A Model of Social Progress

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ABSTRACT

The discussion of the model of social progress is divided into four parts. The first part sketches the features of the theoretical model. Since the basic element is the law of diminishing returns to land, the second part compares labour productivity in successive stages of intensification of agriculture, using the time budget method. In the third part, three examples of historical regression are examined from the vantage point of view of the theory proposed. The three cases have important features in common, providing insight into a possible common cause of historical regression. In the fourth part the theory is applied in a brief analysis of the history of Italy. The rise and decline of ancient Rome is explained. The decline of the Western Empire shares a number of features with other cases of historical regression. In considering subsequent events, in the Middle Ages and early modern times, the emphasis is on the causes, according to our model, of two overarching developments in Italian history: the country's emergence as Europe's leading economic and cultural center and the subsequent halt to development and Italy's lag with respect to other countries.

1. Brief description of the model

The main problem for a model of social progress consists in determining the criterion used to define progress itself – today, no common definition exists. Some scholars have even asserted that no such criterion can be set.[1] However, efforts to define the crite-

[1] Korotaev (2003), c. 7.

rion are still being made and will continue in the future. I am sure that the mistake common to all the criteria of progress proposed to date is the conviction that progress brings a better life for the population. History offers countless examples of worsened living conditions for a majority of the population, while the progress of society as a whole is indisputable. This was the case, for instance, of the transition from hunting and gathering to agriculture, when the average life span actually decreased. Hence, progress is indifferent to man even though it is the work of man. Finally, even if today progress really does improve life for all people, we still need to devise a single criterion for the entire history of humanity.

I think we may begin from the beginnings of man. Man himself is a product of the evolution of the animal world. Since Darwin, it has been generally recognized that this evolution resulted from the struggle for existence. However, as Darwin pointed out: "A struggle for existence inevitably follows from the high rate at which all organic beings tend to increase."[2] In other words, the struggle for existence properly so called begins only when the density of a population exceeds some critical level. When some species occupy new territories, their numbers grow exponentially, as Malthus predicted. But after reaching the critical density, the number of animals will oscillate around that level, according to the equation of Lotka-Volterra. Therefore, the *critical population density of animals is a maximal possible density in the natural conditions given, averaged over a suitable number of years*. Scholars usually use the term "carrying capacity of land," but I think "critical population density" is more precise.

Precisely when population density is at its highest, food becomes scarce, the struggle for existence begins, and the fittest animals survive. In this way, natural selection picks out the best adapted organisms, which eventually results in the emergence of new, better species. This, no doubt, is how human kind itself came

[2] Darwin (1859), p. 63.

into being. But man, thanks to his intellect, can change the manner of obtaining the means of subsistence, enabling more people to live on the same land area. In other words, man can increase the critical population density, avoiding famine and thus averting natural selection.

Obtaining more means of subsistence from the same land is possible only by intensifying land use. Therefore, for man, the *critical population density is the highest possible population density in given natural conditions at a given stage of land use intensity*. Unlike the other animals, the human species is characterized by a considerable range of critical population densities, each corresponding to a given intensity of land use.

In today's agriculture, intensification consists in increasing the input of labour and capital in the same land area. Until the industrial revolution, agricultural intensification consisted chiefly in expanded labour input, albeit with some capital increase, such as by land reclamation (drainage or irrigation). In economic theory, when two factors of production are fixed (land and capital), the growth of the third factor (labour) results in diminishing returns to that factor. In other words, the returns to the marginal increase in the supply of farm labour will diminish.[3]

In classical political economy, this principle is known as the law of diminishing returns to land. Nassau Senior included this law in his four postulates, upon which, he maintained, all of political economy was constructed.[4] The last classical economist, John Stuart Mill, considered the law as "the most significant proposition in political economy. Were the law different, nearly all the phenomena of the production and distribution of wealth would be other than they are."[5] With the industrial revolution, however, the input of capital too began to grow, together with the productivity of labour, thanks to chemical fertilizers, pesticides, farm vehicles and machinery: the

[3] Edgeworth (1925), p. 68.
[4] Senior (1872), p. 22.
[5] Mill (1885), p. 117.

law of diminishing returns to land no longer applied, and economists and historians came to see the law as a curious incident.

However, the works of Ester Boserup in the 1960s revived interest in the law. Boserup worked in preindustrial countries where the law of diminishing returns to land was still in force. She concluded that the intensification of agriculture led to diminishing labour productivity and therefore that the cause of development in agriculture is population growth.[6]

That is, man can intensify the use of land and so raise the critical population density, but as a consequence labour productivity will diminish. In order to avoid famine, the population is subjected to harder and more regular work. Therefore, with every stage in the intensification of land use, the population is compelled to be more disciplined, hard-working, and persistent, so the *level of population development* will advance. From this theoretical perspective, the *level of population development represents the ability to solve life problems*. These problems may be solved on different levels. For example, the problem of water supply may be solved with a bucket and a well, but it may also be solved with a pipeline. The level of development comprises not only the simple opportunity to solve a life problem but also the population's determination to devise the solution by whatever means. So the level of development has two components: intellect and willpower. A generation's development is fully formed by the age of 25 or 30. After that age, the level of development cannot be changed.

Thus, the criterion we shall adopt for gauging social progress is the level of population development achieved. In other words, the *progress of society consists in the rise in its level of development*. However, measuring this level is itself problematic. As noted above, a rise in the level of development depends on the labour activity of the population. The more complex people's labour, the higher their level of development.

[6] Boserup (1965), p. 4.

Throughout history, human labour activity has increased in complexity. The most primitive forms of labour are hunting and gathering. Next come nomadic cattle breeding, forest-fallow farming systems, and other forms of shifting cultivation. Genuine agriculture begins only with two-field and three-field rotation systems. Rice plantations are especially labour-intensive. More intensive forms of agriculture are horticulture, viticulture, and vegetable growing, especially in green houses.

Non-agricultural labour is usually more complex than any kind of agricultural labour. The labour of white-collar workers is usually more complicated than the labour of blue-collar workers. The most primitive forms of non-agricultural labour include mining, retail trade, construction and transport. Much more complex is machine-building. Next follows the labour of white-collar workers: civil service, engineering, finance, banking, education and so on. The most complex work of all is science.

Thus, *the structure of a population's employment is the essential criterion for determining the level of social development*. From this point of view, human history may be divided into three periods, corresponding to three qualitatively different stages in the structure of employment. During the preindustrial stage, the first and longest, the majority of the population worked in agriculture. The second stage began with the industrial revolution, ushering in an industrial society in which the majority worked in industry, trade and other non-agricultural activities. In the third stage, post-industrial society, the majority of the population are relatively well educated white-collar workers.

The population's level of development corresponds to the *level of needs* and *standard of living*. In the long run, the population lives under the conventional standards of consumption only. Of course, people may want a better life, but to live better they have to work harder. The choice of harder and longer work for better living conditions follows from higher levels of development. This postulate is essential to understanding economic development. It is universally recognized that the sole driver of economic growth is an increasing

level of needs. According to the theory proposed here, people will work just to satisfy an achieved level of needs, which corresponds to an achieved level of population development. As a consequence, in preindustrial society the growth of output did not result in consumption growth but in Malthusian population growth. To be sure, every step in the intensification of agriculture did raise the level of needs and hence consumption, although the process was very slow. But one simply cannot take seriously Gregory Clark's thesis that the level of consumption in preindustrial England was equal to that of hunters and gatherers[7] merely because they consumed about 2300 calories a day. The standard of living does not consist only of food, and 2300 calories is approximately the daily requirement for the average human being, regardless of location or historical era.

The standard of living consists not only in the material means of subsistence but also includes the organization of society. The higher the level of population development, the better the organization of social life. In underdeveloped societies, democracy and human rights cannot be up to the standards of most of today's developed societies.

To understand the development of society, let us begin with the first stage of development, i.e. preindustrial society. As we have observed, progressive social change begins only once some critical population density is overstepped. As the land of every country is limited, it may be considered as a reservoir with capacity equal to the critical population density times the land area. The ratio of *population density to critical density is the reservoir's critical coefficient. The reservoir is full when the population density is equal to the critical density*, i.e. the critical coefficient is equal to 1. Further population growth lowers the standard of living below the corresponding level of development. Such a situation cannot endure, making some change to the society inevitable.

The possible changes may be described by *three laws of reservoirs*.

[7] G. Clark, pp. 50-51.

The first law is: *the population pressure in the reservoir is counterbalanced by pressure on neighbouring reservoirs*. When the critical coefficient of a reservoir is greater than 1, the population will try to seize neighbouring land in order to avoid the intensification of land use. The neighbours resist, but if the population pressure on their reservoir is insufficient, they will lose the struggle and the conquerors will settle in. The critical coefficient in the conquerors' reservoir diminishes and progress there stops. The process may recur repeatedly, forming a large region. Such a region can be called an *agglomeration of reservoirs*. The critical coefficient and the level of development are higher in the center of the agglomeration and lower in the periphery.

The first law of reservoirs has three consequences:

1. Population migrates from reservoirs with high critical coefficients to those with lower coefficients.
2. The more severely migration from a reservoir is hampered by natural conditions, the more favourable it is for progress. Reservoirs from which emigration is particularly difficult are islands, peninsulas, mountain valleys, and oases. It is no accident that all the early centers of world civilization were situated in reservoirs of these kinds (Egypt, Mesopotamia, Palestine, Greece, etc.).
3. The reservoirs may form an agglomeration whose center will have a higher level of development and a higher critical coefficient.

The second law of reservoirs is: *the smaller the reservoir, the more quickly it is filled, but also the smaller it is, the less the potential for progress*. The more capacious a reservoir is, the more time it takes for it to fill up. Progress occurs only when the reservoir is full. So the population of a very capacious reservoir will have a constant level of development for a long time and lag behind the populations of less capacious reservoirs. The latter are filled more quickly and consequently develop faster. Of course, a reservoir must have some minimal capacity in order to allow progress at all, because if the population is too small the division of labour is impossible. Thus, opportunities for progress are limited by the size of the population

within the reservoir. The larger a society's population, the more opportunity there is for division of labour, the larger the market, and the more progress the society can achieve. The second law of reservoirs explains the faster development of less capacious reservoirs, such as ancient Greece and Rome, medieval Italy, the Netherlands, Spain and Portugal, and the gradual shift of European centers of power to more capacious reservoirs – England, France, and Germany during the modern era. Today, we can all observe the shift of economic centers to East and South Asia, with the world's most capacious population reservoirs, China and India.

The third law of reservoirs is: *a rise in the critical coefficient causes the growth of social tensions, the acceleration of economic development, and the centralization of power. A decrease in the coefficient produces the reverse processes*.

The critical coefficient increases as a result of rising population density. As more and more people become redundant in agriculture, they look for jobs in trade and industry, and the division of labour deepens. The prices of primary goods rise even faster than those of industrial goods, while wages will lag behind. The shortage of means of subsistence stimulates the intensification of agriculture. As a result, economic development quickens. However, not all can find employment, and more and more beggars, vagabonds, and robbers appear. The worsening shortage of food causes discontent among the broad masses, triggering social tensions. Moreover, the critical coefficient usually rises within the whole agglomeration of reservoirs, so international tensions also increase. In order to control these processes, the society needs a strong central power. However, if for some reason the critical coefficient diminishes, free land becomes abundant so everybody can work on it, reversing all the above-mentioned processes. Historical examples of the working of the third law are the instances of regression in many ancient civilizations.

Thus, the intensification of land use and the increase in the critical density are the only ways for progress to occur in preindustrial societies. However, agriculture cannot intensify infinitely. Eventually, further intensification becomes impossible for natural or eco-

nomic reasons. In this case, the filling of the reservoir will be the *last one*. In preindustrial society, the overwhelming majority of the population was peasants, and all of society depended on them. When the reservoir filled up the last time, the peasantry faced a deadlock. The old ways of solving basic life problems (i.e., the intensification of agriculture) became impossible, and new methods of problem-solving were still unknown. All of society searched for a way out.

Every time the reservoir is filled, according to the third law, there will be social disturbances. But during the last filling, they reach a maximum. Even upper strata in society are discontented with the regime, because their incomes come from the peasantry, who have nothing more to give. In such conditions, a revolution occurs, a *genuine or peasant revolution caused by the final filling up of the reservoir*. This type of revolution may occur only in countries where the peasantry makes up the majority of the population (60%-90%), or in other words, in preindustrial societies. Historical peasant revolutions included the English Revolution of the mid-17th century, the French Revolution, the Russian Revolution, and more recently the Islamic revolution in Iran. It is worth pointing out that peasant revolutions may take forms very different indeed from our own notions of what a revolution looks like.

According to the third law of reservoirs, the economy of the country develops rapidly in the pre-revolutionary period. More and more people come from villages to towns, but only some find work. These people are ready for any action to resolve their life problems. Ignorant, illiterate peasants need leaders. Such leaders usually come from the educated strata. It is they who coin the slogans for the revolution and create the revolutionary ideology. These slogans must be comprehensible to the peasantry. They may consist in religious ideology, as in the Netherlands in the 1570s, England in the 1640s, and Iran in the 1980s; or leftist ideology as in France in the 1790s, Russia in the 1910s, or China in the 1930s and 1940s. However, regardless of the slogans, what the population wanted was always to improve living standards by political means, i.e. by revolution. According to our model, however, this is impossible because the stan-

dard of living can only rise in conjunction with the level of development. Usually, politically revolutionary methods (expropriations, egalitarianism, the fixing of prices, etc.) provide only momentary relief while destroying the economy and actually causing a further drop in living standards. Gradually, the population becomes disenchanted with the revolution, political struggle and civil war foment anarchy and lawlessness, and society seeks order at any cost.

The people are sure that only a strong hand can keep crime in check and secure order. The leaders of revolution are well aware of the social need for the centralization of power, and a struggle for power begins. It does not matter who eventually wins the struggle. It may be a revolutionary and military leader like Cromwell, a general like Napoleon, or a schemer and bureaucrat like Stalin. In any case, revolution usually culminates in personal dictatorship and the repression of all the revolutionary liberties that had been achieved. Many of the revolution's leaders are executed or imprisoned. The population backs the new regime because people are afraid of political instability.

After the revolution, population growth gradually compensates for population losses and the reservoir is filled once more. There are now three possible courses of development:

1. Transition to a stationary state.
2. Transition to external opportunities for development.
3. Transition to industrial society.

If there are no possibilities for further development after the last filling of the reservoir, then the society inevitably shifts to the stationary state: that is, *a state of preindustrial society in which in the long run it keeps an approximately constant population*.The stationary state is a key concept for all classical economists, from Adam Smith to John Stuart Mill, and follows from the law of diminishing returns. According to the classical thesis, population growth must sooner or later halt, as increases in the harvest will not cover the increase in labour input.

Insofar as further intensification of land use is impossible, the society in the stationary state cannot progress. We have economic

and cultural stagnation. The level of development of such societies may stay unchanged for hundreds or even thousands of years. Examples are nomads in arid zones where agriculture is impossible or hunters and fishermen in subarctic zones where even animal husbandry is impossible. In societies with a low level of development, the adjustment of population growth to the means of subsistence occurs mostly via mortality or by positive checks, as Malthus says. In such societies, as in the animal world, population oscillates around the critical density. When it goes above that level, the predictable result is war, famine, or epidemic disease.

In more highly developed societies, population growth is checked mainly by methods that affect marriage and fertility or by preventive checks, again according to Malthus. Marriage will be delayed, so the reproductive period is shortened and the number of births per woman is reduced. Another, more radical solution is an increase in the proportion of people who never marry, which may go as high as 30%, which inevitably causes population growth to cease.[8] In these societies too the population will oscillate around the critical density, but when it goes above that level the birth rate will fall to bring population back below the critical level. For a society in the stationary state, progress is possible only through the influence of the external world.

One variety of such influence is external opportunities for development. *The external opportunities for development are defined by trade with other reservoirs*. In preindustrial society, trade has some peculiarities. It may be defined as either real trade or elite trade. *Real trade involves the products of the division of labour, while elite trade involves goods that emphasize the high social status of their owner*. Real trade arises with the division of labour. Elite trade begins when social stratification comes into being. The external opportunities for development stem from elite trade. Instances of states that developed thanks to the external opportunities were some states of an-

[8] Wrigley and Schofield (1997), p. 262.

cient Greece, whose own reservoirs had minimal capacity (Athens, Corinth, Megara); some city-states in medieval Italy (Pisa, Genoa, Florence, Venice); and, in early modern times, the northern Netherlands.

The goods of elite trade were typically expensive clothes made from high-quality textiles, or jewellery. A well-dressed man was seen at first glance to belong to the upper stratum of the society. Other elite goods were spices, high-quality wines, certain household objects, and so on. The main quality of elite goods was their inaccessibility to the masses. That is, they had to be very expensive. Customers were ready to pay high prices for the goods because they were high on the social scale and their incomes were inherited: tributes, rents, and duties. Therefore, the sellers of elite goods always had super profits, but they tended to be monopolists, as competition would cause a fall in prices and hence the loss of the status of elite goods. As a result there was a never-ending struggle among the states engaged in elite trade, as among Italian city-states during the Middle Ages.

The society engaged in elite trade always sold elite goods to societies with more capacious reservoirs, which according to the second law of reservoirs lag behind, and bought food (first of all cereals) from them. The elite trade enabled these societies to increase the proportion of the labour force outside agriculture, which raised the level of social development considerably. However, according to the second law of reservoirs, eventually the more capacious reservoirs were filled and the less capacious ones could not withstand the competition. The economy of the society exploiting external opportunities would collapse and development would cease, as in Italy in the 17th century or Holland in the 18th.

Thus, the transition to an industrial society – industrial revolution – is the only way to ensure permanent progress once the reservoir has been filled for the last time. Industrial revolution entails shifting the labour force from agriculture to industry and trade. For this transformation, an adequate supply of energy is absolutely necessary. Practically all industries demand energy, but when the reser-

voir is filled for the last time, a country's forests have typically already been cut down. Until the 20th century, the only substitute for wood was coal; and the country where the industrial revolution first occurred was Britain, where coal was abundant. According to the second law of reservoirs, other European regions where coal was plentiful followed Britain – Belgium, northern France and northwestern Germany. Obviously, today oil and gas may take the place of coal.

The industrial revolution comes only after the peasant revolution. As we noted, the peasant revolution usually ends with the establishment of an authoritarian regime. After the revolution, when the reservoir is filled once again and social tensions grow, the new regime suppresses the popular unrest. No new revolution occurs, and the population seeks to solve its problems by working in industry and trade. If enough energy is available, the transition to an industrial society begins. At this stage, the main impediment to industrialization is the low level of needs of the mainly rural population, which has a correspondingly low level of development. In these circumstances, exports may substitute for home demand. The crucial role of massive exports in British development in the 19th century is well known. In developing countries, labour power is cheap owing to the low level of needs, which stimulates exports. The cheap labour of a redundant rural population, who are used to intensive rice cultivation, has made the economies of many Asian countries quite prosperous through large-scale exports.

With industrial revolution, the input of capital into agriculture grows quickly along with farm labour productivity; the law of diminishing returns, the critical population density, and the laws of reservoirs are all invalidated. The mechanism of the rise in the level of population development in an industrial society differs from that in a preindustrial society. Now the main driver is the growth of individuals' needs as a result of the increasing complexity of the work activities. Every generation does its best to give its children better living conditions, and they in turn, as adults, must achieve the new standard conditions. The process recurs with every generation.

As the economy grows, more and more people come to work in industry and trade. The level of development of the population begins to rise quickly, and along with it the level of needs, which produces the expansion of home demand and the growth of real incomes. At this stage, population is growing very rapidly, which further increases home demand. So the economy develops especially quickly, often at record rates.

Meanwhile, the authoritarian regime flourishes. A new elite that controls everything in the society comes quickly into being. It is formed on the basis of devotion to the revolutionary ideology and especially to the leader. But this devotion is insincere: the real basis is personal and family relations. The concentration of power is a nutrient medium for corruption. Many dishonourable men try to join the elite and make their fortune.

At the same time the share of non-agricultural labour is growing, the population's level of development is rising accordingly, and the level of needs and standard of living are going up. Therefore people demand more political and economic liberty. Dissatisfaction with the regime grows, especially among the educated classes. The regime seeks to suppress the dissatisfaction, but when the economic situation worsens the discontent spreads to the lower strata. In these circumstances, there may be a new revolution, an upheaval that some have dubbed a "colour revolution." Unlike the peasant revolution, the "colour revolution" occurs only in industrial countries where the agricultural labour force makes up less than 40% of the total.

The main forces in the colour revolutions are very different. A smaller, highly active group consists of the more educated – students, small businessmen and white-collar workers. A second, larger group consists of the more backward strata: peasantry and unskilled workers, recent urban arrivals from the countryside. The former want economic and political liberty as a way to make their fortune. The latter want higher living standards through political means. However, as noted, this is impossible. The different aims of the main forces in these upheavals determine the outcome. Usually, at first,

the aims of the first group are attained: the authoritarian regime is toppled and the mass media and the economy are freed. But the second, majority group is not satisfied. It wants the government to interfere with the economy through egalitarian actions such as price control, land reform, cost-of-living compensation, or higher wages. So the final outcome of the colour revolution depends on a struggle between its principal driving forces. Consequently, the country undergoes a lengthy period of political instability. If the share of agricultural labour is relatively high (30% or more), there may be a second and even a third colour revolution. But given the higher level of development, colour revolutions are much less cruel than peasant revolutions; they are often bloodless, whereas a peasant revolution never is.

These colour revolutions generally succeed in overthrowing the authoritarian regime, but genuine democracy is still impossible because of the low level of development of the population. What comes about is a *populist democracy* in which the majority vote for politicians who promise to raise the standard of living quickly. In such countries, inflation is usually high as the government prints money in great amounts to fulfil the electoral promises. It is the ideal moment for charismatic leaders who can win the confidence and even the love of the lower strata. But as the populist promises always are unrealizable, the voters become disappointed in their idols and look for a new miracle-maker. The industrial countries of 19th-century Europe did not experience populism, because suffrage was restricted only to the higher social strata, with their high level of development. Such a solution is out of the question today, so populism is a distinguishing feature of many contemporary developing countries.

One important marker of a rising level of population development is a declining birth rate, known as "stage three" in the demographic transition. In preindustrial society, a decline in the birth rate is evidence of a high critical coefficient. As a rule, the birth rate decreases just before a peasant revolution and during the transition to a stationary state, when the critical coefficient peaks. In industrial

society, the law of diminishing returns becomes invalid and the critical coefficient is no longer operative. Therefore, most of the checks on fertility are removed while the death rate drops rapidly thanks to improvements in sanitation and better food supply. A country in this stage experiences a sharp increase in population.

However, a further rise in the level of development ushers in growing needs of the population. This means a rise in the cost of raising children, with increased spending on children's health, education, clothing, toys, books, etc. However, this clashes with higher consumption by the parents themselves. This results in a compromise, the number of children in a family diminishing until it reaches the biological limit, i.e. the point where a further decline in the birth rate produces depopulation. In the long run, the birth rate is equal to the death rate, so the population is stable. Population growth is no longer necessary to progress, because individual needs are rising.

With every year, the labour activity of the population in industrial society becomes more and more complex, and eventually the majority of the population are white-collar workers with higher education. The society is now post-industrial. The population's level of development rises even faster, accompanied by correspondingly rising needs. But the growth of material needs is weak. Practically all of the increase consists of growth in non-material needs. Therefore, economic growth in the post-industrial societies is slack. At the same time, there is rapid development in education, medicine, arts, science, etc. In these branches of the economy, unlike industry, it is impossible to measure development in monetary terms.

This, very concisely, is the development model I propose. Though historiographical analysis of the theme is impossible in the framework of a paper, I would like to define the place of my model among the numerous macrosociological theories of social development. I am sure that all explanations of historical process must eventually be based on factors outside human consciousness, i.e. natural factors such as the biological necessities of the human organism, climate, topography, soil, sunshine, and so on. Otherwise, the number

of unanswered "whys" would destroy any theory. Thus, this model is not of a speculative kind.

Further, this model is demographic but not Malthusian. Malthus posited population growth as a variable dependent on technical innovation, and asserted that when population exceeds resources, some checks on population will reduce the growth of number of people and so adjust population to the production of means of subsistence. On the contrary, Boserup considered population growth as an independent variable, positing that only population growth can force people to produce more means of subsistence, owing to declining labour productivity as agriculture intensifies. My own position is that population growth and the potential of production are interdependent variables. In preindustrial society, population growth is the only driver of the economy, but population can stop growing, bringing social development to a halt. There is a dialectical interaction, although population growth is a main cause of all progressive changes in preindustrial society.

Next, my model is not linear, because it envisages that the development of a society may reach an impasse. This is inevitable when all the possibilities for further development are exhausted. In this case, there is a halt to population growth and further social development. As an interim variant,we allow for the transition to the external opportunities for development or elite trade. But even if a society is on the main road of progress, there are differences in the critical coefficient. For example, two societies may have the same intensity of land use and hence the same level of development, but different critical coefficients owing, by the third law of reservoirs, to differences in social structure, central power and so on. This is what produces the diversity of historical development that we observe.

All demographic models are anti-Marxist, and so is this one. Marx asserted that labour productivity increased over the course of preindustrial history. He thought that rising labour productivity gave rise to the possibility of a surplus product, which is the basis for the existence of exploiting classes (slave owners, feudal lords, capitalists) and the corresponding modes of production (slave soci-

ety, feudalism, capitalism). The higher labour productivity, the less economic coercion in society. The model I propose assumes that labour productivity diminished in preindustrial society. Therefore, Marx' modes of production have no economic foundation. For example, to my mind the term "capitalism" itself is senseless because nobody knows what it means. If it is a society based upon market relations, then, as we have seen, such societies may be of two sorts: one based upon elite trade, the other based upon real trade. The latter is an industrial society, with the majority of population engaged in non-agricultural activity; the former is preindustrial, with the majority of the population engaged in agriculture. And this holds even for the most advanced elite trading society, such as Tuscany in the 15th-16th centuries or Holland in the 17th. My model offers a non-Marxist measurement of social progress: the more complex people's labour, the higher their level of development. Taking the structure of employment as the gauge of the level development, we define preindustrial society as one where the majority of the population works in agriculture and industrial society as one in which over 50 percent of labour is non-agricultural.

Nevertheless, Marx was a great thinker. In my model, his assertion that a society's economic foundation determines political and cultural superstructures is realized in the principal proposition that the complexity of labour determines the level of development. In this way it is possible to define social and economic behavior. Primarily, it is this proposition that differentiates my proposed model of progress from models that treat the problem of economic development from a Darwinian perspective.[9] In such models, the rising quality of labour is the product of natural selection. In my model, the increase in the population's level of development results from changes in the upbringing of the new generation in conditions of increasing labour complexity, training the child for a new, more complex life. It is possible that natural selection within human

[9] For example, G. Clark.

populations may produce behaviour that is more social. However, the criteria for such selection change owing to changes in the nature of labour. Hunter-gatherers are guided mostly by natural instincts, which for a farmer is impossible. The latter must be disciplined and persistent to overcome his instincts and adapt to the necessary calendar for agricultural operations. In this case, therefore, natural selection stems from the demand for a given type of labour activity, and a change in this activity is accordingly a primary cause of progress. Furthermore, natural selection is a very slow process. Explaining progress by reference to natural selection means disregarding many important features of the historical process, such as instances of historical regression. It is impossible that in these cases natural selection turned back. My proposed model does explain these events, as I shall try to show in the following sections.

2. The economic basis of the model

As noted, the economic foundation of my model is the law of diminishing returns to land. This law was discovered empirically by landlords when they increased the monetary input into plots of land. At some point the monetary returns to the investment stopped rising and turned down. Ester Boserup was interested not in returns but in the development of agriculture. She believed that population growth is the independent variable, the major factor in determining agricultural development.[10] Development only comes when there is population pressure, because it consists solely in intensification, which leads in turn to falling labour productivity.[11]

To document changes in labour productivity in agricultural systems of differing degrees of intensity, the method of time-budgets is useful. The best way to show how the method works is by practical example. For this purpose, the data from the Russian Empire are

[10] Boserup (1965), p. 4.
[11] *Ibid.*, p. 33.

valuable, because development was slow and very primitive systems of farming persisted into the 20th century. And luckily sufficient reliable sources of data are available.

To clear a plot of land from vegetation, the trees were girdled or ringed. After between 5 and 15 years the roots had rotted and windfall followed.[12] The wood was then burned and crops sown in the warm ashes, closing up the seeds with the top of a fir tree[13] without any cultivation of land. The labour input per *desiatina* (an old Russian unit of area equal to 1.092 hectare) for every operation was as follows:

1. Girdling – 2 man-days[14];
2. Burning of the wood – 6-8 man-days[15];
3. Sowing – 0.5 man-days[16];
4. Closing up the seeds[17];
5. Harvesting – 6 man-days[18];

Total – 19.5 man-days.

The yield at this stage was about 16:1;[19] in other words, 65.5 kg of seed sown per *desiatina*[20] produced a harvest of 1050 kg, or net of the seeds for replanting, 985 kg. So one man-day of labour yielded an average of 50 kg of grain.

At the end of the 19th century the transition from this forest-fallow system to the two-field rotation system got under way in some parts of the north of Russia.[21] Under this system, a plot of land was sown every other year. The labour input was:

l. Tillage – 8 man-days[22];

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[12] O sdelaniy novin (1835), c. 172.
[13] V.F. Popov (1906), c. 67; P.P. Chubinskiy (1870), cc. 17,20; A.V. Sovetov (1950), c. 19; Y. Lepekhin (1771) , c. 239.
[14] N.G. Kozlov (1902), cc. 4-5.
[15] Y.P. Shchekotov (1884), c. 86; Б-й. (1855), c. 186.
[16] Y. P. Shchekotov (1884), c. 186.
[17] N.G. Kozlov (1902), c. 5; Y. P. Shchekotov (1887), c. 107-108.
[18] V.Y. Gomilevsky (1878), № 5 c. 43.
[19] Y. P. Shchekotov (1884), c. 187.
[20] *Ibid*., c. 187.
[21] Y.N. Smirnov (1890), c. 188-189.
[22] LV. Mylov (1998), c. 195.

2. Harrowing – 2 man-days[23];
3. Sowing – 0.5 man-days;
4. Closing up the seeds – 2 man-days[24];
5. Harvesting – 6 man-days;
6. Tillage of the fallow – 16 man-days[25].

In addition, the two-field rotation method required manuring to keep the harvest from diminishing.[26] Manuring took 300 cartfulls of dung per *desiatina*[27] every six years,[28] requiring a total of 30 man-days of labour,[29] or 5 man-days a year.

7. Manuring – 5 man-days.

Total – 39.5 man-days per *desiatina*.

The yield of this system was between 4:1 and 6:1.[30] The amount sown was 98 kg per *desiatina*,[31] so the yield was 393-590 kg per *desiatina* or an average of 492 kg, or 394 kg net of the seeds. Thus one man-day yielded 10 kg of grain.

These data indicate that labour productivity under the forest-fallow system was 5 times higher than under two-field rotation. Self-evidently, under normal circumstances no one will go from the former to the latter. Nevertheless, the transition was a reality; but it occurred only at the most intensive stage of the forest-fallow system. At this stage the girdling of the trees began to be supplemented by felling them with axes. More often, the peasants girdled big trees and after the wind blew them down, chopped the smaller trees down themselves.[32] Later, girdling was totally superseded by chopping the trees down. The peasants did not simply burn wood in heaps, as before, but placed the wood in banks on poles and during

[23] A.V. Sovetov (1950), c. 297.
[24] L.V. Mylov (1998), c. 198.
[25] A.V. Sovetov (1950), c. 360.
[26] Y.P. Shchekotov (1884), № 10 c. 69.
[27] V.Y. Gomilevsky (1878), № 6 c. 141.
[28] A.V. Sovetov, c. 360.
[29] L.V. Mylov (1998), c. 200.
[30] A. Zasetsky (1773), c. 222.
[31] Y.P. Shchekotov (1884), № 11 c. 197; V.Y. Gomilevsky (1878), c. 43.
[32] O sdelaniy novin (1835), c. 171-172.

the burning moved the banks along the poles, as on rails, with long sticks.[33] The peasants began to till the land, sometimes even twice – both before and after the burning. They also began to strip the trees of bark. As a result, labour input more than tripled:

1. Felling the trees – 20-45 man-days[34];
2. Preparation of the wood for burning – 4-6 man-days, or an average of 5[35];
3. Burning – 6-8 man-days, an average of 7;
4. Tillage – 7-8 man-days[36];
5. Sowing – 0.5 man-days;
6. Closing up the seeds – 3 man-days;
7. Harvesting – 6 man-days.

Total – 60 man-days per *desiatina*.

As a result the yield, in this late stage of the forest-fallow system, was between 7:1 and 12:1;[37] we can assume an average yield of 10:1.[38] In this case output per *desiatina* should be 655 kg, or 590 kg net of the seeds.

To compare the productivity of the forest-fallow and two-field rotation systems, consider that in the last stages of the forest-fallow system the plot was sowed at least twice, so the labour input for the second year was:

1. Tillage – 8 man-days;
2. Sowing – 0.5 man-days;
3. Closing up the seeds – 3 man-days;
4. Harvesting – 6 man-days.

Total – 18 man-days, or for two years rotation 78 man-days.

The yield for the second year was only half that of the first year,[39] about 5:l, yielding 327.5 kg per *desiatina*; and net of seeds, 262 kg,

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[33] Y.P. Shchekotov (1884), № 10 c. 81.
[34] V.Y. Gomilevsky (1878), c. 50-51; N.G. Kozlov (1902), c. 4-5.
[35] Y.P. Shchekotov (1884), № 10 c. 86.
[36] V.Y. Gomilevsky (1878), c. 50-51; N.G. Kozlov (1902), c. 4; B-y (1855), c. 186.
[37] A. Zasetsky (1773), c. 220; Y.P. Shchekotov (1884), № 11 c. 187.
[38] A.V. Sovetov (1950), c. 321.
[39] O sdelaniy novin (1835), c. 74.

making a two-year total of 852 kg. For the two-year rotation method, one man-day yielded 10.9 kg. The evolution of the forest-fallow system tripled labour input and reduced the yield per area of land by five times.

What was the cause of this drastic deterioration? Our sources show that towards the end of forest-fallow agriculture, the peasants burned out mostly new forest that was only 20 years old or even less,[40] while it was considered that for burning a forest should be at least 30 years old.[41] The burning of an old forest was reputed to be more productive.[42] In new forests, the wood for burning was scarce, the heat was not enough to temper the soil properly and loosen it. The burning of the wood accordingly became more complicated, but this did not prevent tillage. Peasants had to till the soil, but the smaller quantity of ash lowered the yield.

Why did peasants began to burn young forest land? Our sources show that the reason was the reduction of land resources owing to population growth.[43] It may seem strange with reference to the vast territories of northern Russia, but the forest-fallow system is possible only on river banks and is quite impossible in the middle of the forest. This is so not only for the north of Russia[44] but for the woodlands of the Ukraine[45] or for the tropics. Grains are dry-climate plants, and in forests the humidity is too high for them. They can grow well only on well-drained plots. As a consequence: "lack of land among the vast woodlands"[46] and "… extreme scarcity of the land… in spite of vast space."[47] The peasants became aware of the extreme scarcity of land suitable for the forest-fallow system.[48] "In the final stages of

[40] A.S. Ermolov (1879), c. 112-113.
[41] *Ibid.*, c. 120-121; Y.P. Shchekotov (1882), c. 104; БергштрассерК. (1838), c. 43.
[42] O sdelaniy novin (1835), c. 171-172; Y.P. Shchekotov (1887), c. 105.
[43] V.F. Popov (1906), c. 44; V.Y. Gomilevsky (1878), c. 33; S.A. Priklonskiy (1884), c. 7, 58.
[44] K. Bergshtrasser (1838), c. 43; P.V. Zasodimsky (1901), c. 7; A.A. Shakhov (1936), c. 30.
[45] Y.O. Levitskiy (1878), c. 2; E. Fogel (1836), c. 219.
[46] S.A. Priklonskiy(1884), c. 7.
[47] V.Y. Gomilevsky (1878), c. 33.
[48] V.F. Popov (1906), c. 44.

this system, the lack of fire-wood [due to the smaller area of forest-land per person – author's note] had to be offset by the best preparation of the plot for burning, the best working of the land, compensating for the reduction of natural resources by intensification of work."[49]

The more labour-intensive method of cultivation was necessary to compensate for population growth. The transition from girdling to felling reduced the time needed to prepare for the burn-out. The natural falling of the girdled trees took 5 to 15 years,[50] where only a year was needed if the trees were felled and stripped. This innovation was equivalent to a 40% extension of the land in use. Nevertheless, under population pressure the fallow period continued to shorten and forests younger than 20 years began to be burned.

The labour productivity of the forest-fallow system in its last stages, that is, was little better than under two-field rotation. Thus, the transition to the latter was due to further population growth because under the forest-fallow system "… a 5-person family, just to keep from starving, had to have 100 desiatinas of land,"[51] while under two-field rotation just 10 desiatinas of arable land was sufficient. The peasants lost in labour productivity but gained in crop yield per hectare.

Boserup focused on the frequency of cropping as the main gauge of intensification of land use and began with the forest-fallow system. However, another system of agriculture without land cultivation is known. Herodotus wrote about it : "At present, of course, there are no people, either in the rest of Egypt or in the whole world, who live from the soil with so little labor; they do not have to break the land up with the plough, or hoe, or do any other work that other men do to get a crop; the river rises of itself, waters the fields, and then sinks back again; then each man sows his field and sends swine

[49] V.P. Petrov (1968), c. 125.
[50] N.G. Kozlov. (1902), c. 6; O sdelaniy novin (1835), c. 72; V.G. Korobeynikov (1935), c. 230.
[51] Y.P. Shchekotov (1884), № 11 c. 184.

into it to tread down the seed, and waits for the harvest; then he has the swine thresh his grain, and so garners it." (Hist. 2,14). This system was common in ancient times and even down to our own era in many parts of the world. The system requires minimal labour input and accordingly higher labour productivity than any system with land cultivation.

Still more extensive land use results in even greater labour productivity. The labour of nomads boils down to the simple guarding of flocks – true nomadism even does without fodder. Sheep and horses can get grass under the snow. The productivity of hunters and gatherers is discussed in Marshall Sahlins' *Stone Age Economics*.[52] Sahlins collated a great deal of information and concluded that hunters and gatherers worked usually 2 to 3 hours a day. And their work is easy. Today, hunting, fishing and gathering are considered as hobbies, fun, relaxation – not work at all. All these examples, taken together, help to form a series of stages of intensification of agriculture. As Boserup has shown, every step towards more intensive agriculture diminishes the productivity of labour. Hence, with every step people must work harder. Certainly, this evolution caused profound demographic changes. And these changes constitute the new conception on which my proposed model of development is built. The population, under necessity, becomes more disciplined and hard-working, so people can raise their standard of living. Man can have more, therefore he wants more. As Maslow has shown, human needs are subject to a definite hierarchy.[53] Once the basic needs (food, water, sleep) are fulfilled, human beings need safety (security, order and stability). The level of security and order is determined by the organization of the society. The higher the level of safety, the more complicated the social organization. But in our theory needs increase only in conjunction with the level of development, which in turn stems from more complex labour activity. Let us recall that in the preindustrial societies, for the bulk of the popu-

[52] Sahlins (2013).
[53] A.H. Maslow (1950).

lation work becomes more complex only owing to the intensification of agriculture, which itself is possible only under population pressure because of falling labour productivity. Thus the model builds a bridge from population growth and economic change to social organization. Hunters and gatherers, shifting agriculturists or nomads cannot found a true state. This is impossible because these forms of labour do not generate a high enough level of development. Hunters and gatherers, shifting agriculturists and nomads simply cannot support a state social order – they lack the discipline.

3. The cases of historical regression

The cases of decline in ancient civilizations are dramatic instances of historical regression. Many scholarly works have been devoted to the phenomenon, proposing various scenarios – natural catastrophes, barbarian invasions, etc. Let us apply the instruments of the proposed theory to some of the best-known historical cases.

3.1 The Minoan civilization

The first civilization in Europe was the Minoan, which arose on Crete in the 2700s BCE. The island is not large, with an area of 8,336 km^2. And it is mountainous, the range crossing it from east to west having peaks higher than 2000 m. Agriculture is possible only in valleys and plateaus, which are quite insignificant in size, such as the Lasithi Plateau (11 km east-to-west and 6 km north-to-south). The largest plain on Crete is Messara Plain, which measures only 50 km east-to-west and 7 km north-to-south. In short, to use our terminology, Crete has a very small-capacity reservoir.

The Minoan culture had all the features of civilization. There were enormous palaces decorated with magnificent frescos and with sewer systems. Crete was the first place in Europe where writing was used: first Cretan hieroglyphics, then syllabic Linear A. Paved roads connected the chief palace in Knossos with other parts of the

island. Findings of many objects of Minoan manufacture in mainland Greece, Egypt, Anatolia, Syria, Cyprus and Mesopotamia have demonstrated the wide trading contacts of the Minoans.

Scientists date the decline of Minoan civilization to the middle of the 15th century BCE.[54]

In 1930 the Greek archaeologist Spyridon Marinatos first hypothesized that the decline of the Minoan civilization was due to the eruption of the volcano of Thera. It seemed evident that the cause of decline had to be some exogenous event that stopped the natural development of the civilization. But subsequent research has found many reasons to question this assumption. First, the exact date of the eruption has still not been determined. Archaeologists had naturally placed it at between 1500 and 1450 BCE[55] because by that time the decline had already set in. But radiocarbon dating puts it between 1627 and 1600 BCE.[56]

Moreover, it has been determined that the layer of ash that fell on Crete after the eruption was no more than 5 mm deep, and many Minoan remains have been found above the ash layer and the possible tsunami level.[57] Such a covering of ash would have been too small to cause the decline of a civilization. Major earthquakes were not uncommon on Crete. When they happened and palaces were destroyed, the Minoans replaced them with still more grandiose ones, as happened in 1600 BCE. It is worth noting that at the time of crisis in 1450 BCE, while most palaces were destroyed, the central palace in Knossos remained largely intact.[58] The hypothesis that the decline of Minoan civilization was due to the eruption of Thera cannot explain this.

My proposed model of progress accounts for the Minoan decline as follows. Crete's small reservoir was filled very early, which is why

[54] O.T.R.K. Dickinson (2004), p. 73.
[55] B.J. Sivertsen (2009), p. 25
[56] W.L. Friedrich et al. (2006), p. 548; P.P. Betancourt (1984), pp. 45-49.
[57] G. Callender (1999).
[58] K.W. Welwei (2002), pp. 12-18.

the first European civilization arose here, as postulated by the second law of reservoirs. However, the reserves for further intensification of agriculture were soon exhausted; in fact, it is the judgment of most archaeologists that by 1450 BCE all the land on Crete suitable for agriculture was in use.[59] According to the first law of reservoirs, one way out of these difficulties would have been migration, if possible. And in fact archaeologists have uncovered extensive evidence of migration of Minoans on islands in the Aegean, Palestine, and the western coast of Asia Minor.[60] It is of prime importance that Herodotus recorded a popular legend about a campaign of Cretans in Sicily and their foundation of a colony in southern Italy, leaving Crete depopulated (Hist. 7, 170-171): "Presently all the Cretans except the men of Polichne and Praesus were bidden by a god to go with a great host to Sicania [Sicily – author's note]. Here they besieged the town of Camicus… Presently, since they could neither take it nor remain there because of the famine which afflicted them, they departed. However, when they were at sea off Iapagia [southern Italy – author's note], a great storm caught and drove them ashore. Because their ships had been wrecked and there was no way left of returning to Crete they founded there the town of Hyria, and made this their dwelling place… The Praesians say that when Crete was left desolate, it was populated especially by Greeks, among oher peoples".

Although Herodotus did not explain why the Cretans had left their island, this popular legend corresponds exactly to the archaeological findings and the reconstruction of the events according to our proposed model of historical progress.

3.2 The Mycenaean civilization

The Mycenaean civilization in peninsular Greece originated in the 16th century BCE, a millennium after the Minoan. This conforms

[59] O.T.R.K. Dickinson (2004), p. 69.
[60] A.M. Snodgrass (2000), p. 308; T.F. Tartaron (2013), p. 21.

to our second law of reservoirs, as the capacity of Crete's reservoir is evidently much smaller than that of the reservoirs in southern and central Greece where the Mycenaean civilization arose.

The golden age of the Mycenaean civilization was from the 15th to the 13th century. Many Mycenaean centers were fortified, and the fortifications were most impressive. The stronghold of Tiryns had two rings of thick walls and a subterranean passage. Archaeologists usually use the word *cyclopean* for the Mycenaean fortifications, as the walls were built of colossal stones. Such fine and powerful fortifications indicate that the population had a high critical coefficient and a long history of warfare. The archaeological findings provide conclusive evidence of the stratification of Mycenaean society. The graves of Mycenaean chiefs and aristocrats are full of gold, silver, ivory and excellent examples of decorative art, while the graves of the common people display only a few, poor possessions.

Starting in 1450 BCE the Mycenaeans used written language (linear B) adopted from Crete and adapted for Greek. Examples of linear B writing have been found in many locations in Mycenaean Greece, sometimes in considerable quantity. At Pylos, a thousand clay tablets with characters of linear B were excavated, suggesting that literacy in Mycenaea was comparatively widespread for those times. The Mycenaean centers traded with many countries: Egypt, Mesopotamia, Cyprus, southern Italy, Sicily, Sardinia and the Iberian peninsula.[61]

However, by the start of the 12th century the Mycenaean civilization had collapsed. The big fortified cites were abandoned, the clay tablets disappeared, the art and decorative handicrafts progressively deteriorated. Some forms, such as frescoes, disappeared altogether, while other crafts – jewellery, engraving, fretwork – became more and more primitive. If in the burial places of the Mycenaeans of the 14th and 13th centuries archaeologists often found objects from foreign lands, such as stained glass, gold, ivory, scarabs from Egypt, or seals

[61] L. Schofield (2007), pp. 71-72.

from Mesopotamia, in those of the 12th century such finds are increasingly rare, and by the 11th century they disappear entirely.[62] Where the ceramics dating from the first half of the 12th century counted 108 different kinds of vessel, the 11th century shows only 12 types,[63] and very crudely made. One archaeologist has said this work was really Stone Age style.[64] Metalware had become rare, and the excavations turned up mostly small articles, such as arrowheads, knives and rings. Armour, helmets, silver and bronze tableware, and diadems had simply disappeared. In some places, the population had gone back to making knives and arrowheads from obsidian.[65] The graves of the 11th century testify to a minimal degree of social stratification, in that the burial inventories were standard and very poor.[66]

Thus, the picture of all of Greece in the 11th and 10th centuries BCE is one of profound regression, which lasted until the 8th century. Archaeologists have termed this period "the Dark Ages of Greece". What was the cause of the regression? The standard answer has been invasion by barbarian tribes. It was once thought that the Dorian tribes had destroyed the Mycenaean civilization. Later, however, many scholars came to reject the theory of Dorian invasion. The Dorian tribes actually came to Greece long after the collapse of the Mycenaean civilization.[67] Besides, in some locations there is no trace whatever of intruders. On the face of it, however, it is difficult to refute the theory of invasion, because without it the regression is apparently inexplicable. The search continues for unknown barbarian tribes that are assumed to have destroyed practically all of Greece while leaving no vestiges.[68] Other scholars, however, recognize that this thesis cannot explain the Mycenaean collapse.[69]

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[62] A.M. Snodgrass (2000), p. 325.
[63] *Ibid.*, p. 34.
[64] R.N. Desborough d'A. (1972), p. 41.
[65] A.M. Snodgrass (2000), p. 382.
[66] W. Kraiker, K. Kübler (1939), s. 9.
[67] R.N. Desborough d'A (1964), p. 252; G.E. Mylonas (1966), p. 224, 406; M.I. Finley (1970), *Early Greece: the Bronze Age and Archaic Greece*, London, p. 61; P. Cartlidge (1979), p. 5.
[68] R.N. Desborough d'A (1964), p. 237; A.M. Snodgrass (2000), p. 305.
[69] O.T.R.K. Dickinson (2004), p. 309.

Interestingly, while some palaces of Mycenaean civilization were destroyed by fire and show signs of having been taken by storm, others were simply abandoned and decayed over time, as on Crete. If the Mycenaean civilization collapsed due to barbarian invasion, how can we account for the fact that some fortified places survived the end of the 13th century by more than a century,[70] as was the case in Attica, where the Acropolis of Athens avoided destruction? Similarly, some Mycenaean regions continued to prosper, such as the Ionian islands, the northwestern Peloponnese, parts of Attica and a number of Aegean islands.[71]

For my purposes here, the crucial development was the very severe depopulation of Greece that took place during the collapse of the Mycenaean civilization. Whereas archaeologists have found 320 places in Greece that were inhabited in the 13th century BCE, there were only 130 in the 12th century and a mere 40 in the 11th![72] And the size of the locations that were inhabited was sharply reduced as well.[73] Scholars have documented the drastic decrease in population in many Mycenaean regions,[74] and archaeologists indicate that the Greek population was smaller in the 11th than in the 21st century BCE.[75]

The principal features of Mycenaean regression, then, were:

1. Decay of fortified towns. Some fortified places were not destroyed but abandoned.
2. Written language was forgotten.
3. The ceramics became much more primitive and potter's wheels fell into disuse.
4. Metalware was much rarer, replaced by stone.
5. Luxury items, art and cult objects almost completely vanished from use. Little if any sign of social stratification appears.

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[70] N.K. Sandars (1978), p. 230.
[71] C. Freeman (2014), p. 126.
[72] A.M. Snodgrass (2000), p. 364.
[73] A.M.Snodgrass (1980), p. 20.
[74] C. Freeman (2014), p. 126.
[75] A.M. Snodgrass (2000), p. 367.

6. Objects of foreign trade vanished.
7. Depopulation
8. No sign of invaders.

From the standpoint of our model, what happened here? The critical coefficient of Mycenaean Greece had become too high, while neighboring lands had lower coefficients. According to the first law of reservoirs, in such cases cases migration is inevitable, and migrations did in fact take place. People traveled east and southeast. Excavations at Miletus offer evidence that Mycenaeans had settled there already by 1450 BCE,[76] and Hittite texts indicate the presence of Ahhiyawa in western Anatolia from 1400.[77] ("Ahhiyawa" is a Hittite translation of "Achaeans"as in Homer's poems, or of Mycenaean Greeks in the modern sense.) We know about Greek raids on western Asia Minor from the Iliad. Scholars now date the Trojan War to the mid-13th century BCE.[78]

However, the mass resettlement of Greeks did not come until later. The bulk of migrants settled on the west coast of Asia Minor, and scholars date the foundation of most of these settlements to the 12th or 11th century,[79] exactly when Mycenaean Greece was being depopulated. Mycenaeans also migrated to Cyprus and the Levantine coast,[80] but most went to the western coast of Asia Minor, which in fact was to become one of the centers of ancient Greek civilization. It is worth noting that it was precisely here that Homer's poems were preserved, while in European Greece they were forgotten.

In short, mass migration produced severe depopulation and drove the critical coefficient down. And what followed, according to the third law of reservoirs, was social and economic regression. Thucydides, in writing about the primordial life of the Greek tribes, spoke of "continuous movement" (Thuc. 1.2). Some scholars have

[76] T.F. Tartaron (2013), p. 21.
[77] T. Bryce (2005), p. 361.
[78] R. Castleden (2005), p. 213.
[79] A.M. Snodgrass (2000), p. 373.
[80] T.F. Tartaron (2013), p. 18.

maintained that in the 12th-11th centuries the population of Greece had gone back to nomadic or semi-nomadic life.[81] This would correspond precisely to the third law of reservoirs, the changeover to more extensive land use thanks to its higher labour productivity. The Dorian tribes came to Greece long after the collapse of the Mycenaean civilization, because there was abundant abandoned land.

3.3 The Harappan civilization

The Harappan civilization arose in the Indus valley in the 27th century BCE. By that time the Indus people had migrated from villages to cities and the Early Harappan communities had become large urban centers, probably the biggest in the world at the time. Their quality of town planning, sewerage and drainage were far more advanced than in any contemporary urban sites.[82] The Harappan people were the first to construct irrigation canals in the Indus valley. Their earliest examples of written language date to the 3rd millennium BCE. Goldsmiths, engravers and potters achieved high levels of skill. Excavations have uncovered large quantities of fine gold, silver, stone and bone necklaces, beads, rings, bracelets and so on. Copper and bronze were widely used. There is substantial evidence that the cities of the Indus valley civilization traded with South India, Afghanistan and Iran.[83]

From the 18th century BCE, however, archaeologists have found only indications of decline. In Mohenjo-Daro, one of the largest Harappan cities, all large public houses were abandoned and fell into ruin, and the population took their bricks to build small new houses. Potter's kilns had appeared in the main streets.[84] By around 1700, most of the cities were abandoned, and there was a substantial decline in population. The principal features of the regression were:

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[81] Ch.G. Starr (1961), p. 80.
[82] D.K. Chakrabarti (1979), p. 206
[83] S. Asthana (1982), pp. 271-285.
[84] R.E.M. Wheeler (1959), pp. 111-113.

1. All towns were abandoned.
2. Written language was forgotten.
3. Ceramics became much more primitive and were produced without the wheel.
4. Metal was used much more rarely.
5. Luxury items were much rarer.
6. Items of foreign trade vanished.
7. Depopulation.
8. No sign of invaders.

The characteristics of the decline of the Harappan civilization are identical to those of Mycenae. In 1953, Sir Mortimer Wheeler ascribed the decline of the Harappan civilization to an invasion of Aryans from Central Asia. In the opinion of specialists, however, the decline of the Harappan civilization, like the Mycenaean, simply cannot be explained by invasion. First, the onset of the Harappan crisis antedates any sign of the newcomers.[85] Second, the decline was endogenous in nature. The cities were not destroyed but abandoned and only fell into ruin afterwards. Significantly, the crisis came first in the central parts of the Indus civilization, and only after a century or two did the peripheral areas to the east and south begin to collapse.[86] Apart from barbarian invasion, other scholars have suggested that the regression was due to changes in the course of the river and drought, or conversely by flood, or by deforestation.[87]

The Harappan was the most geographically extensive of all the early civilizations. The beginnings of the civilization (the Amri culture), some scholars believe, were in the lower Indus valley, on the Sindh plain. Sindh is arid area, with little land suitable for agriculture. In keeping with the second law of reservoirs, this region developed faster. As the reservoirs filled, the population moved up the Indus in Punjab. The Harappan centers were not the first in the Indus valley to be abandoned. Archaeologists have uncovered ear-

[85] G.N. Bongard-Levin, G.F. Ylyin. (1985), c. 107-108.
[86] *Ibid*., c. 92.
[87] For example, Knipe (1991).

lier towns that were abandoned and went to ruin.[88] Thus the Harappan population migrated and constantly developed new lands until the entire Indus basin was filled. Then they began to migrate eastward to the Ganges basin and, on a much smaller scale, southward. In accordance with the first law of reservoirs, the first migration was from the central regions of the civilization, where the critical coefficient was higher. Once the population density had fallen, in accordance with the third law, the regression began. The outlying regions retained their level of development for a time, as in Greece. And like the Dorian tribes in Greece, the Aryan tribes only moved into the depopulated Indus basin after the Harappan civilization had collapsed.

The three cases of regression considered so far share a number of features. Decline was endogenous. Mass migrations were evident and have been recognized by many experts. Yet practically no one posits that these populations had left their land permanently of their own free will. To my way of thinking, the reason for an error made by so many scholars lies in the generally accepted thesis that progress is always good for the people. This may be true for contemporary society, but it was not the case in preindustrial society, where the consequence of progress for the bulk of the population was longer and harder toil, more taxes, more superiors, and so on. For them, "progress" was always harmful, and if there was a chance of avoiding progress by migration, they surely took advantage of it.

4. The development of Italy

Let me begin with a disclaimer: there is space in a paper of this sort for only a very brief sketch of the history of Italian development, intended simply to demonstrate the potentialof the model I propose. Thorough treatment of such a grand theme would require a good number of volumes; historiography alone would take one. I accord-

[88] H. Kulke, D. Rothermund (2004), pp. 23-25.

ingly restrict myself to the principal points in the great sweep of history.

In any event, the model set forth here incorporates some very well-known aspects of population growth or decrease. For example, it has been known since the publication of Malthus' "Essay on the principle of population" that population growth causes rising prices and falling wages. Equally well-known, related phenomena are intensifying social strains and instability, frequent epidemics and famines at moments of fastest population growth.[89] My approach emphasizes features of the interaction between demographic processes on the one hand and social, economic, and political processes on the other that, to my knowledge, have not been suggested by academic studies.

4.1 Antiquity

It was of course not mere chance that ancient Italy was the center of a world empire. According to the second law of reservoirs European civilization had to arise in the Mediterranean, the region with the smallest human capacity; and within the Mediterranean region, the first civilization had to come in the area with the most limited capacity: the Minoan civilization on Crete. Further, in keeping with the second law of reservoirs the center subsequently moved to Greece. In keeping with the first law, following the conquests of Alexander the Great, Greeks began to emigrate to the East en masse, and under the third law this resulted in the economic and political decline of Greece itself, a peninsular zone that obstructs migrationand hence quickens progress. The second smallest Mediterranean peninsula is the Italian, and this is where the next European center of development was inevitably situated. The largest Mediterranean reservoir, the Iberian peninsula, simply took too long to fill up.

It is impossible to understand the development of Italy without

[89] D.H. Fisher (1999).

considering its geography. That which Braudel intuited can be understood scientifically thanks to our proposed theory. The geography is such that in the South of Italy human capacity was minimal in antiquity (comparison with modern Italy is irrelevant, as we are now dealing with an industrial economy; in preindustrial Italy, the absolute majority of the population were subsistence farmers). Moving northwards, capacity increased: it was greater in Campania than in Calabria and Basilicata, greater in Latium than in Campania and greater in Tuscany than in Latium. The greatest human capacity was found in the Po river plain and its extension in Venetia, the capacity increasing from west to east (although in ancient times the plain was not considered be Italy at all but a part of Gaul). These features were crucial to Italian historical development.

In accordance with the second law of reservoirs, the earliest centers of development were the Greek colonies in southern Italy and Sicily, where capacity was the least. Later, the center shifted to the middle of the Apennine peninsula. At that time, Latium and the neighboring territories had the highest population density in all of Italy. By time of the Second Latin War (340 BCE), the Roman state had an area of 3095 sq. km[90] and a population of 250,000 (Liv. XI, 19). This gives a population density of 80 per square kilometer. A hundred years later, according to Polybius (Pol., II, 24), in 225 BCE, during the Gallic invasion, the Italian tribes had differing numbers of men able to bear arms: Umbrians 20,000, Etruscans 50,000, Lucanians 30,000, Iapigians and Messapians 66,000. Assuming that men able to bear arms made up 20 to 25 percent of the population and that today's Italian provinces correspond roughly to the tribal areas of ancient Italy, we can calculated the following population densities: Umbrians, 12 per km^2, Etruscans 11, Lucanians 15 , Iapigians and Messapians 17. All these densities are far lower than those of Latium and Campania.

The population density of Middle Italy demanded very inten-

[90] U. Beloch (1880), S 70.

sive agriculture. The ancient authors reported that 2 *ugers* was enough to support one Roman citizen (NH, 18,2; Varr. 1,10). This means 10-12 *ugers* (2.5-3 hectares) for a family of 5 to 6 members. These conditions produced a population that was disciplined, persistent and diligent, because in order to survive the peasantry had to work harder and harder. Early Roman legends tell of fierce, ceaseless warfare with neighboring peoples. These wars stemmed from the very high critical coefficient. Such conditions could be withstood only thanks to social unity and selflessness. And these were precisely the characteristics that enabled the Romans to conquer Italy and to create a world power.

The third law of reservoirs predicts that the growth of population above critical density will result in the centralization of power, the emergence of social tensions and the acceleration of economic development. All of these phenomena are found in the historical development of Italy. It is certainly no accident that the periods of especially fierce social struggle in Rome were followed by large expansions of the territories under Roman control, as happened between around 390 and 360 BCE, during the struggle of the plebeians for the limitation of occupied fields. It is widely held that the social struggle in Rome was practically always due to a shortage of land, or in our terms by a high critical coefficient. From the mid-fourth to the mid-third century, Rome's territory increased eight-fold, as the rising critical coefficient triggered social tensions, which where conditions permitted issued forth in territorial expansion. By now the Roman colonization of Italy (350-157 BCE) had begun; a total of 53 colonies were founded, and the excess population moved away from Rome and its environs. No wonder the period from the late fourth to the mid-second century was one of social peace. At this stage, the unification of Italy was inevitable. It is out of the question that the Italic tribes pledged fealty to Rome only out of fear of the Roman legions. Rather, the unification of Italy was certainly advantageous for all the Italics. Among other things, it entailed the cessation of tribal wars.

The acceleration of economic development from the end of the

4th century is evident. The first roads, new public buildings, the first aqueduct and the introduction of coinage all tell us that the Roman economy was growing.

There are differing views of demographic processes in Italy in the last two centuries BCE. After Karl Julius Beloch published *Das italische Bund unter Roms Hegemonie* (Italian Union under Rome's Hegemony), some scholars began to suggest that the Italian peasant population was declining,[91] based on the census figures of the first century. But other scholars maintained that the population was growing in the countryside as well as in the towns.[92]

From the standpoint of our model, there are many facts to corroborate the scenario of population growth in Italy in the last two centuries BCE. The period of social peace that marked the colonization of Italy from the early third to the mid-second century gave way to a series of episodes testifying to growing social tension.

First was the movement of poor Romans for land reform, headed by the Gracchi brothers from 130-120 BCE. The bitter struggle for land shows that the critical coefficient was high. Certainly, the allotment of land to poor farmers by a land reform commission lowered the coefficient, but not for long, and by the end of the second century the social struggle had broken out again. The social tensions took the form of a struggle between *populares* and *optimates*. That the main issue of the social struggles in the first century BCE was land has long been clear to historians.[93] After the reforms of Marius, the Roman army was no longer a peasant militia but a professional military force, compensated by pay during service and a plot of land after retirement.

Earlier, during the age of bloody warfare between the Italic tribes, every peasant knew he had to defend himself and his family. With the unification of Italy under Rome, this factor was eliminated, while population growth constantly drove the redundant farming

[91] A. Toynbee (1965); P.A. Brunt (1971).
[92] A. Launaro (2011); E. Lo Casio (2001).
[93] M.I. Rostovtzeff (1926), p. 24.

population off the land. At this point, it is worth noting that in preindustrial societies the sole cause of the emergence of landless peasantry is population growth, because in these societies peasants engage in subsistence farming and are practically immune to the market mechanism. In all preindustrial countries, the course is always the same: the division of the parents' land among the heirs. As long as the remaining plots are sufficient to maintain a peasant family, the additional population will stay in the villages. When it becomes insufficient, a crop failure or two put the peasant in debt, and sooner or later he loses his land.[94] By the end of the 2nd century BCE, the many landless young peasants in Rome constitute evidence of a high critical coefficient. These landless peasants joined the legions of Marius, as they would later enroll in those of another Roman military commander. Tacitus quotes Tiberius to the effect that only paupers and the homeless joined the army voluntarily (Tac., Ann., IV, 4,2).

The consequences of Marius' reform are well known. The veterans wanted land as compensation for their military service, and only a military chief could offer this. As a result, the veterans supported their own commanders in the struggle for power. The rest of Roman history, until the dawn of the Empire, consisted in the power struggle among military chiefs.

This lay still in the future, however. To my mind, the most important event of the time was the War of the Allies, which was triggered by the very high critical coefficient among Italics. This is a particular of considerable importance – during the war with Hannibal, virtually all of Rome's allies in Italy had remained loyal. What changed during the century that followed? Population growth had made land scarce, and the shortage was especially acute for the allies, as the Roman policy of allotment produced inequality of land ownership between Roman citizens and the allies. Therefore, as Appian observes, "The Italic peoples slipped little by little into pau-

[94] J. Goldstone (1991), p. 74.

perism" (Appian, C.B. 1,7). The Italian allies demanded political equality with Roman citizens, and the material realization of this was equality in the land allotment. Significantly, the heart of the Italic uprising was in the Apennines, where the capacity of the reservoirs was smallest and the critical coefficient highest. After the end of the War of the Allies, the Lex Ulia and the Lex Plautia Papiria ensured that Italy was united in the sense that practically all Italics had equal right to land allotment. But by the this time, in the first century BCE, the entire Italian reservoir was full. The uprisings of Lepidus and Catiline and the subsequent civil wars between Roman military chiefs (Marius and Sulla, Caesar and Pompey, Octavian and Marc Antony) are a good indication of a very high critical coefficient in Italy.

The wars between military chiefs represented a pure power struggle, as no social or economic reforms were proposed. The majority of the Roman people took no part on either side, as for them it was totally indifferent who would control the state. They needed order and peace, and the only way out was to put an end to anarchy and confer power on a single man. Thus power was centralized, in accordance with the third law of reservoirs. The result was the Roman Empire.

The land redistributions, which constituted one important consequence of the civil wars, demonstrate that the supply of free land in Italy was now totally exhausted. Obviously, redistribution could not change the critical coefficient, and the only possible solution was migration of the population to conquered provinces outside Italy. And this is precisely what happened. In this sense the foundation of the Empire marked a turning point in Roman history. First Caesar resettled 80,000 Roman citizens outside Italy (Suet., D.J., 42) and only 40,000 in Italy (App. B.C., 2,35; Suet. D.J, 20). With the end of civil warfare Augustus had to demobilize an enormous number of veterans. We know from "The Deeds of Augustus" that he allotted land to 120,000 veterans, not only in Italy but in also in Africa, Sicily, Macedonia, Spain, Achaea, Asia, Syria, Gallia Narbonensis, and Pisidia (RGDA, 29). And the colonization of the provinces continued

under Augustus' successors as well. The lowering of the critical coefficient in Italy and the provinces had begun, in accordance with the first law of reservoirs. The barbarians practiced very extensive forms of land use – the forest-fallow system and cattle breeding on natural pastureland. So the population density there was very low. Roman colonists brought with them much more intensive agriculture, increasing the critical population density many-fold. The Roman provinces were thus converted into reservoirs with very low critical coefficients, while their human capacity was enormous.

As we have seen, the process always involves diminishing activity in all fields and subsequent regression (third law).The consequence was an easing of the social tension in Rome. The century of social struggle from 130 to 30 BCE had come to an end.

The period from the first century BCE through the first century CE was the peak of development of the Roman state. But ancient Rome was a preindustrial society, and as the example of 16th-century England shows this meant that economic growth had to be accompanied by falling living standards for the majority of the Italian population. It is doubtful that the living standards of ordinary Romans improved in the late Republic and early Empire,[95] because this coincided with the greatest territorial expansion of Rome, and the only force that could make such expansion possible was the sons of landless peasants.

Further, there is the question of economic decline. As Rome was preindustrial, the economy consisted mainly of agriculture. Many scholars link the regression of Roman agriculture and of the state with the spread of *latifundia*. The thesis that the decline of Rome stemmed from depopulation and the growth of *latifundia* has a long pedigree.[96] Pliny maintained that the *latifundia* had destroyed first Italy and then the provinces (NH 18,35).

The ancient writers, in their references to the *latifundia*, depicted desolation in lieu of the prosperity that had once prevailed. Col-

[95] P. Temin (2013), p. 226.
[96] M.I. Rostovtzeff (1926); T. Frank (1927).

umella described *latifundia* that had been abandoned, trampled down by cattle or wild beasts and cultivated by slaves in the stocks (Col. 1,13,12.). In sources dating to before the Common Era, *latifundia* are mentioned only in Varro's *Rerum rusticarum libri tres* (Three Books on Agriculture) (1,13,3; 1,22.2). The sources of the first century CE provide much more information on the *latifundia*, which are universally considered to be harmful (for example, NH 18, 17-19, 35; Col. 1,3,12).

Thus, we have solid grounds for saying that the spread of *latifundia* in Italy began during the first century CE, just after the first large wave of emigration. The large estates were a result of depopulation, because they were formed where there had previously been many peasant's plots. To be sure, part of the depopulation of the countryside consisted in people moving to towns, especially to the city of Rome, but the main cause was emigration. Scholars have long supposed that the depopulation of Italy was due to emigration,[97] but they have not generally been able to determine the cause of the emigration. Taking account of the higher productivity of labour under a regime of more extensive farming, the reason for the Italian population's emigration to the provinces becomes evident. In the provinces the critical coefficient was much lower, land was much more readily accessible, and the migrants could obtain more land and practice more extensive agriculture. As a result they worked less.

Certainly, in the first half-century CE the depopulation of Italy was just beginning. But by the second half of the century it had become plain to see. Pliny the Elder wrote that near Rome "The low price of property through all the districts just outside the city in every direction is notorious" (NH, XIV, 5, 50). That was possible only because depopulation had decreased the demand for land.

The falling critical coefficient diminished all the activities of the Italian population, including military service. Now the bulk of the

[97] See, for example Luzzatto (2005), pp. 5-6.

Roman legions, and their most effective units, were made up of provincials (Tac. Ann, III, 40). Consequently, the crisis of central power ensued, during the so-called "Year of the Four Emperors" (69 CE). However, the crisis was quickly overcome; a significant detail: it was the eastern provinces that proclaimed Vespasian as Emperor. This was one of the first signs that the Eastern part of the Empire was in better condition.

By the late first and early second century, the regression in all spheres of life was growing more and more evident. Pliny the Younger received his rent not in money but in kind, because his tenants were seriously in arrears even though he offered them very substantial abatements (Ep. IX, 37, 3-4). Pliny's tenants could not sell their crops to pay the rent, because demand for farm products was diminishing. That is, at this time market relations had begun to decline.

It is worth remarking that the depopulation came first in the South of Italy, where the capacity of reservoirs was minimal (recall that by the second law, processes in small reservoirs are always faster). Depopulation and decline then spread to central Italy. The depopulation of the plain of the Po did not begin until after the second century.[98] Earlier, under Julius Caesar and Augustus, Italics had migrated to the Padan plain, making this the most highly developed and prosperous area in Italy towards the end of Augustus' reign, as contemporary authors noted (Tac. Hist. II, 17; Polyb. II, 15).

By the beginning of the second century CE, the human resources of the Empire were exhausted. The Trajan conquests were the last, and from Hadrian on the Empire could do no more than defend itself. At this time, moreover, Rome was in the throes of a deepening economic crisis. Luzzatto suggests that the causes were competition from the provinces (here he agrees with Rostovtzeff), a reduction in the supply of slaves, and oppressive taxation.[99] I disagree with all three points. First, competition from the provinces could not have

[98] Luzzatto (2005), p. 6.
[99] *Ibid.*, p. 1-3.

caused the depopulation. Since as in all preindustrial societies the majority of the population practiced subsistence agriculture, imports of cheap goods from the provinces could not ruin them. And as Luzzatto himself observes, only after 200 CE do we hear of Gaul exporting wine,[100] and by this time Italy was already in deep decline. Rather, the imported wine was a substitute. Second, the slaves too were only substitutes, taking the place of free labour. It is hardly necessary to prove that free labour is more effective than slave labour. The patricians were only obliged to turn to slave labour because emigration and the fall of the critical coefficient had made it impossible for them to hire wage labourers. And third, there is no example in all of world economic history of taxation ruining an entire country without sparking popular uprisings.

This entire account of the crisis corresponds to our third law of reservoirs. Economic decline and the political passivity of the populace were accompanied by the weakening of central power. By the end of the 2nd century economic stagnation[101] and the instability of the Roman emperors had become evident. Civil war lasted, with some intervals of peace, from 193 to 285. The depth of the political crisis was in 268-285, with the Empire splitting into three competing states.

The falling critical coefficient radically altered the nature of the Roman army. Before the reform of Marius, it had been a home guard. Afterwards it became an army of the landless sons of peasants compelled to join the army to avoid starvation. Upon retirement, they were given a plot of land. By the second century CE there was an abundance of free land. We know from Tacitus that veterans often abandoned the land they had been allotted and did not want to be farmers (Ann. IV, 27). The army was now a force of mercenaries, who did not want to work.

The only reason for the population to support the army was the barbarian threat, which had become menacing indeed. While the

[100] *Ibid.*, p. 4.
[101] A. Bernardi (2013), p. 32.

critical coefficient in the Empire was falling, in the barbarian periphery it was instead rising rapidly. The typical barbarian practices of cattle breeding in natural pastureland and forest-fallow agriculture result in very low critical population density. And the barbarians accordingly displayed a considerable bent for warfare. It is well known that an external threat strengthens the power of the state, and in fact despite the declining critical coefficient, the power of the emperors was building. But the sole basis of this power was the army. The emperor Severus accordingly advised his sons to enrich the soldiers and despise the rest. Herodian thought that Severus weakened the strict discipline of the soldiers and their respect for their superiors by teaching them to covet money (III, 8, 4). Later the emperors' dependence on soldiers only intensified. The structure of the army changed in this period, as soldiers were allowed to marry and settle in their own houses. Where previously only veterans had been allotted land, and only after 20 years of service, land was now available to all. So by the time of Constantine the army was composed of frontier garrison troops and mobile field forces. Given the declining motivation of the Roman soldiers, the frontier garrison troops had to defend their own homes and families, and with them the entire Roman empire.

By 285 the profound political crisis had been overcome. The emperor had become an autocrat, but the economic crisis only worsened.[102] The decline in market relations resulted in constant budget deficits, as it made it much more onerous to pay taxes, even if the nominal sum of taxes did not increase. To finance the deficit, the emperors debased the currency. Between the mid-second and mid-third century the silver content of the denarius was reduced by 46%.[103] The debasement continued later and so did inflation. The proclamation of Diocletian's Edict on Maximum Prices showed that the emperors had no real instrument to stop economic decline. It was impossible to fix prices when the debasement of the currency con-

[102] *Ibid*., p. 25.
[103] K.W. Harl (1996), p. 127, table 6.1.

tinued. Certainly, the regress of the Empire could not be stopped by any sort of administrative measure. An especially striking example of the impotence of the state was the restrictions placed on social and professional mobility by Diocletian and afterwards by Constantine, which sought to bind every man to his occupation and make it hereditary from father to son.[104] Our theory predicts that a decline in the critical coefficient will inevitably produce social regression and the destratification of society. The attempt to preserve the social structure was vain; regression resulted in backward development.

Another major development was the barbarization of the army. The motivation for Romans to perform military service had totally collapsed. Free lands were abundant, so why risk one's life? The situation of the barbarians, with their high critical coefficient, was quite different. They willingly joined the Roman army, and this process went on until practically all the soldiers of the Roman legions were barbarians.

It is impossible that such sweeping changes to the Roman military and Roman society could have been due to the rise of the Sassanian empire, as some scholars propose.[105] The Sassanids were successors to the Parthian empire, which had long been a dangerous enemy but had never provoked such profound changes within Rome. Nor did the Sassanids ever threaten the existence of the Roman Empire, and the span of time during which they scored some military victories over the Romans was relatively brief (about 50 years), so the consequences of their actions were necessarily limited in both time and space. Like Mesopotamia, Persia was one of the world's very first civilizations, and by the third century CE these areas had long since been in the stationary state. As usual in such societies, population oscillated around the critical density. When the density increases, the state should strengthen and its war-making should increase, in accordance with the third law of reservoirs. And this scenario corresponds precisely to the historical facts: in this pe-

[104] Luzzatto (2005), p. 9.
[105] P. Heather, pp. 62, 67.

riod the number of settlements between the Tigris and the Euphrates increased by 50 per cent.[106]

Probably the migrations from peninsular Italy to the Padan plain at the turn of the first century CE were followed by migrations out of Italy and out of Spain and other Mediterranean lands to Gaul and the Rhine valley. In the first half of the 2nd century the migrations were routed to the north of the Balkan peninsula, in the valley of the Danube. The migrants from regions with intensive agriculture and correspondingly high levels of development did not switch immediately to more extensive farming in the new lands where this was feasible. This change was ineluctable, but it would necessarily take some time. First the migrants had to see that more extensive agriculture ushers in higher labour productivity. Also, it is possible that the migrants settled in compact clusters on the best land, enabling them to preserve their agricultural tradition much longer. Therefore, the regression was relatively slow. In the fourth century the stabilization of the situation is evident.[107] But towards the end of the century another wave of more extensive agriculture got under way, and the crisis consequently intensified. The economic situation worsened,[108] political instability reached peak intensity, the barbarians invaded Roman territory and sacked Rome. The deterioration of Roman society is visible in many spheres. For example, archaeologists have found that villas as a type of settlement disappeared from the 350s on in Britain and Northern Gaul and from the fifth century even in the Mediterranean.[109] This can be read as a sign of social destratification.

Significantly, in Italy it was the Padan plain, the most capacious part of the country, that retained its population for the longest time. Certain towns in northern Italy, such as Milan and Aquileia, Padua and Ravenna, continued to prosper in the first half of the fifth cen-

[106] *Ibid.*, pp. 61-62.
[107] A. Bernardi (2013), pp. 43-44.
[108] *Ibid.*, p. 25.
[109] C. Wickham (2005), p. 177.

tury. For a period of a century, until 404, Milan supplanted Rome as the seat of imperial government and was surpassed by Aquileia.[110] Only after the depths of depopulation had been reached was the capital of the Western Empire finally transferred to Ravenna, owing not to its economic importance but to its safe location.

Again, some particulars are significant: Diocletian ruled from the eastern part of the Empire, and Constantine transferred the capital to the East. This was no mere coincidence. The Eastern Empire was doing much better than the West and survived much longer. Our proposed model illuminates the reason for this difference. The Eastern Empire consisted of the former state of Alexander the Great. Greeks and Macedonians had migrated from their native lands to the newly conquered territories. These processes had lowered the critical coefficient in Greece and Macedonia and caused the regression that facilitated the Roman the conquest of those lands. And the relatively low critical coefficient in the Eastern part of the Empire discouraged mass emigration from it. Therefore, in the East depopulation did not occur and regression was avoided. The reservoir there did not fill up until the time of Justinian, allowing him to undertake the conquest of the lands of the Western Empire. Archaeological studies have found that the high point of development of settlements in many parts of the Eastern Empire came in the fifth and sixth centuries, followed by contraction in the seventh and eighth.[111] In the Balkans, after the seventh century rural settlements are very hard indeed to track.[112] In short, the demographic trend corresponds to political and economic developments. In the western Mediterranean, by contrast, the development of settlements appears to have been relatively continuous, with no peak in the fifth and sixth centuries.[113] This suggests that there was not a generalized population decline in the Roman empire but a redistribution of population from the Mediterranean to the northern provinces.

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[110] Luzzatto (2005), p. 12.
[111] C. Wickham (2005), pp. 148-149.
[112] *Ibid.*, p. 164.
[113] *Ibid.*, p. 400.

4.2 The Middle Ages and early modern times

It is possible that the population decline in the West came later – in the sixth and seventh centuries when economic and cultural regression was at its worst.[114] Following the contraction of the great migration period, the low population density made very extensive agriculture possible. At this point, the possible population growth would cause the intensification of agriculture and a decline in labour productivity, which would be undesirable for the peasantry. For this reason, population growth is usually restrained within some limit that prolongs the low-population phase of demographic crisis. That the critical coefficient in Italy was very low is evident from the political situation. Italy was unable to resist foreign invasion (Lombards, Franks, Arabs, German kings). The Italian states had little if any central power.

However, sooner or later population growth quickens, because all the possible methods of restraint applicable in a preindustrial society are objectionable to the people. And this is what happened in the tenth century, not only in Italy but in Europe as a whole. The question here is the theory of the great waves of population growth.[115] From the point of view of our theory, the great wave was due to the filling of the reservoirs in the European agglomeration. The smallest reservoirs filled up relatively rapidly, but not the larger. In the latter, peasants could intensify agriculture and evade famine, war and epidemic but did not want to do so, because of the concomitant decline in the productivity of labour. Then both checks on population became operative: mortality increased and fertility decreased; hence the population diminished.

In this period Italy was not a military power, because the critical coefficient in the adjoining lands was higher than in Italy itself. This is clear from the campaigns of the German kings in Italy following the creation of the Holy Roman empire. This wave of population

[114] Many examples of regression in that period are collected in B.Ward-Perkins (2005).
[115] Fisher D.H. (1999).

growth, that is, led to the transition of Italy to a condition of external opportunities for development.

The population growth of the 10th and 11th centuries had consequences that correspond perfectly to our theory: the acceleration of economic development, the intensification of agriculture, urbanization, development of trade and industry, internal colonization,[116] rising prices and falling wages (the "Malthusian scissors").

All this is familiar enough, but some key features of the process can be explained only by our proposed theory of progress. First, the economic revival began in Southern Italy, even though starting in ancient times depopulation was sharper there than in the North. In the early Middle Ages, the South was the theatre of incessant warfare between Byzantines, Arabs, Lombards and later Normans. Especially devastating were the Arab raiders, who destroyed even such strong fortresses as Monte Cassino and San Vincenzo al Volturno. Nevertheless, in accordance with the second law, the less capacious reservoirs developed faster. A meaningful detail: in the South the revival of trade began in the small coastal towns of Calabria. The Apulian towns, especially Bari, were also of some importance. But the most important Christian trading center in the Mediterranean, except of course for Constantinople, was now Amalfi in Campania.

These facts correspond to our theory because Campania had the highest population density in Southern Italy. Once the critical coefficient had become high enough there, its towns could be expected to triumph over the other southern towns in the struggle for trading primacy. It is interesting, in fact, that the main center of trade was Amalfi, which had practically no arable land, and not Naples with its fertile hinterland. Here the action of the second law of reservoirs is evident.

The rise of Amalfi began in the ninth century and reached its apogee in the tenth and eleventh.[117] It is difficult to discover any geographical advantages that might account for Amalfi's rise. It has

[116] W. Abel (2013), pp. 25-28.
[117] B. Kreutz (2011), p. 83.

practically no harbor, while the adjoining part of the Tyrrhenian sea has the weakest winds in all of the Mediterranean.[118] The only cause for Amalfi's primacy in commerce was the absence of strong competition, in accordance with our second law.

It is possible that Amalfi's commercial activity commenced with common goods – grain, salt, wine – which were sold in the vicinity.[119] But very soon the main traffic was in luxury goods or goods of elite trade. (The term most commonly used is "long-distance trade," but I believe it to be inexact. Such trade may also be short-distance. The chief characteristic is that the goods are sold primarily to a social elite.) As always, the elite trade brought colossal profits. As always, the society engaging in elite trade sold elite goods to societies in more capacious reservoirs, hence more backward societies, and bought food from them. We know from Luidprand that in the tenth century the traders of Venice and Amalfi brought valuable textiles to northern Italy, in exchange for the foodstuffs needed to sustain their populations.[120]

However, in accordance with the model the more capacious reservoirs further north had begun to fill up. A newly redundant population was squeezed out of agriculture by the rising critical coefficient. These people were ready for any work, and the smaller reservoirs of the South could not withstand the competition. Step by step, the elite trade of Amalfi and other southern towns contracted. The exclusion of the South of Italy from the elite trade had very important consequences. Earlier, a fair number of southern towns had become active in the elite trade, gaining autonomy and the status of Republics.The lack of any possible external opportunity for development led to the centralization of power in Southern Italy. Significantly, the Kingdom of Sicily was not founded until 1130, even though the Norman conquest of the South of Italy had come in 1071. The conquest as such did not create a centralized state. Not until important changes in the southern Italian states had occurred could

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[118] *Ibid.*, p. 91.
[119] M. de Treppo, A. Leone (1977), p. 27.
[120] Luidprand (1998), p. 55.

Roger II do so. The changes were the exclusion of the South from the elite trade while the critical coefficient was rising. The trade had made it possible to lower the coefficient by importing foodstuffs. Once this avenue was closed off, the critical coefficient in the South rose steeply, and by our third law power was centralized.

Luzzatto maintained that the development of economic autonomy and self-government in the southern towns was halted by the Normans and Frederick II, who established a centralized state authority that could not tolerate local autonomy, making commercial and industrial activity impossible.[121] This account confuses cause and effect. In societies engaged in the elite trade, the business of the active population depends on international political decisions. Therefore, these people want to take part in the decision-making, so the societies engaging in large-scale elite trade practically always had a republican order. But if the society has lost the possibility of trading in elite goods, then participation in government becomes pointless. The naturalization of life led to a decline in all kinds of trade. Incomes declined while the critical coefficient rose. As a consequence, the authority of the monarch replaced the republican order. This is precisely how the Kingdom of Sicily came into being. Instead of elite goods, the South of Italy had begun to export foodstuffs and primary goods.

The small capacity of the reservoir made the political development of Southern Italy especially swift. The Kingdom of Sicily had strong centralized power. The feudal lords were prohibited from selling their fiefs, the bearing of arms was banned, all vassals were subjected to the king's taxes. The clergy was made subject to the common law and prohibited from acquiring land. The cities were deprived of the right to self-government. A bureaucratic administration was created. State monopolies were imposed on grain, iron, salt and silk. Centralized states of this sort did not arise in the rest of Europe until the 16th century, so the Kingdom of Sicily was far ahead of the others.

[121] G. Luzzatto (1950), pp. 100-109.

Meanwhile, primacy in trade passed from Amalfi to Pisa. In the 11th century, when Amalfi's decline was already under way, Pisa was the leading trade and naval center of the Western Mediterranean. It waged victorious wars against the Saracens and Genoa, dominated Corsica and Sardinia, and served as a major naval force in the First Crusade. The standard interpretation of the rise of Pisa, in fact, relates it to the Crusades, but the latter were the product of the rising critical coefficient in Western Europe. We know from Robert of Rheims that Pope Urban II said at the Council of Clermont: "Let none of your possessions detain you, no solicitude for your family affairs, since this land which you inhabit, shut in on all sides by the seas and surrounded by the mountain peaks, is too narrow for your large population; nor does it abound in wealth; and it furnishes scarcely food enough for its cultivators. Hence it is that you murder one another, that you wage war, and that frequently you perish by mutual wounds. Let therefore hatred depart from among you, let your quarrels end, let wars cease, and let all dissentions and controversies slumber. Enter upon the road to the Holy Sepulcher; wrest that land from the wicked race, and subject it to yourselves. That land which as the Scripture says 'floweth with milk and honey.'" (Historia Hierosolymitana I, 1). In other words: the critical coefficient is high, the necessities of life are scarce. The only way out is emigration.

The rising critical coefficient in Western Europe quickened the development of central and northern Italy. The rise of Pisa stemmed from the emergence of possibilities for the elite trade. But after the Battle of Meloria in 1284, commercial and naval supremacy passed to Genoa, the entrepôt for the western part of the Padan plain. Genoa's only rival was Venice, and bitter but undecisive warfare between them lasted for 125 years. By the fifteenth century, however, Venice had clearly become the leading power. Was this mere chance? I think not. In fact, the passage of trade and naval primacy coincides exactly with the relative capacity of the Italian population reservoirs: first from the minimal capacity of the South (Amalfi) to Tuscany (Pisa) and then to the Padan plain, first the western part (Genoa)

and finally the east (Venice), where the capacity of the reservoir was greatest. Certainly, the immediate neighborhood of any of these maritime republics had very limited capacity, but the manpower came to them from entire regions. The redundant population, as a consequence of the high critical coefficient, was the sole cause of economic and strategic success. In other words, the process we have traced conforms to the second law.

The elite trade changed Italian society utterly. Labour activity was now much more complicated, and people's development accordingly much more advanced. As a consequence, standards of living were high and the development of culture was astonishing. No other country in Europe traded in elite goods on such a scale, hence none had a comparable level of development. Italy was the prime center of European economic and cultural growth in the Middle Ages and early modern times.

The maritime republics engaged mostly in transit elite trade, although manufacturing was of some importance. For the inland towns, however, elite trade was quite another matter. Essentially it was impossible, so instead they specialized in the production of the elite goods. Of these goods the most important, that for which there was the greatest demand, was textiles and garments. Textiles, in fact, formed the most widespread trade in all of medieval Europe. It is well known that in Italy the main center of textile manufacture was Tuscany. At this time the capacity of the region's reservoir was optimal: not as small as those in Southern Italy but not as big as that of the plain of the Po. And as a result textile production was most highly developed in Tuscany. It is evident that in medieval Italy cloth-making constituted the most complex labour for the greatest number of people. Tuscany, in fact, was the most highly developed district not only in Italy but in all of Europe. And it was also, of course, the heartland of the Italian Renaissance. Again, this fact corresponds to our proposed theory.

The course of development of the communes in the North of Italy in the 13th century attests to the filling of the reservoirs according to our third law. That economic development was accelerating

is beyond question. Social tensions were growing, as is shown by the incessant wars between the city-states and the recurrent uprisings, coups, conspiracies and bloodshed. Interestingly, the 12th and 13th centuries saw the rise of a series of religious sects in Italy, some of them quite radical (Cathars, Waldensians, Humiliati, Franciscans and others). Given the rising critical coefficient, many people found themselves at an impasse and were looking for some way out. The level of cultural development of the population meant that the solution was sought in religious sphere.

In Northern Italy the centralization of power had some peculiarities. If the South was centralized with strong monarchical power, in the North matters stood quite differently, with large numbers of self-governing communes. According to the second law, the processes of centralization had to begin there later than in the South, and in fact they did. The first instances of centralization did not come until the first half of the 13th century: the states created by Ezzelino da Romano and by Pallavicino. Later the medieval lords came to power: the Scaliger, Este, Gonzaga and Visconti families, and others. Centralization followed the third law: a high critical coefficient caused internal strife, popular uprisings and anarchy. In these conditions the majority of the population was ready to renounce a portion of liberty in exchange for security. By the beginning of the 14th century, practically all the northern communes had become signorias, except for the towns that conducted large-scale elite trade, where business people still had a direct interest in decision-making and where the trade yielded profits high enough to produce good incomes for the general populace. This eased social tensions and prevented the centralization of power; and in fact no centralized state was formed in northern Italy.

The obvious locus of the centralization of power was Milan, which commands Italy's most capacious reservoir, the Po valley plain. Milan's greatest enemies – Venice, Florence and the Papal States – all got most of their income from outside Italy, and their citizens were accordingly uninterested in the unification of the country.

The process of unification came to a halt, as the forces for and against it were in balance.

At the turn of the 14th century, the critical coefficients in the various Italian states were considerably greater than 1. Both prices and social tensions peaked, while wages were at a minimum. In the terms of our model, some of the reservoirs in central and northern Italy were now filling for the last time. Incessant wars and uprisings testify to a revolutionary situation in many Italian communes. Even Venice experienced an uprising, Tiepolo's Rebellion in 1310.[122] As always when a reservoir is filled for the last time, economic growth (which had marked the previous two centuries) gave way to intensifying economic difficulties. The peasantry simply had no resources with which to pay rents; feudal lords had no money to buy elite goods; merchants incurred losses; craftsmen and workers were idled. The banks of Siena and Florence, the largest in Europe, collapsed. In 1316 Europe and Italy experienced the worst famine ever.[123]

The facts presented here, I believe, warrant the conclusion that the demographic crisis followed from the filling of the reservoirs. In fact, the European population had begun to diminish even before the Black Death.[124] Moreover, despite the awful death toll of the epidemic, the plague alone could not have caused such a long and steep population decline. Wrigley and Schofield have shown that in preindustrial societies, extremely sharp rises in death rates are followed

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[122] The stability of the Venetian state, which prompted the wonder of contemporary observers as well as of modern scholars, reflected the fact that it was very difficult for peasants to settle in the city. Venice is situated on a series of small islands and until the beginning of the 15th century had no *contado* of its own. In-migration from the rural villages was a prime cause of the popular uprisings in the other Italian cities. Scholars have stressed the anxiety of town administrations in the face of the influx of paupers (L. Martines, 1979, p. 8). Many cities were constantly promulgating laws to force peasants back to their native villages (Carol Lansing, 2003, p. 87) The Venetian authorities strictly controlled migration to the city, and relaxed their grip only under extraordinary circumstances, such as after the Black Death when migrants were granted civic rights for a year.

[123] Fisher (1999), p. 37.

[124] *Ibid.*, pp. 37-39; R.S. Gottfried (2010), p. 43.

immediately, the very, next year, by a rise in the birth rate, as the population that had been excluded from reproduction by preventive checks could now succeed to vacant sources of income and marry.[125] Given the close correlation between population and price movements,[126] the example of England indicates that the Black Death caused only a brief fall in prices, as population and prices turned back up already in the 1350s.[127] The long-term reduction in prices and in population began only in the mid-1370s and lasted until the 1480s. My own view is that the demographic crisis of the 14th century was the result of the filling of the reservoir. This triggered the mechanism of preventive population checks, which drove down the marriage rate and as a consequence birth rates.

Significantly, the crisis began in the South before the North. The prices of wheat in southern Italy had peaked by 1270,[128] but not until the 1320s in the North. Thus the South again passed ahead of the North. Historians have calculated that the demographic contraction in southern Italy was sharper than in the remainder of the country – the region lost as much as 45% of its population.[129] The crisis resulted in severe economic, demographic and political decline in the South. The strong state had been so seriously weakened that adventurers from all over Europe laid claim to its crown. The disintegration of the kingdom is undeniable proof of the decline.

The period of decreasing population had all the features suggested by the third law: prices were falling and wages rising, economic activity flagged, agriculture became more extensive, reclaimed lands returned to swamp, no new heresies sprang up, epidemics and famines had become rare and milder, popular uprisings decreased sharply. For the city-states engaged in the elite trade, the only danger of rebellion stemmed from contracting demand for elite

[125] E.A. Wrigley, R.S. Schofield (1997), pp. 351, 354.
[126] *Ibid.*, p. 404.
[127] E.H. Phelps-Brown, S.V. Hopkins (1956), p. 299, fig. 1.
[128] M.A. Gukovsky (1990), c. 41.
[129] Eleni Sakellariou (2011), p. 107.

goods in the more capacious and more backward European reservoirs. In this case, the craftsmen and labourers might revolt, like the Ciompi in Florence in 1378.

The demographic surge in Italy and Western Europe generally began in the middle of the 15th century, though some growth had been possible from the beginning of the century. As in the 12th and 13th centuries, this wave of population growth caused an upturn in prices and rents, a downturn in wages, economic revival, and the intensification of agriculture. After a protracted pause, the reclamation of land in the Padan plain was resumed. Again, new heresies spread in Italy, such as Anabaptism and Non-Trinitarianism. Even in the kingdom of Naples, notwithstanding the Spanish Inquisition the Reformation had some success. After a period of Gothic reaction during the crisis of the 14th century, powerful new impetus was imparted to the development of Italian art and to the entire Italian Renaissance.

However, the new wave of population growth did not simply repeat the previous one. It brought not only the revival of progress in Italy but also, by the second law, competition from the more capacious European reservoirs. And even within Italy there were changes in the structure of the elite trade. The most capacious reservoirs of the Po valley began to fill up, and by the early 15th century Lombardy had far surpassed Florence in cloth-making.[130]

Starting in the late 15th century, cloth-making spread rapidly in many European countries. Previously, there had been two main districts for the production of high quality cloth: Tuscany and the southern Netherlands. Due to natural conditions, England was the leading producer of high-quality wool. Owing to the small capacity of its reservoir and closeness to England, the southern Netherlands had a substantial textile industry starting as early as the 12th century, though Italian cloth was of higher quality. Italian merchants used some cloth from Flanders as a semi-finished good that was finished by Arte di Calimala, one of the oldest Florentine guilds.

[130] G. Luzzatto (2005), p. 156.

Starting in the 16th century, however, English cloth output grew steadily, and it was evidently much cheaper than Italian cloth, as the English used their own wool, not to mention the cheapness of labour. Instead of exporting the wool, England processed it into cloth in ever-growing quantities. The English began to be intensely industrious as the population grew rapidly in the late 15th and 16th century.[131] More and more people became redundant in agriculture, turning to cloth production to make a living. Another serious rival for Italy was Holland. The Dutch textile industry expanded in the 15th century, although for the time being the output was mostly exported to the Baltic.[132] By the end of the 16th century, however, Dutch cloth was being sold increasingly in the Mediterranean. And during that century textile production expanded rapidly in a good number of other areas: southern Germany, Catalonia, France, and more. To compensate for the resulting losses, starting in the early 15th century Italian cities increased their production of silk.[133] Unlike wool, the raw silk was Italian, but even so in the last quarter of the 16th century French silks largely supplanted Italian in the European market, just as English and Dutch cloth had driven out Italian.[134] Here we can see how less capacious reservoirs cannot withstand the competition of more capacious ones.

The application of the second law is also visible outside of textile production. The filling of more capacious reservoirs deprived the maritime republics of their large-scale trade in elite goods. It is interesting that the first to undergo this change was Genoa, which sold elite goods in Western Europe, where the reservoirs were smaller than in the East and so filled up earlier; the changes began with the new wave of population growth in the 15th century, when Genoa consequently came to specialize in industries like wool, silk, cotton and paper.[135] Banking too was of primary importance. In Venice, by

[131] E.A. Wrigley, R.S. Schofield (1997), p. 531.
[132] Israel J. (1998), p. 118.
[133] G. Luzzatto (2005), p. 160.
[134] C. Cipolla, p. 202.
[135] S.A. Epstein (1996), p. 274.

contrast, the marine economy remained dominant,[136] and Venice's trade with the East was five times as great as Genoa's.[137] And no wonder, given that Venice exported elite goods to Central Europe and the Balkans where the reservoirs were far more capacious than in West. In addition, Venice was the port closest to south eastern Germany, where the lion's share of European silver was mined. In the mid-15th century economic development in southern Germany quickened, and by the end of the century silver production in the Tyrol had trebled.[138] For many years the Fondaco dei Tedeschi in Venice continued to be an active business center.[139]

However, in the course of the sixteenth century, the emergence of new trading routes excluded Venice from the elite trade with the East. As a result various industries quickly developed in Venice itself: book printing, textiles, glass, paper, soap. Hence the development of Venice followed that of Genoa. And like Genoa,[140] Venice too was unable to withstand the competition of the more capacious reservoir. The industry of the North contracted, like that of Tuscany before it.

The decline of the elite trade aggravated the problems caused by the rising critical coefficient. In Tuscany, where the decline in the production of elite goods was especially steep, the financial collapse of the 1570s caused the failure of several banks and the cessation of trade and wage payments. The Grand Duke had to grant a loan to bankers to stabilize the situation.[141] The decline of the textile industry and spreading unemployment at the end of the 16th century resulted in exceptionally high prices, famine and social tensions. A contemporary reported that in the area around Florence people were starving to death.[142]

Famine, in fact, was par for the course in late 16th and early 17th

[136] D. Romano (1987), pp. 29-31.
[137] E. Ashtor (2014), pp. 478, 485.
[138] R. Scribner ed. (1996), p. 272.
[139] G. Luzzatto (2005), p. 151.
[140] C. Cipolla, p. 199.
[141] B. Arditi (1970), p. 26.
[142] *Ibid.*, p. 51.

century Italy. Famines were especially severe in the South. There – where elite trade was impossible and the internal potential for development had been exhausted as agriculture could not be intensified any further – the transition to the stationary state had come very early, maybe already in the 14th century. By that time, the kingdom of Naples was primarily agricultural and rural. According to the estimates of historical demographers, according to the earliest known Aragonese count in 1447 the population of Southern Italy was 45% less than before the 14th century crisis. Scholars maintain that the population losses of the South were more severe than in the rest of Italy.[143] As in other parts of Western Europe, the resurgence of population growth began in the second half of the 15th century. Demographic fluctuations of this sort are normal in countries in the stationary state, though all changes in society are cyclical and there is never progress. By the mid-15th century the population of the South of Italy approached its estimated pre-plague levels of between 2 and 2.5 million.[144] In other words, the southern reservoir was filled again. This caused a rise in bread prices, which doubled by the 1570s and soared further over the next two decades to peak at more than five times the mid-century level.[145] Notwithstanding the rise in the critical coefficient, there was no progressive change or development in the Kingdom of Naples, only rising exports of primary goods: grain, olive oil, wine, fruits and raw silk. Simultaneously, social tension was growing. Interestingly, under stationary state conditions it took the form of rural banditry, which was especially rife late in the century when bread prices were highest.[146] The government of the Kingdom spent large sums on the suppression of banditry.[147]

Starting at the turn of the 17th century prices were highly volatile, but with an overall downward tendency, hitting their low for the

[143] Eleni Sakellariou (2011), p. 107.
[144] *Ibid.*, p. 112.
[145] A. Calabria (2002), p. 15.
[146] F. Braudel (1947), pp. 112-124.
[147] A. Calabria (2002), p. 21.

century towards the end of the 1630s, before turning up to peak at mid-century.[148] This price pattern corresponded to demographic dynamics. In the late 16th century the population checks began to operate, diminishing the number of people. After a centuries-long hiatus, the plague returned to Italy in 1602, ravaging the country with a series of epidemics, the most devastating being that of 1630, after which bread prices peaked.

Another way in which the population was reduced was by emigration. People fled to Sicily, to North Africa and Turkey, or else became beggars and bandits.[149] The population decline in the South of Italy had some peculiarities. Migration to Naples was fundamental. The city grew especially quickly during the 16th century to become one of Europe's largest cities, while many of the Kingdom's towns were depopulated. Thanks to the mild climate and cheap bread, with which the authorities supplied Naples,[150] it was possible for many young people to live even without housing, after having been driven from their lands of origin by overpopulation. Certainly, it was very difficult for these people to marry and have children, and fertility diminished. Another mechanism, common in the Catholic countries, was monasticism.[151]

The transition to the stationary state also came in Tuscany in the 17th century, entailing an especially severe decline by comparison with the area's former prosperity. Thanks to the elite trade, Tuscany had imported large volumes of foodstuffs, enabling a good part of the work force to make a living producing luxury goods. With the loss of this elite trade, food imports on that scale became impossible. The potential for the intensification of agriculture had been exhausted long since, although in cases like this some intensification always occurred. Hence, the population in excess of the critical density had to vanish one way or another, and Tuscany underwent a

[148] *Ibid.*, p. 21.
[149] *Ibid.*, p. 36.
[150] *Ibid.*, p. 34.
[151] G. Burnet (1752), p. 143.

drastic demographic and economic crisis. Montaigne, who had traveled there in 1581, wrote: "… [we] found ourselves in country fairly fertile, thickly populated and everywhere under tillage."[152] The hills were terraced: "… the mountains, which enclose the valley aforesaid, all beautifully cultivated and green to the summit, thick set with chestnuts and olives, and in some places with vines, which they plant all round the mountains, letting the circles rise one above the other in terraces."[153] Montaigne had been impressed by Tuscany's high population density: "… neither Orléans, nor Tours, nor even Paris, can boast of environs so richly set with villages and houses as Florence."[154]

Bishop Gilbert Burnet, who traveled in Italy a hundred years later (in 1685), saw a radically different picture: "… as one goes over Tuscany, it appears so dispeopled, … and that in many places the soil is quite neglected for want of hands to cultivate it; and in other places there are more people, they look so poor, and their houses are such miserable ruins, that it is scarce accountable how there should be so much poverty in so rich country, which is all over full of beggars."[155]

The Tuscan population had done everything possible to intensify agriculture: terraced hills, intensive crops like wine grapes, saffron and vegetables; but the population growth exceeded the critical level, and the demographic trend turned downward, bringing economic and cultural decline.

The only part of Italy that had not exhausted its possibilities for further development was the plain of the Po. Here were many waterlogged lands where reclamation was possible, offering the best conditions not only in Italy but in all of Europe for the large-scale cultivation of rice. And farming was steadily intensified from the 15th century on, with a pause during the population decline of the

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[152] M. Montaigne (1903), v. II. p. 60.
[153] *Ibid*., v. III, p. 38.
[154] *Ibid*., v. III, p.
[155] G. Burnet (1752), p. 142.

17th century: land reclamation progressed, and increasingly large areas were planted with rice, fodder crops, and industrial crops like flax and mulberries. Later, maize and potatoes were introduced. Interestingly, Burnet contrasted the territories of Venice, Switzerland, and the Genoese coast, all heavily populated, with Tuscany and the Kingdom of Naples, which had so few inhabitants.[156] In addition, he described the "… Pope's dominions [as] … more abandoned than any other part of Italy."[157] In a word, according to Burnet's report the situation in the North was far different from the rest of Italy. In writing about Lombardy Burnet often used the word "garden" and noted that the ground was better cultivated than in other parts of Italy.[158] To this observer, the contrast between the North and the rest of Italy was striking.

Thanks to the constant intensification of agriculture, the population density of the Padan plain was the highest in Europe until the 19th century, three times the European average. In accordance with our proposed theory, the center of Italian development shifted to the North, which would become the center of Italian unification and industrialization. And in the Po plain itself, the main locus of development was in the West, where the capacity of the reservoir was smaller. The eastern part of the plain was agricultural and more backward.

The main, indeed the sole, obstacle to the early industrialization of Italy was the lack of coal. Had there been coalfields, no doubt Italy and not England would have been the first industrial country, and it would have achieved this status much earlier. In this case, the elite trade would have served only as an auxiliary for industrialization, as it did in England in the 18th century.

The development of Italy has always been crucial to the progress of human kind, and scholars have accordingly paid special attention to the country's history. Twice Italy was the crucible of European de-

[156] *Ibid.*, p. 143.
[157] *Ibid.*, p. 142.
[158] *Ibid.*, p. 119.

velopment, in ancient times and in the late Middle Ages, and both times Italy eventually lost its leadership, although the decisive impact of Italy on modern civilization is unquestionable. It would appear, on the basis of this brief excursis, that the course of Italian development can be explained quite satisfactorily by the theory that I have proposed here. Naturally, the thesis remains open to discussion.

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