzed a most important factor in the long-run, that is, technological progress. Finally we have not considered capital accumulation. Much work is thus left over to future research.

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