The Classical Approach to Capital Accumulation

Classical Theory of Economic Growth

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Abstract

The aim of this thesis is to explain how the main liberal classical economists perceived economic growth in developing countries, such as France or Great Britain, in their time. The thesis will focus on the studies of François Quesnay, Adam Smith, Thomas R. Malthus and David Ricardo. I will present how the different events during the end of the 18th century and the beginning of the 19th century influenced their theories and made these authors develop them the way they did. Further I will also present the vision they had regarding the political economy implemented by the respective leaders of these countries, and whether the economic measures applied were encouraging or discouraging economic growth according to them. Compared to other European countries, France and Great Britain made early adjustments towards liberalization, where especially Great Britain was the main representative that changed the perception of the time towards free trade. In this period, Great Britain became the top country in terms of agricultural production and industrial manufacturing.

The purpose of the thesis is to analyze the theories of the four authors mentioned above, using a unified model in order to enable a comparison among them. The model will evaluate how the ideas of these authors were interrelated in order to identify the common denominators of the different theories, and also to showcase the differences in their ideas. As theoretical foundation, the Solow model on economic growth has been selected. Possible production functions are suggested and explained according to how these authors were contemplating the economy of their countries to reach the stationary state.

The main difficulty has been to adapt these early theories, which in many cases were very simple, in order to explain using a common framework the beginning of economic growth theory. The thesis concludes that how these authors developed the subject of economic growth was not casual; it was actually highly influenced by their personal backgrounds, events, and rulers of the time.

Table of Contents

1. INTRODUCTION 4

1.1 PURPOSE 4
1.2 METHODOLOGY 4
1.3 LIMITATIONS 4
1.4 OUTLINE 5

2. FRANÇOIS QUESNAY (1694-1774) 6

2.1. FRANÇOIS QUESNAY'S BIOGRAPHICAL SKETCH AND HISTORICAL CONTEXT 6
2.2. FRANÇOIS QUESNAY'S THEORY OF ECONOMIC GROWTH 9

3. ADAM SMITH (1723-1790) 16

3.1. ADAM SMITH'S BIOGRAPHICAL SKETCH AND HISTORICAL CONTEXT 16
3.2. ADAM SMITH'S THEORY OF ECONOMIC GROWTH 18

4. T. ROBERT MALTHUS (1766-1834) 22

4.1. ROBERT MALTHUS ´ BIOGRAPHICAL SKETCH AND HISTORICAL CONTEXT 22
4.2. ROBERT MALTHUS' THEORY OF ECONOMIC GROWTH 24

5. DAVID RICARDO (1772-1823) 28

5.1. DAVID RICARDO'S BIOGRAPHICAL SKETCH AND HISTORICAL CONTEXT 28
5.2. DAVID RICARDO'S THEORY OF ECONOMIC GROWTH 29

6. THE CLASSICAL LIBERAL MODELS OF ECONOMIC GROWTH AND THE SOLOW MODEL 34

7. CONCLUSIONS 50

REFERENCES 52

1. Introduction

At the end of the 18th century and the beginning of the 19th century, economic changes influenced economic theories more than ever. Economic growth rates increased tremendously, and some philosophers of the time became the first economists. They developed what we know today as the classical economic growth theory.

Mercantilism up until then had been the accepted economical system to increase the welfare of a country. However, the new economists started to think beyond this theory. They distinguished between productive activities and unproductive ones. They studied the origin of the surplus in a country, how this surplus should be invested, and how to reach the stationary state.

How these theories were developed is a topic that has been widely discussed in the past by well-known economists such as Joseph A. Schumpeter or Arthur Lewis. However, in this paper I will not focus just on the way these theories were developed. I will explore the importance of historical events of the time deeper, and how they contributed to develop the classical economic growth theory. Also, explanations on how the different authors´ backgrounds might have influenced them will be provided. A focus will also be given to the interconnections among these authors and how they influenced each other.

1.1 Purpose

The purpose is to describe the economic growth in France and Great Britain at the end 18th century and the beginning of the 19th century through the eyes of four main liberal classical authors: Francois Quesnay, Adam Smith, Robert Malthus and David Ricardo. I will point out what were the explanatory variables that they considered crucial in order to reach the full potential of these countries, as well as their opinion regarding the changes that had to be taken in order to achieve economic growth. As a theoretical foundation, I have decided to use a common growth model, the Solow model. The model has been adapted to explain the different perspectives of these authors. This thesis is an attempt to represent the different economic growth theories these authors had by using a common framework.

1.2 Methodology

This thesis is based on descriptive literature. An extensive research on descriptive literature was necessary to understand the point of view of these four classical authors, not just in order to understand their theories, but also to understand the reasons as to why these authors reached different conclusions on the same issues. Additional information has been acquired from different Internet sources.

1.3 Limitations

I have to point out some limitations regarding the material used. First, the bibliography about these authors is extremely extensive, as well as the historical books that explain the economic changes in the XVIII-XIX centuries. Even though these authors were just starting

to develop the economic growth theory, this does not necessarily mean that their explanations were simple.

I am aware of the fact that some historical events or factors that could have had an impact on the development of these four different economic growth theories have not been included. However, it is nearly impossible to present a more complete picture since that would have required a far greater effort.

1.4 Outline

The thesis is divided into two main parts. The first part includes four sections, one per author. Each section provides an extensive explanation of the personal background of each author followed by the historical events that influenced the theories. Afterwards, in each section, the reader will also find an extensive explanation of the economic growth theory developed by each author. This will provide all the necessary information to recognize similarities and differences that are present in the four different economic growth theories. In the second part, the theory of each author is analyzed in the context of the Solow model. This part starts by summarizing all the key assumptions from each author. Afterwards, a model for each author will be developed. This will enable the comparison among the different author's theories.

2. François Quesnay (1694-1774)

"The first discovery of a science is the discovery of itself". Joseph A. Schumpeter.

2.1. François Quesnay's Biographical Sketch and Historical Context

The Physiocrats were a group of French economists in the 18th century that first were known as "the Economists". Adam Smith said about the Physiocracy that "with all its imperfections is perhaps the nearest approximation to the truth that has yet been published upon the subject of Political Economy". Sometimes the group was considered to be a sect[1], due to its radical ideas. Its leader is the man to whom this part of the paper is dedicated, François Quesnay. He was a doctor with an agrarian bias. He was born in a lower-class family with an agrarian background. He had medical studies and described the conditions in the economy as the "health" in the social-economic "organism".

Quesnay was a pioneer studying the income and expenses accounts of economic societies and the interrelations among the members and the economic activities of society. His doctrine was related to his "agrarian bias", so his background must be taken into account to understand his ideology. For him, a nation's farms and working farmers were the only sector of the economy that was capable of producing profits. Consequently, they were the generators of economic growth, and according to him, the size of the surplus in the economy would be directly related to the capital intensity in agriculture. For this reason, he defended that agriculture should be the last source of tax revenue.

Even though successful merchants or bankers already existed in this time, the reader must understand that this theory was developed in a very primitive country, being the agriculture the main sector of the French economy of subsistence. In Quesnay´s eyes, the manufacturing sector could not generate a surplus. He thought that the price of any manufactured goods would be equal to the raw materials used to produce such goods plus the expenses incurred by the producer while manufacturing. The expenses incurred by the producer would be restituted when selling these goods, but without room for profit due to competition. It would be this restitution that would allow the producer to live by his/her work, but without generating wealth. Quesnay mentioned that producers would include as expenses a return for their work and the risk incurred when creating the enterprise, however, he did not mentioned any return for the producer´s own capital. On the other hand, he contemplated the existence of a return to the agriculture in order to provide for the depreciation of its capital.

Also, it is important to take the geographical characteristics of France into account. France had a Mediterranean climate capable of generating a great agricultural outcome, a vast territory and extensive river systems. But France was not productive, and Great Britain was. The rivalry of these two countries motivated Quesnay to further study the productivity of France´s economy. In that time, France admired the "agricultural revolution" that was taking place in England, something that would take place in France in the 1840s after the arrival of the railway.

[1] Schumpeter, Joseph (1961), p. 223-232.

The 18th century was the origin of the liberal economy. It was in the period known as the Enlightment when numerous different philosophical theories started to develop. The circumstances during this period were a continuous improvement in the understanding of the human nature. The men of the Enlightment were hoping for *"a new world of rationally reconstructed societies of free, enlightened individuals all both thinking and behaving "rationally" and in line with their own best interest as individuals and with those of all mankind".* The goal was the realization of a perfect utopian society. This perfect utopian society (with optimized amounts produced and consumed, and fixed prices) would be reflected in the most famous work of Quesnay, the *Tableau Economique* (the first input-output table long before Wassily Leontief's work – the beginning of "The National Income Analysis" and the "Mathematical Economics"). The *Tableau Economique* had as purpose the clarification of the output that France, given the conditions in the Eighteenth Century, should have been producing. This new vision about societies was based on the principles of competition and cooperation, free individuals and natural rights. This supposed the beginning of the theory of the liberal economy: an economic system of free and competitive enterprises and markets, in other words, *laissez faire*. Quesnay taught laissez faire and free trade as absolute norms of political wisdom. [2]

The Physiocracy should be understood as a natural reaction to the mercantilist policies of Jean-Baptiste Colbert during the reign of Louis XIV.[3] Colbert´s (chief minister, 1661-83) dominant principles were those of royal financiers. These principles were preventing the country from reaching its potential. The reasons were the multitude of unnecessary taxes, the internal custom arrangements, bureaucracy and regulations. In contrast, the Economists wanted to reform the country's structure in order to allow private initiative and the free play of the market. During the Eighteenth Century, growth in the rural economy depended on the supply of and the demand for bread, government's economic and fiscal policies, and speculations by landowners and merchants.

150 more regulations on agriculture and manufactures were established during the period in which Colbert was the chief minister. This State regulation blocked innovation and enterprise completely. Colbertism was a variety of mercantilism. The power of the State -the king- depended on the quantity of the precious metals in its possession, and trade was the first mean to acquire these metals. So we could state that Colbert's policies were in favor of the commercial classes, ignoring during his mandate the modernization of agriculture. The free movement of food was only allowed intermittently, and sales abroad were just permitted in years of plenty. The objective of this was to provide cheap food for the cities and its merchants -by generating an overproduction and the depression of the foodstuff prices.[4]

However, this was not the only reason. Power was the objective behind these actions. France had to maintain a vast army capable of defending its extensive territory. Concessions were

[2] Taylor, Overton (1960),Chap 1
[3] Blaug, M (1962), p. 24-32
[4] Doyle, William (2001), p. 7-41

made to the merchants because of the interest that the king had in the trading centers, a resource of income due to the taxation. The macroeconomic consequence of these actions was the depression of the grain prices which enabled a provision of cheap food for the army and for the population in the cities.[5] This policy generated an unsustainable situation for the peasantry. Centralization became really oppressive and this situation generated socioeconomic changes. The rural leaders moved to the main cities as a consequence of these policies. Because of this, the peasantry was in a situation of no representation in the institutions.[6]

In contrast to Colbertism, Quesnay thought that the agriculture was the sole source of the "total annual output", a concept that would later be adopted by Adam Smith, and for this reason, it should be the last source of tax revenue. Quesnay was living in a country just before a large revolution. The expensive wars and the bad fiscal practices were the main characters in the governance of Louis XIV. Quesnay wanted to simplify the tax system. The aristocracy, which was now exempted of taxation, would instead pay a single direct tax on the land-rent incomes in order to simplify the tax system.[7] In contrast, farmers were being taxed, and because of this, they could not invest in capital that would eventually increase productivity. On the other hand, Quesnay thought that a single direct tax on the land-rent incomes would first of all make the collection of taxes less complicated, and secondly, it would allow the farmers to increase productivity. Eventually, this would benefit the land owners too, Quesnay thought.

In the opinion of the Physiocrats, the solution to restore the French economy was to substitute taxes that did not fall on the capital of farmers for those that did. It is obvious that Quesnay thought that taxation that fell on agricultural advances was really damaging to land production in the conditions of France during that period. He thought it would be beneficiary for the society as a whole to allow the prices of foodstuffs to reach equilibrium. He also defended that commercial policies which restored the profitability of agriculture should be adopted. By allowing exports, the demand of foodstuffs would increase, the prices and profitability would increase too, and farmers would be able to invest in capital in order to increase productivity. Total production would increase and as a result, landowners could later on demand higher rents to the farmers, and the state could collect more taxes from the landowners. In summary, Quesnay thought that the price of food might be increased as a result of better marketing policies at home and overseas in order to generate economic growth. The Physiocrats used to say that "Paris certainly was not all of France", in allusion to the policies that were detrimental for the peasantry. [8] They argued that in the long run, the new tax reform would benefit the landowners and the whole nation. This class had to assume the responsibility of making the land as productive as possible by paying taxes in order to contribute to the capital growth or expansion and development. He also explained that the aristocracy was already paying the problems generated by a bad tax system. The

[5] Hilton L. Root, (1994), Ch. 2-4.
[6] Jones, Peter (2003), Ch. 2
[7] Taylor, Overton (1960), p. 22-23.
[8] Eltis, Walter (2000), p. 39-59.

depression of the foodstuff prices allowed an increase of the industrial production since manufactures could be produced at a lower cost; however, since this sector was also heavily taxed, the aristocracy was already paying the increase in prices of finished goods by paying indirect taxes, being the landowners the main consumers of finished goods.

The focus of this new tax system was not to distribute income in a more fair way, or to develop an economic policy against the aristocracy, but to increase the output in the economy. Physiocrats were convinced that this would generate economic growth for the nation. It should be an obligation of the government to make the landlords responsible for maintaining the fixed capital and even the working capital, they thought. In Quesnay´s period, rents were high enough to compensate the landlords for these costs, and also to leave them a surplus[9].

2.2. François Quesnay's Theory of Economic Growth

It is useful to distinguish among the three different classes that Quesnay differentiated to understand his theory: the proprietary class (classe des propiétaires), the producer class (classe productive), and the urban population, artisans and merchants (classe stérile).[10]

The Physiocracy is based on one core proposition; the agricultural sector is the only sector capable of generating a *net surplus,* which is paid as a rent or revenue to the landlords, while the industrial sector remains sterile because it cannot produce profits. Quesnay thought that the industrial sector would always have a rate of return of zero, the manufacturing sector would not produce surplus over cost. The reason was that competition among entrepreneurs would prevent them from generating a surplus over cost. An increase in industrial efficiency would just cheapen products and not produce a surplus for the producers.

On the other hand, an increase in agricultural efficiency would increase the surplus of the economy. Quesnay thought that agricultural costs were fixed. He identified these costs as the food that the farmers would consume themselves while producing. Since the food consumed by the farmers is constant; an increase in the nation´s farms productivity would suppose an increase of the nation´s surplus. That is why he thought that farmers should not be taxed in order to allow them to increase the capital/labor ratio. The capital/labor intensity of agriculture determined the size of this surplus. Landlords would have higher revenues, and would increase the demand of finished products. Because of this, artisans would be able to subsist. Consequently the surplus in agriculture would cover the cost of the raw materials of producing manufactures, the expenses incurred by the workers, and the merchant´s return. His opinion was that the manufacturing sector can only exist through the wealth of those who pay for it – the landowners. Moreover, he expressed that manufacturing sector was dependent on the agriculture, since this was the origin of the raw materials used to produce manufactures.

[9] Lewis, W. Arthur (1961), p. 120-136.
[10] Blaug, M (1962), p. 28.

Quesnay's theory established that taxation should not fall on those who work the land, because the total output cannot grow without agricultural growth. Furthermore, Quesnay made a distinction between the profitability of *la petite culture* (which are the small farmsteads) and *la grande culture* (which is the large state). He identified the second as more productive because it would allow for higher capital intensity. The rates of return are for Quesnay the "annual advances" or circulating capital needed to continue with the process each year. Quesnay also studied the profitability of different techniques of cultivation being capital intensive horse drawn plough technique the most profitable, in contrast to the cultivation of land with labor alone, or with ox drawn ploughs.

His successors also studied these assumptions. David Ricardo – although it seems that he never had access to Quesnay's previous studies – for instance, though that the spade husbandry technique was more profitable than horses or oxen due to the high cost of maintenance of them. So, for Ricardo, labor was of more importance than capital or land, in clear opposition towards Quesnay's theory.

Quesnay also related the investment in capital to the growth of population (an idea shared with his successors), being taxes the main enemy of both. [11] The harmful effects of taxation are important in his model. The impact on the annual advances is direct, and by reducing the growth, the tax revenue is also reduced in the long term. A consequence of this is the reduction in capital accumulation of the sector and higher costs in collecting such taxes.

Quesnay´s solution was to increase the prices of foodstuffs and exempt the farmers of paying taxes. This way, the rents paid to the landlords by the farmers would increase, and farmers would see the returns in agriculture increased.

Quesnay also established that the aristocracy should be encouraged to avoid the acquisition of foreign manufactured goods and redirect their income to the acquisition of French foodstuffs. On the other hand, it was recommended that the farmers should increase the cultivated area and invest in tools to increase the efficiency of the land (not the labor). This investment in capital should be followed by a modernization of the agricultural techniques, he stated.[12]

Less extensive were the studies of the production of manufactures. Quesnay has been widely criticized by 20th century scholars because he thought that the production of manufactures was unproductive or sterile. Quesnay thought that the price of manufactures was the sum of the raw materials plus the cost incurred by the manufacturers – cost of production and wages. When selling their products, the manufacturers would come back to their initial state. They would use their income to buy raw materials again and produce. This would allow them to subsist.

[11] Eltis, Walter (2000), p. 1-21.
[12] Vaggi, Giani (1987), p. 20-22.

As stated before, according to Quesnay, an increase in industrial efficiency would indeed mean a decrease in manufactures prices, an idea developed later by William S. Jevons. Also, due to competition there would not be space for profit that could be reinvested or taxed. That is why he considered the sector sterile or unable to generate any surplus.

One of the failures of the Physiocrats was that they did not realize that in their times, there were already prosperous capitalism, bankers and merchants. This is one of the main weaknesses of the theory; the absence of entrepreneur's profit. When asked about the existence of great merchants, his answer was that in a perfect competition market these great merchants would not exist. It seems that Quesnay's was simplifying his model making the assumption that entrepreneurs would have a constant returns over time, enough to keep the incentives to operate such activity, but not enough to generate profits, since an increase of capital would not mean higher income, but lower prices.[13]

Quesnay believed that the *net surplus* generated by the agricultural sector was determining the aggregate demand of the economy. To distribute the wealth to the whole nation, this surplus or circulating capital should be spent in its totality by the landowners, and nothing should held back or lost overseas. According to Quesnay theories, the economic flow was as follows. Farmers would produce the nation's net surplus. Then, a small part of it would be destined for own consumption and replacement of working capital, and in exchange of money used to buy urban products. The rest would be used to pay the landowners, who after using part of it in their own consumption; would be in possession of the country's net income. After paying taxes these landlords would be contributing to the country's stock of wealth.[14] The agricultural sector would generate income to the tenants every year and still reserve income – circulating capital or "annual advances" – as advances for the following year. The sterile sector would receive a part, and half of it would be spent on food. The remaining will be used for the reposition of raw materials and other expenses that would allow the constant output in this sector of the economy I referred to before. Figure 1.1 illustrates this process:

[13] Taylor, Overton (1960), p. 24-25.
[14] Blaug, M (1962), p.27

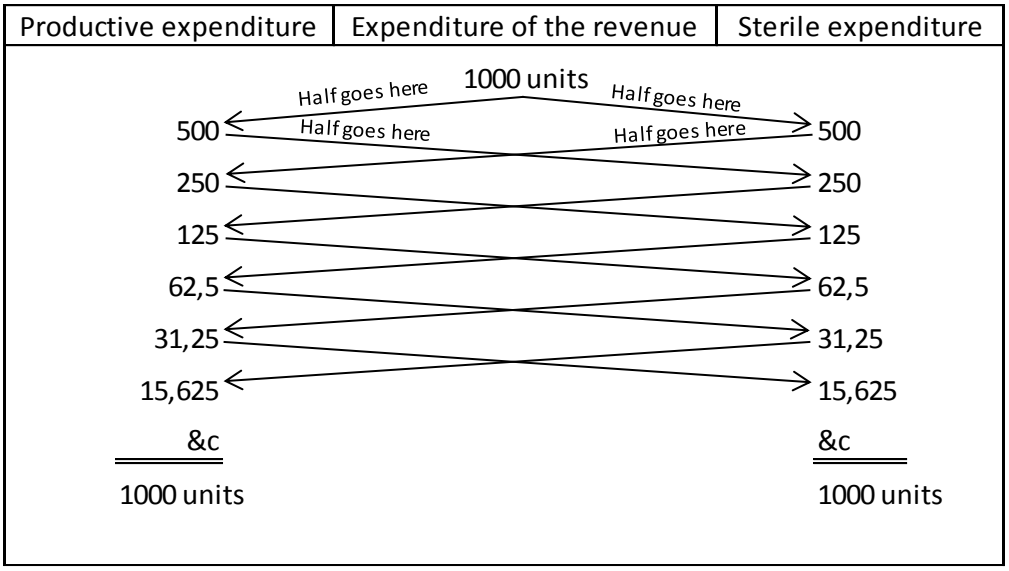

Figure 1.1. In the figure, the net surplus generated by the agricultural sector is 1000 units. This is the revenue of the economy – rents paid by the farmers to the landowners – and determines the aggregate demand of the economy. The landowners would spend half in foodstuffs and the other half in manufactures. Both sectors would receive then 500 units. Both sectors retain half of this until the end of the circulation process, 250 units that they would use to supply themselves with products of their own sector. Each sector would then spend the other 250 units in products of the other sector. The process would continue until total expenditure is twice the original expenditure of the landlords.

Figure 1.2 reflects the circulation of money that Quesnay suggested was taking place in France´s economy. In Figure 1.2 we can see that the aristocracy is exempted of paying taxes. It shows that agriculture is the only sector generating revenue. This revenue is paid in the form of rents to the aristocracy.

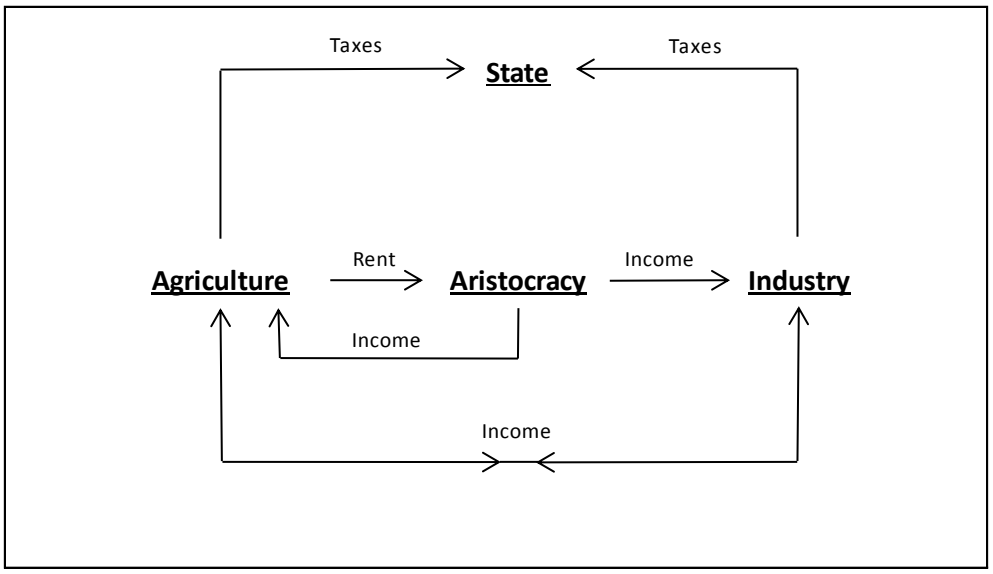

Figure 1.2. In the figure, the circulation of money is started by the agriculture, which transfer rents to the aristocracy. The aristocracy uses this money to supply itself with foodstuffs and finished goods. Income is transferred to agriculture and the manufacturing sector, and both sectors pay taxes on this income and buy goods from the other sector. The agriculture reserves then part of the income as the "annual advances" to produce again the next year in order to generate the net surplus of the economy.

Figure 1.3 reflects the circulation of money that Quesnay suggested. In Figure 1.2 we can see that the aristocracy pays now one single tax. Agriculture is still the only sector generating revenue. However, in this situation, the "annual advances" would be bigger since agriculture does not have to pay taxes anymore. The combination of this measure with a raise in the prices of foodstuffs would allow an increase in capital accumulation.

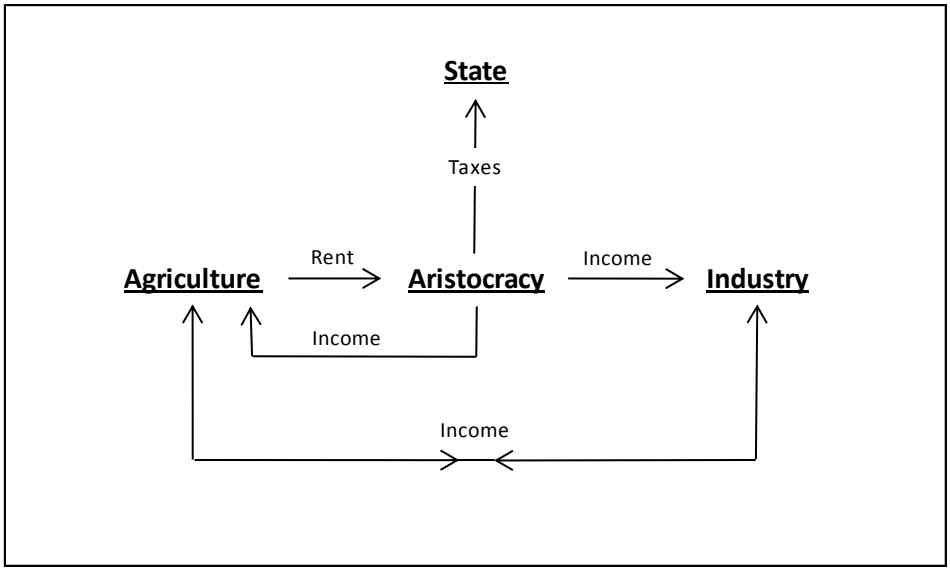

Figure 1.3. In the figure, the circulation of money is started by the agriculture, which transfer rents to the aristocracy. The aristocracy uses this money to supply itself with foodstuffs and finished goods and pays taxes to the state. Income is transferred to agriculture and the manufacturing sector, now exempted of paying taxes. Since agricultural products are free of tax, the demand of these products increases and the income of this sector too. The agriculture disposes now of bigger "annual advances" to produce again the next year and invest in capital in order to generate a bigger net surplus of the economy when the process starts again.

In order to explain the circulation of money, Quesnay made simplifications. The interest needed by the agriculture to replace the capital and international trade were not contemplated in the Tableau. Quesnay was presenting a closed economy; where the circulating capital should be spend in its totality for the system to work. This idea had its origin in the circulation of blood in the human body.

It can be said that the Tableau represents a situation in which an economy will achieve continuous reproduction with a constant level of output in each sector at the time of reaching the stationary state.

Quesnay considered that there were two main causes that were keeping France's economy from reaching its potential. First, the consumption of foodstuffs was not enough. Secondly, taxation and low prices of the agricultural products were damaging the rate of return of the farmers. Technical improvements in agriculture was the only factor that could bring economic growth, but these improvements could not occur if profitability was low, so marketing foodstuffs in a better way by increasing prices was the only way to begin the process.

Regarding the first cause, the low demand of foodstuffs, Quesnay explained that the landlords, who initially held the *net surplus* of the economy, should redirect their consumption towards French agricultural products, and reduce the acquisition of manufactures. This way, the agriculture would maintain the rate of return needed to become productive. Consumption of manufactures would have as a consequence a smaller demand for foodstuff. Therefore, the prices of foodstuff would remain low, and the agriculture would remain unprofitable.

Quesnay started the discussion around how influential the consumption of the "productive goods" was. This is one of the central topics in the Wealth of Nations. With clear differences with Quesnay's theory, Adam Smith also included the industrial sector as productive. This supposed an improvement of Quesnay´s theory. For Smith, the rate of growth was depending partly on the ratio of "productive" to "unproductive" consumption. This also influenced Robert Malthus, who also had a different opinion. For him, the consumption of luxury goods was the factor that maintained the circular flow and economic growth, and therefore economic prosperity. This was related to Malthus´ population theory. He stated that luxury goods were an incentive for the aristocracy to delay marriage. This would eventually reduce the population growth rate and stimulate economic growth if the supply of foodstuff was big enough to support the existing population. [15]

The profitability of agriculture depends on three main issues: human capital, technology, and physical capital. Even though Quesnay studied the profitability of different techniques and their impact in the production, he did not contemplate the possibility of improvements in the existing technology at the time. He shared this view with Malthus. He thought that it was an increase of the farm capital what would allow France to reach the stationary state.

Another way to increase profitability was to market agricultural products better, by increasing prices. He encouraged the free movement of foodstuff. [16] The previous policy of France was to cheapen agricultural products in the cities as a way to empower the industrial sector.

To conclude this part, there are some connections with Quesnay´s successors that I would like to mention. The Jean Baptiste Say's Law of Markets had its origin in the Pysiocratic theory against mercantilism. The central lesson of the Tableau is that money is a medium of exchange, that reduces barter exchange, and the creation of output automatically generates the income whose reimbursement makes it possible to enter upon another cycle of production. But Say redirected this against the Physiocrats, as they argued that the income received was not automatically restored to the income stream.

For Quesnay, the industrial sector was just possible because of the existence of agriculture. Food production was the vital sector of the economy, as Malthus would state lately too. The manufacturing sector was based on the work of the peasantry, a concept close to the

[15] Blaug, M (1962), p. 29
[16] Eltis, Walter (2000), Ch.1-Ch. 2.

Marxian "exploitation of the workers". [17] Exactly as Quesnay let land alone be productive of surplus value, Marx let labor alone be productive of surplus value. The difference was that Marx tried to show how surplus value emerges from the mechanism of competitive markets, while Quesnay related physical productivity with value productivity.[18]

[17] Taylor, Overton (1960), p. 21-24.
[18] Schumpeter, Joseph (1961), p. 238.

3. Adam Smith (1723-1790)

"Bankruptcy is perhaps the greatest and most humiliating calamity which can befall an innocent man. The greater part of men, therefore, is sufficiently careful to avoid it. Some, indeed, do not avoid it; as some do not avoid the gallows." A. Smith

3.1. Adam Smith's Biographical Sketch and Historical Context

To introduce, probably the greatest economist in the eighteen century, I will use the words that Joseph A. Schumpeter said about him: he was a Scotsman to the core; his family background was the Scottish Civil Service. He was a gentleman, an intellectual, and he used to criticize the business activity, he was a professor all his life. To understand his human nature, but not his economics, it can be said that no woman played a role in his life, with the exception of his mother. Passions of life were just literature to him.[19]

Some historians of economic theory have tried to rank the different economists according to their technical skills or their analysis capacity; others have tried to do so attending to the originality of their different theories. Adam Smith is not the first one in these categories, but he was able to compile the best ideas of others, and clarify the importance of the Political Economy. His wish was to find the steps to achieve economic growth, what he referred to as the "wealth of nations". [20]

Adam Smith spent many years of his life as a teacher at Oxford, Edinburgh and Glasgow. Among his friends, we can find James Watt, teacher with him at Glasgow, and inventor of the steam engine. Watt was a businessman that influenced Smith deeply, and helped him to understand the business culture in a realistic way. He was also teacher of the Duke of Buccleuch. Travelling with him around the continent he met François Quesnay in France. Smith was more interested in explaining actual patters rather than a theory of an ideal world like the Physiocrats. Although he was very sure about the value of his theories, he was not expecting the full application of them. Perfection could not be expected; he was quite pessimistic and aware of the fact that improvements require time.[21]

Although it could seem that the British economic growth was caused mainly by the Industrial Revolution, there were other important factors too. Imperialism and capitalism preceded this process, turning London into the center of the international trade.[22] The manufacturing sector and commerce slowly replaced agriculture. The growth was also accompanied by financial development, and in some occasions slowed down by war.[23]The Industrial Revolution was not just some improvements in industrial techniques, but a series

[19] Schumpeter, Joseph (1961), p. 181-182.
[20] Farrer, James (2001) p. 5-15
[21] Taylor, Overton H (1960), p. 77-80.
[22] Rubinstein, W (1993), p. 25-26
[23] Fisher, Douglas (1992), p. 1-40.

of changes related in an orderly way to prior changes in industrial organization and to the enlargement of markets.[24]

Between 1750 and 1850, the long term rate of growth of the British economy became historically unique, nothing like that happened in any other nation. Britain became a large exporter of advanced technology at the end of the 18th century. The reasons were the abundant supply of coal, a productive agriculture, a system of property rights and an effective state. Britain was the antithesis of France.[25] This is the origin of the differences in economic theory between Quesnay and Adam Smith regarding economic growth.

However, France was not completely lagging behind; it had a better balance between old social structures and new wealth. French agriculture was a big obstacle to achieve economic growth; but the country did exploit its comparative advantages. Even though at the end of the Industrial Revolution France was less urbanized, the people enjoyed similar standards of living in both countries. [26]

The Industrial Revolution was not the only engine of modern growth. Population increased, and for the first time in history, wages increased too at the same time. Britain passed from 11 million people in 1800, to 16 in 1850, and still the wages were rising. This data obviously contradicts Malthusian theory, as we will see later. Technology and the capital stock improved enough to maintain the standards of living.[27]

Even though Smithian theory was not fully applied until some decades after the publication of Smith's main work, the Wealth of Nations, trade liberalization was completely adopted in 1846. These years were characterized by an enormous economic growth.[28]

In 1776, the year of the publication of the Wealth of Nations, the Declaration of Independence was signed in the United States of America. The day of the Declaration of Independence, Thomas Jefferson said his famous words "life, liberty and the pursuit of happiness", influenced by Smith´s theory. Smith had a big impact with his publication, not because he established a new model of economic growth, but because his certainty of the model's success. He was determined to change the institutions, and moreover, his promise of a better life for those who were struggling to survive on the previous decades made his work popular. He showed the little progress that had been achieved with the mercantilism and suggested a radical change. He thought that nations should not grow any more at the expense of others. He established that the keys for economic growth were freedom, competition and justice.[29]

Smith was directed against "the mean rapacity, the monopolizing spirit of merchants and

[24] Young, Allyn (1928), p. 527-42.
[25] O'Brien, P. & Quinault, R (1993), p. 1-25
[26] Mathias, P. & Davis J (1984), p. 45-54
[27] Mokyr, Joel (1993), p. 171-178.
[28] Bairoch, Paul (1993), p. 45-47.
[29] Skousen, Mark (2006), Ch 1

manufacturers, who neither are, nor ought to be, the rulers of mankind". He never abandoned the conviction that agriculture was the principal source of Britain´s wealth.[30]

Adam Smith was in clear opposition to the merchants and businessman of the time, and with the mercantilism system that obviously was an advantage for the national industries. He considered the monopolistic situation that mercantilism had generated to be against the public. On the other hand, he was a supporter of the countrymen. He though that agricultural productivity should be encouraged but he did not think that agriculture was the only generator of net surplus in the economy as the Physiocrats. He was for the improvement of productivity both in manufacturing sector and agriculture. The solution for him was specialization and division of labor. As previous conditions, he considered the need of bigger markets and growth of accumulation of capital – same as Quesnay.

3.2. Adam Smith's Theory of Economic Growth

The title of his famous work "An Inquiry into the Nature and Causes of the Wealth of Nations" reflects that economic growth and development were the main topics that concerned Smith. In his book, he talks about capital accumulation, population growth, and labor productivity. He argued in favor of free trade and against planned economies.

The Wealth of Nations tries to answer primarily one question and that is how to measure the national wealth. Smith´s objective was to do it in a very comprehensive and coherent way. For the mercantilists the national output was the treasure or the supply of money generated by the country. They were viewing the national output not as the basis for the welfare of the population, but mostly as the stock of money available in case of war. Smith stated that what really create wealth are the supplies of goods being produced and made available to the people in the markets. He also thought that the nation´s output depends on the accumulation of capital and the efficiency of labor. This is the main point in Smith's theory.

In the Wealth of Nations, the main cause of the economic growth is the nation´s working population which is employed in productive labor – Smith pointed out that both agriculture and manufacturing sector were productive. However, Smith considered the government expenditures as unproductive. Another cause of the economic growth is the accumulation of capital. In order to have a high level of working population employed in productive labor, the accumulation of capital must be high. This will provide the conditions for the division of labor and specialization which are the main causes of economic growth. A precondition of this, as I have already mentioned, is to have markets big enough to absorb the production, which permits a higher productivity and lower costs. This was the beginning of the economic "law" of decreasing unit-cost of production with increasing output developed by Alfred Marshall one century later.[31] The size of the market and labor productivity also depends on the regulation of domestic and international trade. Any restriction will limit the

[30] Blaug, M (1962), p. 37-39.
[31] Taylor, Overton (1960), p. 80-99.

size of the market, lowering international specialization of labor and domestic productivity.[32]

Smith identified three aspects that correlate the division of labor with the increase in productivity. The first is the increase in the number of workers; the second is the increase in efficiency of the workers; and the third is the accumulation of capital. He explains this very clearly in one of his passages:
"This great increase of the quantity of work, which, in consequence of the division of labour, the same number of people are capable of performing, is owning to three different circumstances; first, to the increase in dexterity in every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labour, and enable one man to do the work of many".[33]

The process of capital accumulation plays an important role in Smith's theory of economic growth. Smith thought that capital accumulation contributes to the expansion of the market. With more capital, labor is equipped to perform specialized actions and wages can increase above the subsistence level. This increases population which increases the demand and permits the expansion of the market.[34]

One of the main contributions in the Wealth of Nations was the "invisible hand" concept. The idea behind this concept was that capitalists that were willing to increase their profits would invest in those activities that could provide the highest contribution to the nation. Capital accumulation was for Smith the basic condition for growth. He thought that capitalists, by accumulating capital, contributed to the economic growth of the nation meanwhile they earned profits.[35] This is different from what Quesnay proposed; now the *net surplus* would be determined by the capitalist and not by the farmers.

From Quesnay's France of the 1750s we go to the England of the 1770s, a country clearly immersed in an industrial development which had never been seen before. This would explain a lot of the differences between the theories of Quesnay and Smith. Smith developed some concepts that will explain the topic that is being discussed in this paper in a better way; the creation of surplus and its re-investment to generate economic growth. Smith divided the categories of income, something not done by Quesnay, into wages (the return to labor), rent (the return to land) and profit (the return to capital).

In Smith's theory, the manufacturing sector was incorporated as a generator of surplus and played a major role, although agriculture was still of vital importance. He also appreciated the potential of the division of labor in the manufacturing sector and its possible effects in raising the standards of living in the population, and also the correlation between capital

[32] Adelman, Irma (1961), p. 27.
[33] Smith, Adam (1937) , p. 7
[34] W.W. Rostow (1990), p. 33-50.
[35] Taylor, Overton (1960), p. 111-117.

accumulation and productivity growth in the long term. According to Smith, capital accumulation would permit an increase in population and employment. With a market big enough and the division of industrial labor, the result would be an increase in the productivity per worker. The explanation to this is that the higher number of workers concentrated around an activity, the more complex and effective the division of labor can be, and this concentration depends on the extend of the market. Free competition was a vital component in Smith´s theory too. He thought that an increase in capital would result in a decrease in prices of goods, and the increase of the purchase power of the population. Consequently, when being close to the end of this process, Smith assumed a decrease in the rate of profit. As we will see later on, Ricardo agreed on this process. Quesnay also identified a decrease in the industrial prices when increasing capital in an environment of perfect competition; however, he did not think that industrial activity could generate profits.

Agriculture however, was still the main focus of study; Great Britain was a developed country, but still we are analyzing an economy in the 18th century, and agriculture was of vital importance. Smith considered the division of labor difficult to apply in the agricultural sector, as the activities change through the different seasons. Also, few workers are needed to run a farm, which makes the division of labor difficult, and few consumers provide a market, which makes the existence of a big market difficult. Smith´s conclusion was that increasing returns in the manufacturing sector were possible with an increase in the accumulation of capital. If the demand for industrial products increased, productivity would raise too. The expansion of the supply would be possible only with an increase of capital, because although more workers would have to be employed, more fixed capital would be needed as well. On the other hand, an increase of capital in agriculture would generate diminishing returns. Smith realized that an increase of the demand of agricultural products would raise the prices in this sector – as Quesnay assumed. The increase in prices would then enable an increase in the wages of the farmers, so cost of production would be higher. The increase in wages would be followed by an increase of the labor force in the long run – Quesnay did not realize this, since he assumed labor to be a fixed variable. The increase in the labor force would generate diminishing marginal product of capital per worker. Unit costs would increase as employment would increase with the increase in agricultural production.

In Smith´s theory, accumulation of capital would depend on the allocation of the output between consumption and investment. He suggested that investment should be directed towards productive activities, such as agriculture or manufacturing sector. Smith defined productive activities as the ones were their workers produce profits, and something storable – supplies of equipment and food kept for use. Also, such activities should be able to maintain production without constant infusions of capital.

Smith's theory of economic growth makes a distinction between labor that produces capital, and labor that does not. Investment, consumption and governmental expenditure were in Quesnay's model possible because of the rents produced by agriculture. With Smith, profits can also be generated by the industrial sector. To get more investment, a reduction in

consumption would be necessary. It was also important to direct the investment to projects capable of generating surpluses and not losses.

Another factor for the successful accumulation of capital would be to guarantee property rights. At the same time, it would be necessary to control the governmental expenditure. According to Smith, governments rarely directed the investment in the right direction. This should be done by private hands, because private investors know better to where they should direct theirs capitals. Regulating trade was damaging too, according to Smith´s theory. This would be the seed of the comparative advantage law that David Ricardo would develop later. A country should always produce whatever generates higher surplus, leaving less productive activities to other countries with more capability to produce them. Unproductive activities should not be pursued, because market forces would allocate the capital of such activities to those that are more productive, a process known as the "invisible hand".

Turning to the population function, Smith thought that it would be expanded at the same time as the demand of labor: "the demand for men, like any other commodity necessarily regulates the production of men". At the same time, wages would rise with the accumulation of capital. This continuous accumulation of capital, the increase in wages, and the increase in population (that would allow subdivision of labor), would reduce the prices of manufactures, and purchasing power would be higher, relative prices in manufactures go down when a society progresses. This chain of events: increase of capital, increase of labor, increase of wages and reduction of prices; would reduce profits, but would generate economic growth.[36]

To conclude this part, I would like to introduce some connections that Smith had with the other classical authors. Smith's explanation for the decrease in profits is the competition of capitalists, an idea related to the "exploitation of the workers" concept made by Karl Marx. Due to competition, capitalists would see profits reduced when reaching the steady state. Initially, wages would rise with the increase in accumulation of capital. Then the population would increase and this would generate a bigger labor force. However, after reaching the stationary state, capitalists would have to reduce costs in order to have profits and wages would return to the subsistence level – this would be explored later by Malthus. On the other hand, he also provided two solutions to avoid reaching the stationary state. The first solution was the freedom of international trade in order to get the benefits of international specialization, an idea developed later by David Ricardo. The second solution was the regulation of competition by the institutions[37], something that Marx would agree with in later studies. Smith supported the idea of having a minimum wage. In contrast with Quesnay, he was not a free market economist without exception; he supported the idea of protecting infant industries and the introduction of tariffs to protect the nation´s interest and counteract the effect of taxation on certain national products. [38]

[36] Eltis, Walter (2000), Ch. 3.
[37] Adelman, Irma (1961), p33-42.
[38] Buchholdz, T (1990) p38-39.

4. T. Robert Malthus (1766-1834)

"After much discussion we each retain our opinion. These discussions never influenced our friendship. I should not like you more than I do if you agreed in opinion with me". David Ricardo

4.1. Robert Malthus ´ Biographical Sketch and Historical Context

T. R. Malthus lived during the French Revolution, which postulated liberty, equality and fraternity, and during the American Revolution, which established the importance of democracy. He also experienced the British Industrial Revolution.[39] He was a very conservative thinker, defender of the traditional class structure of English society. Actually, he belonged to the high class of the society. In 1775 he was accepted in the St. John's College at Cambridge where he focused his studies mainly on philosophy and mathematics. In 1791 he was elected Fellow of St. John's College and in 1798 he was ordered to become an Anglican priest. At this time, he started to develop the essay that would give him recognition. He was known among his students as Population Malthus. Even though he was a clergyman, his approach to the population issue was strictly scientific. Being a priest was merely a profession like any other in his time. His work had really close connections with Charles Darwin´s theory of evolution. Darwin extended Malthusian statements about human population to all the species (fast growing populations are where food is available or easily produced). [40]

When it comes to the historical context, the Napoleonic Wars were quite influential in the development of the classic theory of the time. As a consequence of the war, there was an increase in prices. At the same time, the wages were going down, which caused a situation of starvation for the British working society. Moreover, Great Britain started to import wheat. After the war, there was a period of deflation. These issues made economic studies very popular, and especially those made by Ricardo and Malthus. They were intellectual enemies, but friends when they were not discussing economics. They had the same purpose, although different perspectives and solutions.

It has been said that Malthus turned the *Wealth of Nations* into the "Poverty of Nations". He thought that an increase of wages would increase population growth, but the increase in population would eventually decrease wages again. He did not take the decrease in the death rate because of economic advances into account, nor the impact of technology. Neither did he appreciate the opportunities of international trade. It is true, however, that in his time, there was no reason to think that trade and technology would solve the situation.[41]

When Malthus published his *Essay*, it was generally believed that the strength of a nation was closely related to its population at any circumstances, without taking food production constraints into account. Increase of population was thought to be connected to increase in

[39] Glass, D.V (1953) p. 1-25
[40] James, Patricia (1979) p. 1-39
[41] Barber, William J (1967) Source: www.wesleyan.edu/css/readings/Barber/chapter2.htm

production capacity. However, Malthus did not agree. He thought that high capital accumulation would generate high population growth. This would impoverish the country because it would be hard to maintain a high level of capital per worker. Also, Malthus presented Britain as an island with limited capacity to produce foodstuff. It is important to emphasize that the country was immersed in war, and the food supply was not enough to maintain the population.

The origin of Malthus' interest for economics and population growth began with the discussions he had with his father about William Godwin and the Marquis de Concorcet, the main exponents of a trend of thinking related to the utopian socialism and philosophical anarchism. The basic idea that Godwin expounded was that the fate of the individual was determined by its circumstances, being the State the main responsible of the individual's welfare[42]. His main work, *Essay on Population*, was an attempt to refute this.

Malthus was sure that institutions and inequality were not the causes of the widespread poverty, as Godwin thought. The sources of poverty were two "natural laws" according to Malthus: the tendency of mankind to multiply and the fact that population increases will always absorb increases in the supply of food.[43] He made this very clear in his *Essay*:
"I think I may fairly make two postulata. First, that food is necessary to the existence of man. Secondly, that the passion between the sexes is necessary, and will remain nearly in its present state.... Assuming, then, my postulata as granted, I say, that the power of population is indefinitely greater than the power in the earth to produce subsistence for man. Population, when unchecked, increases in a geometrical ratio. Subsistence only increases in an arithmetical ratio. A slight acquaintance with numbers will show the immensity of the first power in comparison with the second".[44]

Malthus' scenario was one in which population would grow exponentially, while production of food would increase – with diminishing marginal product of capital – until a certain extent due to the fact that land was a limited resource. He was in disagreement with Smith and Ricardo. For him, specialization and trade were not the solution due to the unstable international relations and mankind was condemned to live always in poverty.

Malthus stated that there were two ways to maintain a high level of income per person. He called them "preventive checks" and "positive checks". "Preventive checks" referred to population control. At that time, there were not effective methods of birth control. However, Malthus suggested celibacy, among other things, as a solution. The other solution was a consequence of not implementing "preventive checks". "Positive checks" were factors that increase the death rate such as wars (due to the tensions generated by the lack of resources) or famine and epidemics (consequence of a shortage of the food supply). He also stated that education run by the government for the lower classes and universal suffrage would help. He also pleaded for elimination of the Poor Laws (a charity system of "poor relief" that existed

[42] Landreth, Harry Colander, David C (2002), p. 107-111.
[43] Griffith, G. Talbot (1967), p. 89-100.
[44] Malthus, T Robert (2001), p. 10

in England and Wales from 1536 until the emergence of the modern welfare state) in order to help to control the population growth. He opined that any attempt to alleviate poverty would be counterproductive since it would allow the poor to have more children. He attacked the Poor Laws because these laws were contributing to the increase of the demand of food without contributing to the expansion of its supply. These aids were an incentive not to work, and also allowed their beneficiaries to reproduce themselves faster than in normal conditions.[45]

The Essay transformed Malthus into an intellectual celebrity. He was seen by many as a "hard-hearted monster, a prophet of doom, an enemy of the working class. But he did the first serious study about the welfare of the lower classes, and even Karl Marx, who hated his conservative attitude, agreed to this.[46]

Often Malthus has been condemned because some of the gaps in his theory, and tradition have disfigured his ideas. Indeed, he was the first anti-Malthusian. It has been said that he was for the control of the population, this opinion is fully documented, but on the other hand he also related population growth with progress:
"If population and means of subsistence had increased at the same rate, it is likely that man would never have emerged from the state of savage". [47]

Although Malthus was sometimes far from the orthodox classical propositions, he agreed most of the times with the classical theory.

4.2. Robert Malthus' Theory of Economic Growth

Demography became very relevant in the 18th century. Population growth was a consequence of the agricultural and industrial revolutions that took place, creating future labor force, according to neo-Malthusians researchers. Also some medical innovations were implemented.[48] Based on the studies that Malthus did about the USA, population doubles itself every twenty five years, with a geometrical ratio (Malthus did not take into account that part of the population growth in America was explained due to immigration and not to natural population growth). On the other hand, the supply of food grows arithmetically.

Quesnay assumed that the agricultural production could rise due to capital accumulation while maintaining cost (mainly farmer´s wages) and labor constant. However, he did not study the diminishing marginal product of capital or the effects of higher salaries on population growth, deeply. However, he indicated that there were limits to population growth, and a continuous growth was not desired. His perspective on population was actually really close to the Malthusian theory.[49]

[45] Barber, William J (1967). Source: www.wesleyan.edu/css/readings/Barber/chapter2.htm
[46] New School for Social Research (2002) Source: *The History of Economic Though Website.*
[47] Peyreffite, Alain. Malthus Unknown (1982), Source: http://208.106.171.85/bulletin/vol4/No1/
[48] Razell, Peter (1994), p. 7-10
[49] Spengler, Joseph J (1965), p. 171-185.

With Smith, diminishing returns could be expected in agriculture because specialization and division of labor were difficult in this sector. Malthus used this argument to conclude that population is determined by food supply, and since population grows faster than the demand of labor and the food supply, population growth, would bring poverty. He concluded that increases in population should be stopped to be in accordance with the stock of food. These theories were developed even more in Malthus' mind when he was travelling around Scandinavia in 1799. Malthus found especially in Norway a number of institutional arrangements to inhibit early marriage. Lower class people had to prove to the minister of the parish that they had enough assets to support a wife and a family.[50]

Malthus´ intention was to discover how to keep good living standards in the English society. It is interesting to give attention to the reason why Adam Smith and Robert Malthus, although they both lived in Great Britain, had a different opinion about the consequences of capital accumulation and the increase in wages. The main difference lies in their different points of view about the population growth matter. Smith thought that capital accumulation would increase productivity and this would increase the demand of labor. This would raise the wages. Population would increase too, since individuals would now enjoy a higher income. The population would grow at the same rate as the demand of labor, which in other words means that the demand of labor would determine the population growth ("the demand for men, like any other commodity necessarily regulates the production of men", Adam Smith said). Malthus also thought that population would grow with an increase of wages due to the increase of the demand of labor.[51] However, he predicted a different outcome in the long term. Figure 1.4 shows the differences between Smith and Malthus:

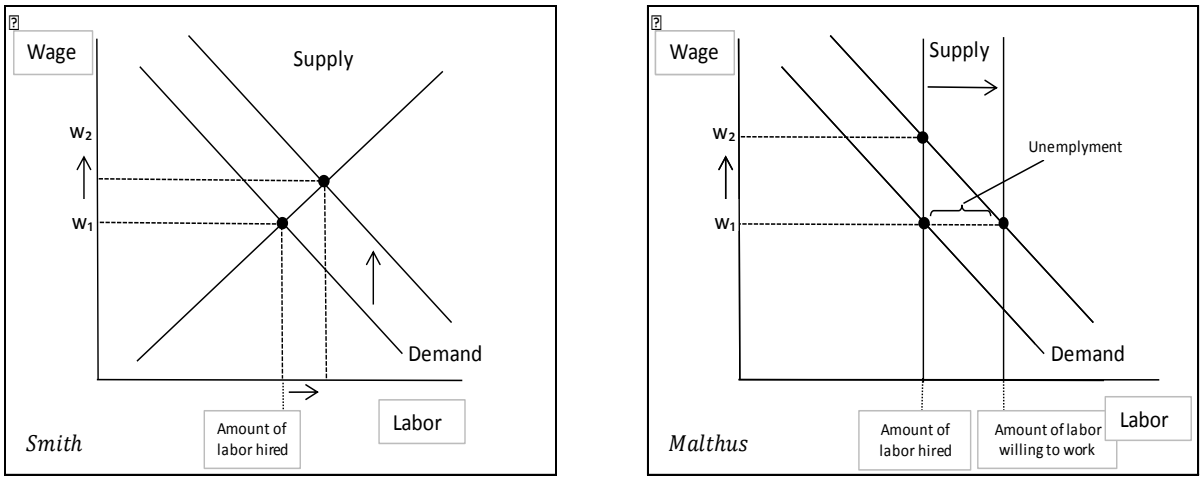

Figure 1.4. The graph to the left describes how Smith thought that the employment market would change with accumulation of capital. An increase of the demand of labor would occur due to the increase in productivity after capital accumulation and wages would go up. Demand of labor would increase, and this would imply a movement along the supply of labor (and population) until reaching the equilibrium point at which wages are at w_2. Probably, he was influenced by Quesnay and his assumption of the full use of resources. The graph to the right illustrates Malthus' theory. First, the demand of labor would increase producing a shift of the demand of labor upwards and an increase in wages from w_1 to w_2. However, although in the short term population would enjoy high wages; in the long run these high wages would increase the rate of population growth at a

[50] Peterson, W (1999), p. 46-57.
[51] Fisher, Douglas (1992),p. 6-8

higher rate than the demand of labor due to the law of diminishing returns, producing either unemployment if the salaries stay at w_2 or a decrease in salaries until reaching w_1. This would have as a consequence a higher population and higher unemployment or lower income per capita (wages could go below w^1 too). This would generate a difficult situation in a country with an economy of subsistence, Malthus thought, and that is why he suggested population control. He did not think that the newly employed people could be more productive because there would be less capital per worker in the economy and fixed land to produce food for everyone (he did not think that technology would increase productivity enough to provide sufficient food for the population).

There was also a debate between Smith and Malthus about the production in the economy. As we saw before, Smith thought that the capitalists of the economy would be the ones deciding where to allocate the investment. Capitalists that were willing to increase their profits would invest in those activities that could provide the highest contribution to the nation. Malthus thought that if capitalists were to allocate the investment, this allocation might not be directed to the production of food if there were other activities more profitable (production of manufactures). He thought that agriculture could be unprofitable but still necessary, while trade could be profitable for the entrepreneur, which means a low allocation of resources in order to produce food for a growing population. High demand of food might as well raise the prices, making food less accessible for the poor statements of society.

Malthus was not taking the effect of commerce of manufactures into account. Industrial expansion could allow the buying of food from abroad. However, he stated that nations based on trade, historically, had had ephemeral success. Relying on the supply of food of other countries was a high risk according to him. He thought that agricultural production was vital since it was the sector providing raw materials to the manufacturing sector – same as Quesnay.

He also thought that if the demand of manufactures from other countries went down (the possibility of the arrival of the industrialization process to other countries was also taken into account by Malthus), a country could just maintain its growth by reducing prices, but if the demand was inelastic, this decrease in prices would not increase such demand and the quantity produced. However, as opposed to Smith, he stated that the production of luxury goods might be beneficial, not because of its profitability, but because luxury goods might be an incentive for the population to delay marriage and children, in order to accumulate bigger fortunes to have access to these type of goods.

In conclusion, agricultural self-sufficiency, and balance among agriculture, the manufacturing sector and services were Malthus' recommendations. He recommended maintaining the Corn Laws to encourage self-sufficiency.

Even though that his predecessors were focused on the role of supply (production), Malthus turned to the role of the demand, although his theory about population was based on the supply side. He stated that after an economic crisis (war was the situation he contemplated and experienced himself), governments should increase expenditures to keep production high and allow capital accumulation to increase in order to stimulate the economy. He stated

that every society must have a body of unproductive workers (governmental employees), but without incurring in losses. He was in favor of the increase of taxes on landlords when needed to increase the State income.

He thought that entrepreneurs would produce a commodity when the price is high enough to cover the expenses while generating a profit that supports growth – in this he agreed with Smith. He considered profits mainly to depend on consumption by landlords and aristocracy, capitalists and the government, and also on international trade (especially when the internal demand of a product was high, since this would increase the price).

As we have seen earlier, when shortage of labor occurs, there is an increase in wages, and living conditions improve, which promotes an increase in population. After some years (Malthus stated around eighteen between each generation), this process would generate an oversupply of workers, causing a decrease in wages. The working would then loose acquisition power.

While Smith suggested that the solution to avoid this situation would be international trade and the regulation of competition by the institutions in order to increase the profit of the capitalist (which would stimulate the accumulation of capital again), Malthus thought the solution was an increase of government expenditures through an increase of taxes on the wealthy classes. This way, consumption would rise increasing the profits of the entrepreneurs and capital accumulation. According to him, a society should not save, but consume, because saving produces low demand and low profits.[52]

[52] Eltis, Walter (2000), Ch. 4-5.

5. David Ricardo (1772-1823)

"For the general prosperity, there cannot be too much facility given to the conveyance and exchange of all kinds of property, as it is by such means that capital of every species is likely to find its way into the hands of those, who will best employ it in increasing the productions of the country." David Ricardo

5.1. David Ricardo's Biographical Sketch and Historical Context

David Ricardo is the natural successor of Adam Smith. He had his first contact with economics at the age of fourteen, when he started to work as an assistant of his father in the London Stock Exchange. In 1815 he was already a rich man and he decided to dedicate himself to the public life. He bought a country state and started to work in the Parliament, becoming the country's expert in political economy.

Ricardo was, first of all, a businessman. He did not study moral philosophy, and his knowledge had no basis in books, but in personal experience. There was a clear difference between Smith and Ricardo. Smith was a professor, realistic in details, but without theoretical rigor. On the other hand, Ricardo was abstract and precise. Ricardo, as Malthus, was also quite pessimistic, and some of his ideas influenced Marx, who saw that economic liberalism was not the solution, and thought that socialism was the future[53]. Ricardo emphasized the importance of the diminishing returns in connection with the rent of land that regulated the profits of capital. Ricardo's law of land was his main contribution and also probably his main connection to Robert Malthus. Ricardo specified that there were different degrees of fertility of land, and this might lead to unequal profits to the capital and labor applied to it. His other main contribution was the concept of the comparative advantage, which demonstrated the benefits of international specialization.[54]

The Napoleonic Wars influenced him as they influenced Malthus' theories as well. In that time, England was suffering monetary, fiscal and commercial problems. England's problems at the beginning on the 19th century were very well described by Rostow:
"The pressure of an accelerated population increases on the food supply during the years of war and its dramatic easing in the postwar years; a period of sustained agricultural expansion and high profitability followed, after 1812, by a dramatic fall in grain prices, agricultural distress, and a sharp debate on agricultural protection; wartime inflation with detachment from a bullion standard and a floating exchange rate after 1797, and then return to a gold standard in 1821 in a contentious setting of falling prices; and, asserting itself progressively in the background, and first round of the industrial revolution, making possible the financing of the war against Napoleon in good part via cotton exports, generating also an enlarged and increasingly assertive industrial and commercial middle

[53] Taylor, Overton H., 1960. A History of Economic Though: Social Ideas and Economic Theories from Quesnay to Keynes. International Student ed. Massachusetts: McGraw Hill, p73.
[54] Blaug, Mark., 1999. Who's Who in Economics. 3rd ed. United Kingdom: Edward Elgar Publishing Limited, p936.

class and a volatile urban working class sensitive to fluctuations in the cost of living and employment" [55].

David Ricardo stated that the principal problem of the economy was to determine the distribution of the income among the different classes. He was especially focused on the effects of the Corn Laws. The Corn Laws were introduced in 1815. They were trade laws designed to protect cereal producers in the United Kingdom against foreign competition. Ricardo argued that the Corn Laws were the main obstacle for economic growth expansion. He stated that taxes should never fall on the benefits, but on the landlords and the luxury consumption, a theory that was against his own interest. He expressed his concern about the agricultural situation in the preface of his main work, Principles of Political Economy and Taxation:

"The product of the earth - all that is derived from its surface by the united application of labor, machinery, and capital, is divided among the three classes of the community; namely, the proprietor of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated. But in different stages of society, the proportions of the whole produce of the earth which will be allotted to each of these classes, under the names of rent, profit, and wages, will be essentially different; depending mainly on the actual fertility of the soil, on the accumulation of capital and population, and on the skill, ingenuity, and instruments employed in agriculture"[56].

In 1799, he had the opportunity to read Adam Smith's Wealth of Nations. He wrote his "Principles of Political Economy and Taxation" in 1817, mainly because of the help of James Mill, who persuaded him to write down his economic ideas. Ricardo agreed with the classical perspective in the majority of the controversial topics of the time. He disagreed with Malthus regarding how useful the government influence in the economy after economic depressions might be, and defended Say's Law.

5.2. David Ricardo's theory of economic growth

Since the beginning, Ricardo stated that he was not agreeing with the Physiocracy and the idea that the agriculture was the only sector capable of generating a net surplus. He thought that all sectors of economy could be profitable, and that it would be the market the one allocating investment accordingly. He also stated that wages would be regulated not by the market, but by something even simpler, the requirements for subsistence. Wages in the long term would always be around the level of subsistence. But even with constant wages, the profits would suffer the impact of the diminishing returns in the agriculture.[57]

According to Ricardo's theory of income distribution, the first important assumption is that when wages rise, prices do not have to rise necessarily, because the reduction of profits do not affect prices, as prices have a long run equilibrium and do not depend on wages. In other

[55] W.W. Rostow (1990), p. 33-50.
[56] Ricardo, David., (2001) [E-book]. Source: Umea University Library
[57] Barber, William J (1967). Source: http://www.wesleyan.edu/css/readings/Barber/chapter3.htm

words, wages might rise and profits might be reduced, however, the relative value of the commodity would remain unchanged, unless the value of money (the value of gold) was changed (after the Napoleonic Wars, the United Kingdom was suffering a shortage of silver and introduced the gold standard, a monetary standard under which the basic unit of currency is equal in value to and exchangeable for a specified amount of gold).

Ricardo arrived to the conclusion that the only factor that changes prices in the long term is the variation of gold price (which depends on gold productivity), which he considered fixed in his assumptions to simplify his theory. He thought that if less labor was needed to produce gold or the same amount of labor would produce a higher quantity of gold (increase in productivity) relative prices in all commodities would fall. Ricardo agreed with Smith on the matter of increasing returns in manufacturing, and he expected an increase of labor productivity over time.

The case was different in agriculture. Here, Ricardo agreed with Malthus, with the decreasing returns on land. He thought that productivity would fall with the use of less fertile land (Ricardo was not taking into account the effect of the improvement of technology in the agricultural sector as Smith and Malthus did). He thought that prices in the long term were expected to grow in agriculture. This would raise wages in agriculture, and this would cause economic growth (increase of agricultural production), better living standards for the farmers, and a decrease in profits.

Profit analysis is important when talking about Ricardo, also when talking about Smith and Malthus, as it is related to capital accumulation. All three agreed that with economic growth, an increase in wages reduces profits, and there is a point in which the stationary-state is reached and capital accumulation ceases.

Ricardo thought that with a positive rate of profit, capital would accumulate and the demand for labor would grow (a higher amount of capital would be available, and more labor would be needed to increase the total output). When labor demand is growing, wages increase as we saw in Figure 1.4. An increase of the demand of labor, and high wages, will increase population, as we saw with Smith and Malthus and the economy would move towards the steady-state.

Ricardo agreed with the positive relation between capital accumulation and population. In the long term, capital and employment would grow at the same rate, although in the short term they might rise at different rates. Fluctuations would occur for example when a country is being industrialized, a case in which capital would rise faster than employment.[58] Such a situation is typical in countries that are at the beginning stage of development, when the fertile land is in abundance, and laborers cannot be supplied as fast as capital accumulates[59], so this topic is still very interesting nowadays.

[58] Eltis, Walter (2000), p. 182-197
[59] Adelman, Irma (1961), p. 47-52.

Ricardo was indeed born in the middle of the industrialization process that was occurring in Britain, but agriculture was still the main topic. One of his main concerns was how capital accumulation in the agricultural sector could contribute to economic growth. He differentiated between two kinds of improvements that could increase profits in the agricultural sector: changes that increase land productivity and changes that increase machinery used in agriculture.

When it comes to changes that increase land productivity, Ricardo differentiated between long term effects and short term effects. In the short run, land productivity would occur due to an increase in labor productivity, and this would have no impact on the demand of food, because population would not increase immediately. This would have as a consequence less employed people in the agricultural sector. This increase in labor productivity would promote an increase in the capital accumulation in the long run.

Ricardo also stated that improvements in land productivity would reduce rents for the landlords. More productive land would generate more food, however, as population would not adapt immediately, agricultural prices would decrease. Also, since more output would be generated by the same amount of land, the less productive land would not be used, and landlords would not receive rents for this land.

Malthus, on the other hand, was completely in disagreement with this proposition. Malthus point of view on this issue was that higher productivity would increase the supply of food, and this would increase population, which would increase the demand for food. Malthus did not recognize that actually, these were the effects that Ricardo was considering, but in the long run.

On the other hand, the other improvement that Ricardo contemplated to increase agricultural production (an increase of machinery) would not reduce rents for the landlords. This would make it possible to produce a bigger output with less labor, but to obtain the more output; less land could not be used, as the output would grow more slowly than the capital stock. In the long run, both improvements (land productivity and machinery) increase marginal productivity and profits, and as consequence, the rate of capital accumulation.

We have seen the effects that improvements in agriculture would have on the landlords according to Ricardo, and now I will describe the effects on the labor class. We have seen that wages change according to the demand of labor and the demand of labor increases when capital increases, so an increase in capital means an increase in wages too. Malthus thought that if population was controlled, wages could remain high when reaching the steady state. On the other hand, Ricardo thought that wages would increase with capital accumulation, and the purchasing power would then be in the hands of the labor class, which would increase population (he did not contemplated birth control as a solution). Then wages would fall because the supply of workers would always increase at a higher rate that the demand of workers, due to the diminishing marginal product of capital. Wages would continue falling

until the economy reached the steady-state, were wages would be sufficient to maintain the actual population.

Another debate between Ricardo and Malthus was about the use of public expenditure. Malthus thought that in order to stimulate the economy, the State should increase consumption in order to increase the demand. This would generate an increase of the demand of labor and an increase of wages. Ricardo argued that the State should redirect their efforts towards investment in order to generate capital accumulation[60]. Even though Smith and Ricardo had different views on how desirable public workers were, they had the same solution to generate prosperity, accumulation of capital in order to move the economy to a higher steady state.

In the beginning, Ricardo stated that the population would always gain with the introduction of machines and the improvements in technology. Everybody would enjoy the benefits of the reduction in prices. This would slow down the deceleration of the economic growth rate. Ricardo did not believe that mechanization would increase unemployment. As we have seen, with Ricardo economic growth goes together with capital accumulation and the increase of the demand of labor. He thought that with population growing, less productive land should be exploited, wages would rise, and mechanization would be attractive to increase productivity. But in the third edition of the *Principles* he stated that with the introduction of machinery the distribution of the output would not be equitable among the different classes, being the working class the most affected, because of the deterioration in its standards of living. The reason for Ricardo was that an increase in the fixed capital would immediately reduce the circulating capital. In the future, this would become the center of the Marxian theory.

It has been said before that wages could increase as capital raises, since sometimes accumulation of capital increases faster than the demand of labor, but we have to consider that Ricardo was sometimes working in the short term (in the short term, capital can grow faster than the demand of labor, and increase in profits generated by the mechanization would incentivize accumulation of capital even more and increase the demand of labor more), and other times in the long term. In the long run, capital and labor would tend to growth at the same rate, Ricardo stated, and wages would remain constant.

Although in this paper I will not introduce Ricardo's theory of the comparative advantage and its international consequences, it can be said here that mechanization was also related to international trade. Ricardo's opinion was that if England did not follow the process of mechanization and its advantages, other countries would.

The stationary state described by Ricardo was a point in the economy in which growth was not achievable anymore, because of the diminishing agricultural returns. When all the land of a country is cultivated, the economy has arrived at the point in which population, and profits (and of course capital accumulation) cannot rise anymore. Taxes on foreign

[60] Eltis, Walter (2000), p. 198-223.

agricultural products can just accelerate this process. But if manufactures can be exchanged by food (in clear opposition with Malthus) with other less developed countries, then the process could continue[61]. Ricardo did not agree with the efforts of some countries to maintain the products of other countries out of its barriers, in order to protect some specific sectors of the economy.[62]

[61] Eltis, Walter (2000), p. 227-242.
[62] Caravale, G (1985), p. 285-300.

6. The Classical Liberal Models of Economic Growth and the Solow Model

This is the beginning of the second part of this paper, where François Quesnay's, Adam Smith's, Robert Malthus' and David Ricardo's theories will be summarized prior to the introduction of the Solow model and the development of each author models.

In this last part, the Solow model on economic growth will be introduced. This model has been selected as theoretical foundation to have a common framework to compare the four different authors. In this part, the model will be adapted to represent the perspectives of the four authors on capital accumulation and economic growth.

The Solow growth model is designed to show how growth in the capital stock, growth in the labor force and advances in technology interact in an economy, and how they affect the nation's total output. [63]

In order to build the model, the first step will be to determine the supply and demand for goods and their relation to the accumulation of capital. However, before starting with the development of the model and its adjustments to represent each author theories, the key assumptions of each author will be summarize below.

In Quesnay´s theory, labor force was assumed to be a fixed variable and technology was absent. Land was not a fixed factor according to Quesnay – since not all of France soil was being exploited – however, this factor is not included in the Solow model, and it will be omitted in the development of Quesnay growth model. Quesnay focused on the relation between capital and labor. Quesnay was presenting an economy that had reached the steady state, an economy with a constant level of per capita output.

These were the core components of Quesnay´s theory of economic growth:

- He assumed that the *net surplus* of the economy would determine the demand – that is, that the supply would create the demand – in the Tableau he presented a closed economy, although he mentioned the importance of exports in France´s economy.
- In order to increase the *net surplus*, Quesnay assumed that the prices paid to the agriculture would have to be increased. For this to happen, the demand of foodstuffs had to increase. This would have as consequence an increase in the "annual advances", what would allow an increase in the price of the production factors. In other words, the wage that farmers earn and the rent the owners of the capital collect (in this case, the farmers), would increase.
- Higher factor prices in agriculture would increase the income of the farmers. This would allow savings, and increase capital accumulation.
- Quesnay assumed that factors of production were fully utilized – that is, no resources were wasted.
- He assumed that labor was a fixed factor, since an increase in wages would not increase the number of people employed. He did not contemplate that an increase in wages would

[63] Mankiw, G (2006), p187.

increase the labor force in the long run, which would eventually cause a decrease in wages.

- He thought that France´s labor force was fully employed – no resources were wasted – and no additional workers were coming from abroad.
- He referred to capital intensity as the key component of economic growth. Capital was the core variable in Quesnay´s theory.
- Particularly important in Quesnay´s theory is his emphasis on the importance of reducing taxes paid by the agriculture to avoid falls in production[64], since this was the only generator of economic growth according to him. For this reason, taxes will be explicitly incorporated in the Solow model when presenting Quesnay´s theory.

Finally, it is important to emphasize Quesnay´s opinion of the different sectors in the economy, since it differed substantially with the theories that his successors would develop after him. Figure 2.1 represents Quesnay´s analysis of the manufacturing sector:

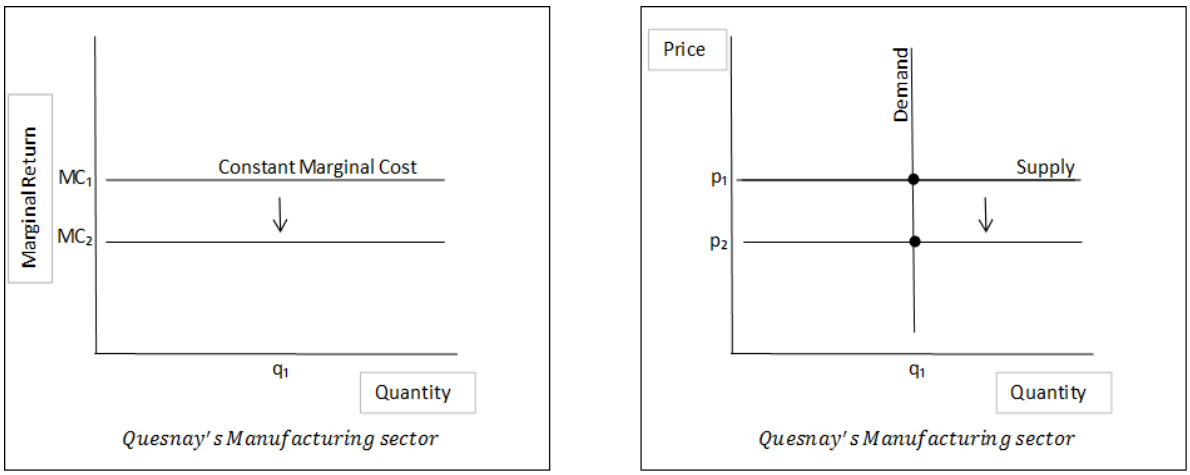

Figure 2.1. Quesnay assumed the manufacturing sector had constant marginal cost. He thought that the marginal cost would not change no matter how many units of manufactures were produced. He was contemplating a perfectly competitive market were the marginal cost was equal to the unit price. For this reason, an improvement in the manufacturing technology would lead to the reduction of the marginal cost, producing a downward shift of the marginal cost curve as shown in the graph to the left. As shown in the graph to the right, this would cheapen products. This would lead to a downward shift of the supply curve while the demand of manufactured products would remain fixed because in his analysis, population was a fixed variable. Quesnay developed this opinion based on the actual conditions of France at the time. In this period, 92% of the population was employed in agriculture, while the remaining population (the aristocracy) owned 50% of the land and received the totality of rents and taxes. For this reasons, the Physiocrats found it hard to believe that the manufacturing sector could generate wealth in France. Moreover, they argued, that labor employed in industry would be at the expense of agricultural production (since they assumed labor to be a fixed variable). [65]

[64] Eltis, Walter (1975), p335-341
[65] Charbit, Yves (2002), p858-860

Figure 2.2 represents Quesnay´s analysis of the agricultural sector:

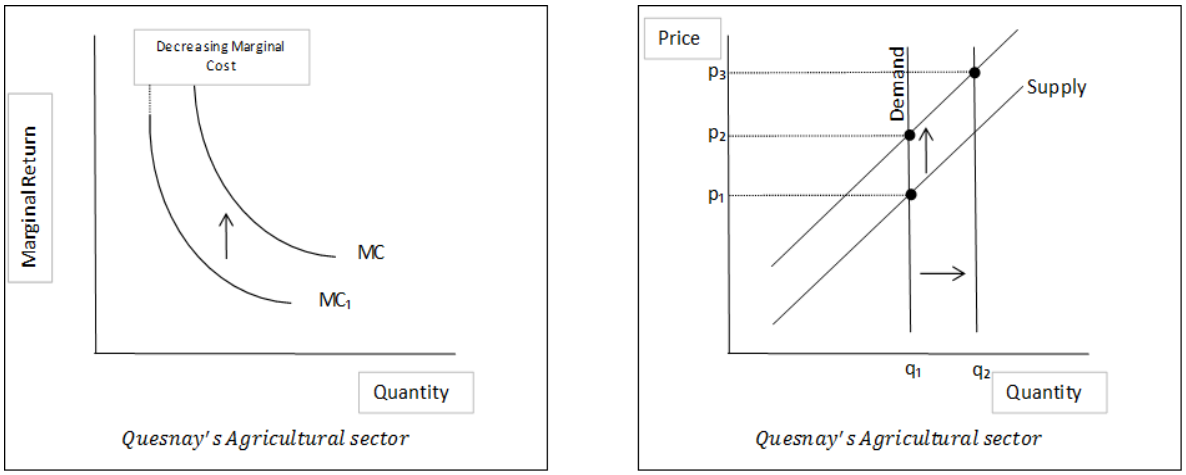

Figure 2.2. In the agricultural sector, Quesnay expected decreasing marginal cost. He identified the agricultural total cost of production to be constant (food consumed by the farmers while producing). An increase in the agricultural production would lead to increasing marginal returns since more production would mean less cost per unit.

Quesnay suggested an increase in prices of foodstuffs through an increase in the prices of the factors of production in order to increase the net surplus. These would increase the marginal cost of production, which is represented in the graph to the left as a shift upwards of the marginal cost curve. An increase of the prices of production (income of the farmers) would allow for an increase in investment (together with the reduction of taxation falling on the farmers) and subsequently an increase of total output per worker. The equilibrium price is determined by the supply conditions, so an increase in the factors of production would increase the price of the foodstuffs. This is shown in the graph to the right as an upward shift of the supply curve.

The demand of food was inelastic at the time (consumers buy foodstuffs regardless of the price in an economy of subsistence since most of the income is destined to buy food supplies) and he assumed population to be fixed. However, at the same time, he was contemplating an increase of the demand due to a change of the consumer habits of the aristocracy and better marketing policies of the agricultural products abroad. [66] This is shown in the figure as a shift to the right of the demand curve. In his theories, the factor that would allow an increase of the supply while increasing the prices would be an increase of the demand.

Through this process, we can easily see that Quesnay´s main concern was to increase agricultural prices in order to guarantee the profitability of the modern capitalist agriculture. [67]

It can be said that while Quesnay realized the effects of an increase in the saving rate in the short term (he proposed the reduction of finished goods consumption in favor of an increase in investment in agriculture in order to increase the output of the economy), he did not estimated the long term effects in the economy of the accumulation of capital (population growth and the increase of the labor force). Quesnay presented a model in which labor was a fixed variable and technology was absent. These are the main two differences between Smith and his predecessor. Even though Quesnay appreciated the importance of using effective techniques in agriculture, he directed his analysis towards an increase of capital accumulation per worker in the agriculture. On the other hand, although for Smith accumulation of capital was still of vital importance, labor and technology gained prominence due to the concepts of "division of labor" and "specialization" that he

[66] Eltis, Walter (1975), p341-42
[67] Mazat, N. & Serrano, F (2011), p25-26

introduced. For this reason, labor and technology are not assumed to be fixed in Smith´s model.

These were the core components of Smith´s theory of economic growth:

- He considered accumulation of capital and bigger markets pre-conditions for economic growth – the same as Quesnay.
- However, Smith considered both agriculture and the manufacturing sector to be productive sectors. He identified that accumulation of capital in manufacturing sector could generate increasing returns, while this would not be possible in the agriculture. Overall, he thought that the whole economy would present diminishing returns due to the fact that the agricultural sector was bigger than the manufacturing sector.
- Together with capital accumulation, he considered working population employed in productive labor a key component of economic success.
- He thought that accumulation of capital had to grow constantly in order to counteract the effects of depreciation and population growth (this will be shown graphically in Figure 2.6. when developing the model).
- He assumed that accumulation of capital would equip labor to perform specialized actions. The effect would be an increase of wages, a reduction of prices, and a bigger population due to the improvement of the living conditions. Bigger populations would create bigger markets and allow an even more effective division of labor, which in turn would increase the productivity. He thought that the population function would expand at the same time as the demand of labor.
- However, when reaching the steady state, profits would be reduced. As a solution, he suggested international specialization and the implication of institutions to regulate the competition in the markets. He thought that this way, the capitalists would generate profits again, allowing capital accumulation and the increase of the saving rates. This would allow the economy to move to a new steady-state.

As we have seen, there are substantial differences between Smith and his predecessor regarding the analysis of the manufacturing sector and the agriculture. Figure 2.3 shows Smith´s view on the manufacturing sector:

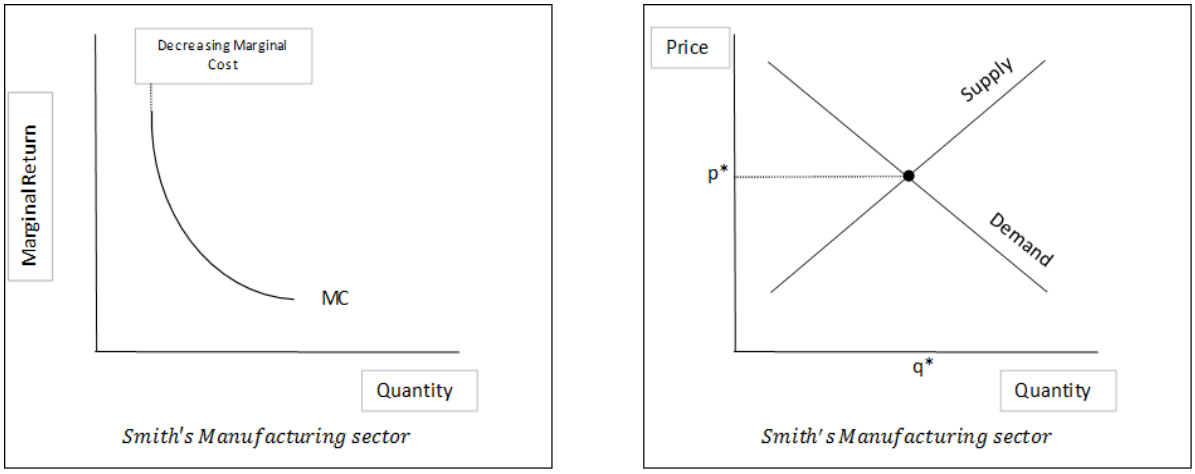

Figure 2.3. In opposition to Quesnay, Smith thought that the industry and not the agriculture would have decreasing marginal cost and increasing returns due to the specialization of labor. Another difference to Quesnay would be that population is not a fixed variable anymore, and the demand of manufactures is not inelastic.

Figure 2.4 represents Smith´s analysis of the agricultural sector:

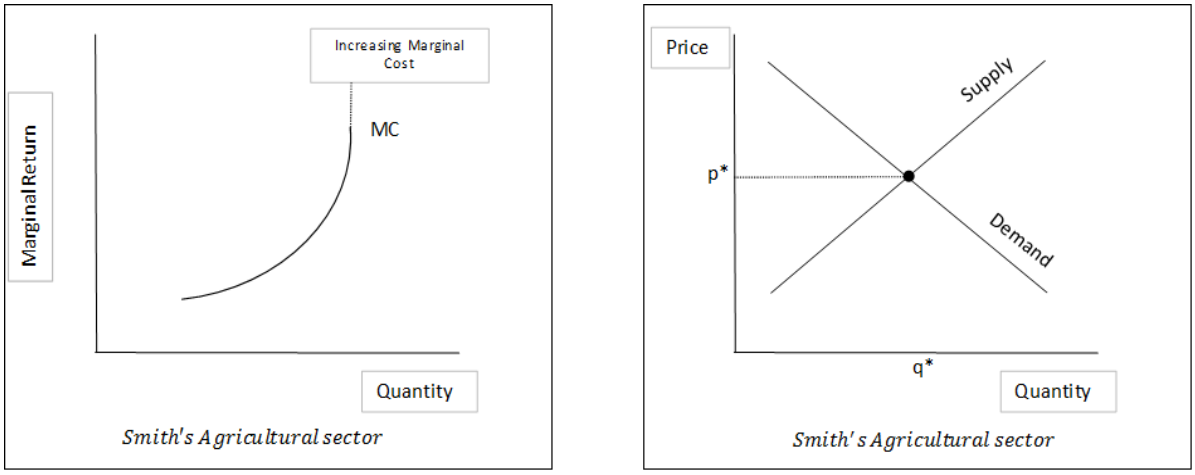

Figure 2.4. In the agricultural sector, Smith assumed that increasing marginal cost of production was due to the scarcity of land (graph to the left). Moreover, the seasonal aspect of agriculture, the few workers needed to operate a farm and the fact that just a few consumers provide a market, made him think that the division of labor and specialization would not be possible in agriculture. This would lead to diminishing returns in this sector of the economy.

While Quesnay directed his analysis towards an increase of capital accumulation per worker in order to increase the agricultural production, Smith focused on labor and technology in order to achieve economic growth.

Smith argued that capital should be invested in the way that generates the greatest revenue for the inhabitants of the country. Capital should first be directed to agriculture, afterwards to manufactures, and lastly to foreign trade according to him, being the final objective an increase of the employed population of the country.[68]

Malthus, on the other hand, considered labor and land of vital importance. The essential idea was that an increase in population (or labor) while holding the land factor fixed, would have

[68] Splengler, J (1959), p1-2

as a consequence lower output per worker taking into account the law of diminishing returns.[69]

These were the core components of Malthus' theory of economic growth:

- He stated that accumulation of capital would generate an increase in wages, what would improve the living conditions in the short term and increase the population growth rate.
- However, Malthus stated that in the long term, an increase in population would lower down the standards of living due to the fixed nature of the land factor and the diminishing returns in agriculture.
- He thought that even if accumulation of capital could grow constantly in order to counteract the effects of population growth, it would still mean less output per worker because land was fixed and technological change was absent in his economic growth theory.
- In disagreement with Smith, he considered governmental expenditure, especially during economic crisis, as a factor for economic success. He suggested an increase of taxation on the higher classes as a way to increase governmental expenditure if needed.
- Finally, he suggested maintaining society in a steady-state with a constant living standard and zero population growth (what would mean zero accumulation of capital).

Lastly, it can be said that Ricardo´s theory was mainly influenced by Adam Smith. Ricardo focused on the role capital accumulation to influence technical change and labor productivity.[70] However, he agreed with Malthus in many aspects related to demography and food constraints, especially at the end of his career, and it is important to note that they went through the same historical events.

These were the core components of Ricardo's theory of economic growth:

- Ricardo contemplated an improvement on the standards of living in the short term. The explanation for this is the income distribution theory that Ricardo developed. Ricardo stated that prices would rise, and the same would happen to wages in the short term. This would cause an improvement of the standards of living of the whole society. This process would decrease the profits of the landlords, and the purchasing power would be transferred to the workers. Finally, the reduction of profits would stop the accumulation of capital, and wages and prices would become constant reaching the stationary state.
- However, prices in agricultural commodities in the long term were expected to rise due to the use of less fertile land and the decrease in productivity (land would suffer diminishing returns), and because of an increase in population.
- Ricardo's theory would change at the end of its career, coming closer to Malthus. Ricardo contemplated an economy that would reach the stationary state due to capital accumulation. In the long run, population would increase too, at a higher rate than demand of labor, reducing the capital per worker and wages.

[69] Ekstein, Z. Stern S. & Wolpin K (1988), p353-354
[70] Heinz, D. Kurz (2010), p1193-1205

- However, he was more optimistic than Malthus. He suggested two solutions: accumulation of capital and trade to increase the exchange of manufactures for agricultural products once that all the cultivable land in the country was being used.

After summarizing the key assumption from each author, I will introduce now the Solow model. The model will be adapted with the purpose of explaining the main similarities and differences among the authors.

Starting with Quesnay, I will develop the model to explain the production functions of each author and the different factors that were core to accomplish economic growth according to them.

The supply and demand of goods plays a central role in the Solow growth model. The same is true for the Quesnay model, with the peculiarity that Quesnay´s focused mainly on the supply and demand of agricultural products only.

When it comes to the supply of goods and the production function, in the Quesnay model, output is stated as a function of capital and labor. The same occurs in the Solow model. The production function will then be:

$$Y = F\ (K, L)$$

The Solow growth model assumes that the production function has constant returns to scale

$$zY = (zK, zL)\ where\ z > 0$$

Production functions with constant returns to scale allow us to analyze all quantities in the economy relative of the size of the labor force. To see that this is true, we can set $z = 1/L$ in the preceding equation to obtain

$$Y/L = F\ (K/L, 1)$$

The equation shows that the amount of output per worker Y/L is a function of the amount of capital per worker K/L, which is exactly what Quesnay thought when it came to the analysis of the output in the agriculture. Also, the assumption of total returns to scale implies that the size of the economy – number of workers – does not affect the relationship between output per worker and capital per worker. It is appropriate for the development of the model to denote all quantities in 'per worker' terms, so $y = Y/L$ is output per worker and $k = K/L$ is capital per worker. We can write the production function as

$$y = f(k), where\ f(k) = F(k, 1)$$

The slope of this production function will always remain positive, since an increase in the capital per worker would have as a consequence an increase in the output per worker. Consequently, we can say that $f(k)$ will always have positive marginal products as $y' = f'(k) > 0$. Also, the production function in the Solow model presents diminishing marginal product of capital. When k is high, the average worker has a lot of capital, so an extra unit

increases production just slightly. [71] Even though Quesnay did not refer to the concept of diminishing marginal products of capital in agriculture, it was his contemporary Anne Robert Jacques Turgot – also a physiocrat – who first pointed this property in the production function. Turgot stated that "successive applications of the variable input will cause the product to grow, first at an increasing rate, later at a diminishing rate until it reaches a maximum". [72]

In the Solow model, when it comes to the demand of goods and the consumption function, the demand for goods comes from consumption and investment. The same happens in the Quesnay model, with the peculiarity that investment just occurs in one sector of the economy, the agriculture. This can be represented as follows:

$$y = c + i$$

The Solow model assumes that every year people saves a fraction s of their income and consumes a fraction $(1 - s)$. This can be represented with a consumption function as follows:

$$c = (1 - s)y$$

where s is the saving rate and a number between zero and one. Quesnay assumed that the saving rate was close to zero in the French economy, since all that was being produced was being consumed and the farmers were not in possession of the country´s wealth. According to him, the government fiscal policies were also damaging the saving rate. He mentioned, however, that the provisions to provide for the depreciation in the agricultural sector were taken.

In order to see what the consumption function implies for investment, we can substitute $(1 - s)y$ for c in the national income accounts identity:

$$\begin{aligned} y &= c + i \\ y &= (1 - s)y + i \\ y - (1 - (1 - s)) &= i \\ i &= sy \end{aligned}$$

This proves that investment equals savings[73]. In the Quesnay model, the agriculture was the only sector that could increase prices while maintaining the costs constant, for this reason, the agriculture was the only sector capable of generating a profit that would allow savings. Because of this, I will refer to the investment in agriculture as i^a and to the savings as s^a.

I have now introduced the two main components of the Solow model – the production function and the consumption function. So far, the Solow model seems to reflect Quesnay´s theory. The next step is to explore how the Solow model can reflect how Quesnay understood the growth in the capital stock. Quesnay pointed out that the capital stock was

[71] Mankiw, G (2006), p188
[72] Spiegel, W (1983), p195
[73] Mankiw, G (2006), p189

the key variable for France to increase the economy´s output. However, he concluded that the capital stock was very low in the French economy in the 18th century. He considered both investment and depreciation to be very low in the main sector of France´s economy – the agriculture. Investment per worker in the agriculture can be expressed as a function of the capital stock per worker:

$$i^a = s^a f(k)$$, where k is the capital stock in agriculture.

This equation relates the existing stock of capital, k, to the accumulation of new capital, i^a, in agriculture. Especially in Quesnay´s model, it is important to highlight the effects of taxation on the accumulation of capital. Taxes were a core component of his theory. He was aware that the government was not investing the resources it received in taxes. These resources were used, on the contrary, for the financing of expensive wars. This income tax was reducing the total amount available for investing in the agriculture. This can be represented as follows:

$$i = s^a y(1 - t)$$

where t represents the taxes.

To incorporate depreciation into the model; it can be assumed that a certain fraction δ of the capital wears out each year. In Quesnay's theory, depreciation just existed in agriculture; δ^a is the depreciation rate in agriculture. We can express the impact of investment and depreciation on the capital stock with the equation:

Change in capital stock = Investment – Depreciation

$$\Delta k = i - \delta k$$
$$\Delta k = s^a y(1 - t) - \delta^a k$$

where Δk is the change in the capital stock between one year and the next. In Quesnay´s theory, as we have seen, the only difference is that change in the capital stock could just occur in the agriculture, and just capital in agriculture could be depreciated.

Quesnay was presenting an economy that had reached the steady state. The only productive sector of the economy – the agriculture – had a capital stock, $k*$, at which the amount of investment was equal to the amount of depreciation. He suggested that the economy´s capital stock would not change because investment and depreciation just balanced. That is, at $k*$, $\Delta k = 0$. This state of the economy would remain in the long term unless an increase in the saving rate of the agriculture raised investment in the sector causing the capital stock to grow towards a new steady state. In conclusion, he confronted a profit maximization problem in the agriculture, where taxes and low agricultural prices were the main obstacles. He concluded that if the output of the agriculture was the sum of the raw materials used in the production, the wages of the farmers, the depreciation of capital in agriculture and the rents paid by the farmers to the landowners, the only way to reach a new steady state would

be to increase the income of the farmers. This would mean to increase their wages by reducing the taxes they paid, and increasing the price of the foodstuffs, in order for them to have a higher income that would allow them to invest and produce more. This could create a situation in which saving would exceed depreciation:

$$s^{a} f(k) > \delta^{a} k$$

Figure 2.5 represents the steady-state of France that François Quesnay described graphically. It illustrates the production function, the investment function in agriculture, the allocation of the output between consumption and savings, and the depreciation in agriculture. It also represents the changes that Quesnay considered necessary in order to improve France´s economy.

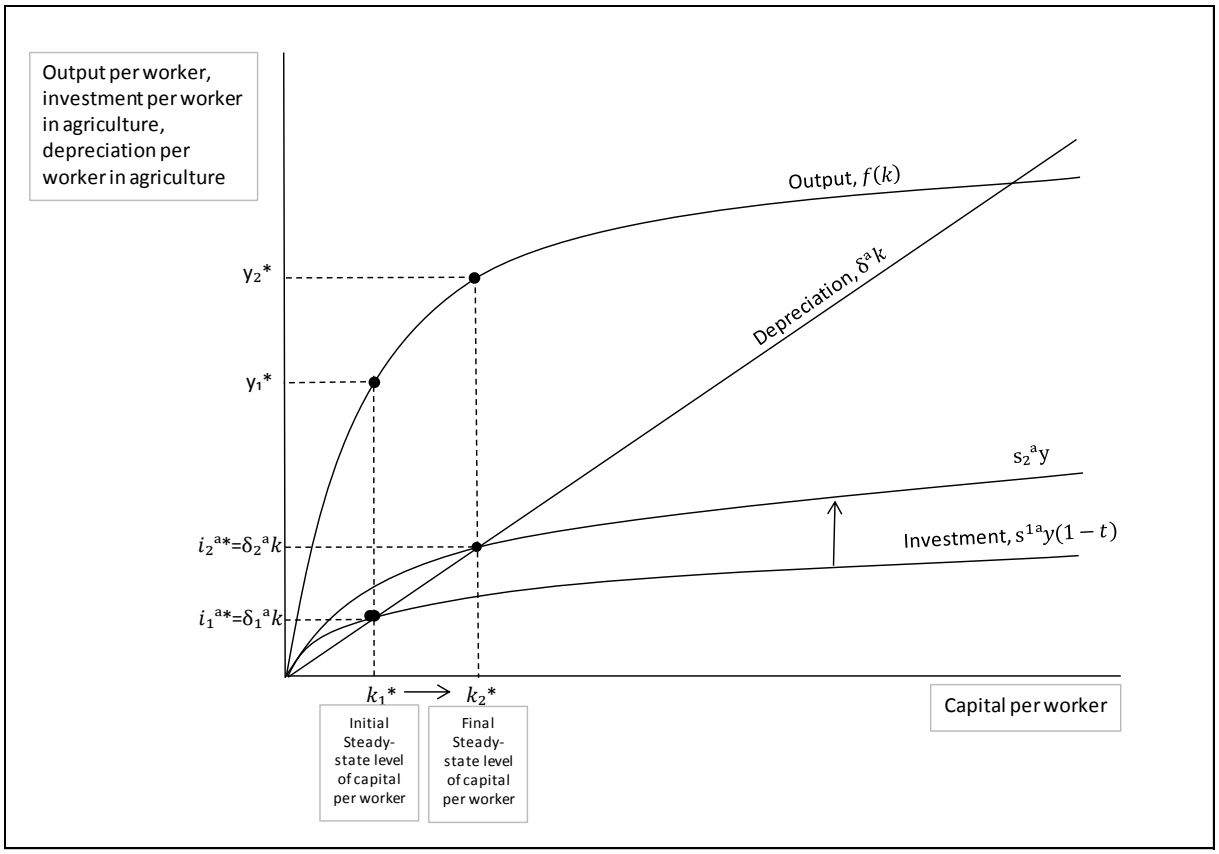

Figure 2.5. The main component of the graph is the production function. The production function shows how the amount of capital per worker k determines the amount of output per worker $y = f(k)$. The slope of the production function is the marginal product of capital. The production function becomes flatter as k increases, indicating the diminishing marginal product of capital in agriculture. The next component of the graph is the investment in agriculture. In Quesnay´s theory, the investment in agriculture was very low due to a very low savings rate function $s_1{}^a y\,(1-t)$, a consequence of taxation falling on the agriculture. This reflects an allocation of the output in which most of the part of it is destined to consumption, and very little to investment. The third component of the graph is the depreciation per worker in agriculture, which was according to Quesnay, very low in the French economy of the 18th century. The economy had a capital stock in agriculture at which the amount of investment was equal to the depreciation, that is $\Delta k = 0$. Both the capital stock $k_1 *$ and the output $y_1 *$ were steady over time. Quesnay suggested an increase in the savings rate through a cut in taxes paid by the farmers. This implies that the amount of investment for any given capital stock is higher. This is reflected with the shift of the saving function $s_1{}^a y\,(1-t)$, upwards, where $t = 0$. Now, at the initial steady state level $k_1 *$, investment exceeds depreciation. The capital stock rises until the economy reaches the final steady state $k_2 *$, were capital and output are higher.

In Figure 2.5, we can see that the model assumes an increase in the saving rate. This is due to a decrease in taxes but also due to an exogenous change – an increase of the demand and price of the agricultural products result of better marketing policies for the foodstuffs at home and abroad.

However, Quesnay did not realize that a very high saving rate might not be beneficial– a steady-state level of capital per worker higher than $k^2 *$ in Figure 2.5 – would eventually mean less and less consumption per worker due to the diminishing marginal product of capital in agriculture. The effects of an excessive saving rate could lead to a less desirable steady state in which consumption is not maximized, as described by the Golden Rule in macroeconomics[74]. The long term effects of accumulation of capital would be explored later by his classical successors.

The next author to be introduced in the framework of the Solow model is Adam Smith. As we have seen, the main changes when introducing Smith´s theory are the introduction of technology progress and population growth.

When it comes to the supply of goods and the production function, in the Smith model, output is still stated as a function of capital and labor. However, the labor is affected by the efficiency of labor, denoted as E:

$$Y = F\ (K, L\ x\ E)$$

In Smith´s theory, the efficiency of labor raised because of an improvement of the skills of the labor force due to the division of labor and specialization. The term $L\ x\ E$ represents the effective number of workers, which in Smith´s theory, were those working both in agriculture and the manufacturing sector

The next step when elaborating Smith´s model is to introduce the population growth. Smith explained that an increase in the saving rate would increase consumption and the output of the economy in the long run. This would generate an increase of population and labor force.

The growth in the number of workers causes capital per worker to fall. While investment increases capital stock per worker, an increase in the labor force decreases capital stock per worker in the same way as depreciation does. This can be represented in the following way:

$$\Delta k = sf(k) - (\delta + n)k$$

where n is population growth. Technological progress also affects the change in the capital stock. The efficiency of labor grows at some constant rate g and affects the change in the capital stock in the following manner:

$$\Delta k = sf(k) - (\delta + n + g)k$$

[74] Mankiw, G (2006), Ch 7

This means that to keep k constant, the investment per worker needs to grow to provide for the depreciation, the increase in workers, and the increase in "effective workers" created by technological progress.

I have now introduced the two new components of the Smith model – technology progress and population growth. The next step is to explore how the Solow model can reflect how Smith understood the economic growth in the capital stock. Once again, I will explain graphically the process that Smith suggested in order to achieve economic growth. Figure 2.6 illustrates the production function, the investment function in agriculture and the manufacturing sector, the depreciation of capital and the new changes: labor technological progress and population growth. It also represents the changes that Smith considered necessary in order to generate economic growth.

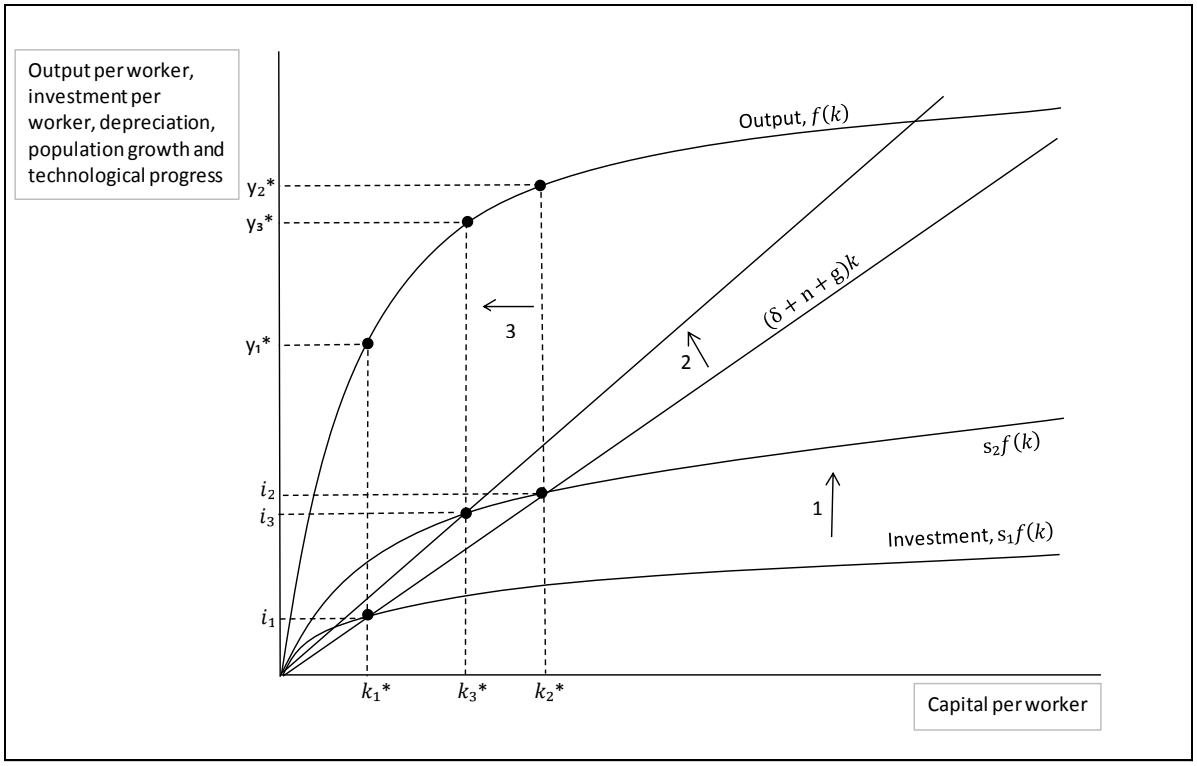

Figure 2.6. The main component of the graph is the production function. The main difference with Quesnay is that now $y = f(k) = \frac{K}{L\,x\,E}$. The next component of the graph is the investment. In Smith´s theory, accumulation of capital was the first step to achieve economic growth. The curve $s_1 f(k)$ shifts up and the steady-state goes from $k_1 *$ to $k_2 *$. In the long run, this produces a chain of effects: labor would be equipped to perform specialized actions; the effect would be an increase of wages, a reduction of prices, and a bigger population due to the improvement of the living conditions. Smith was describing an economy that was increasing saving when starting with less capital than in the steady state were $MPK - (\delta + n + g) = 0$. The consequence of this would be that when increasing capital, total output rises above depreciation, maximizing consumption. The third component of the graph is the depreciation, technology and population function. An increase of these three variables would make the economy go from $k_2 *$ to $k_3 *$. At this point, $K = (\delta + n + g)$, which means that consumption is maximized. Population enjoys higher wages and a higher level of consumption together with a higher purchasing power. However, profits for capitalists are close to zero and capital accumulation stops.

In Figure 2.6, we can appreciate that when the economy goes from k_2* to k_3*, the capital per worker is reduced. This would mean that new workers and new effective workers would have less capital to produce, what would decrease productivity, and the demand of labor. Apparently, Smith did not predict that in a situation in which productivity drops and supply of labor increases, wages or employment would drop. His conclusion was that population would expand at the same time as demand of labor, something that Malthus would not agree with as we will see in the next model. Smith concluded, however, that international specialization would reduce cost of production. This, together with the implication of institutions in order to regulate competition, would allow capitalists to increase profits and increase accumulation of capital again.

The next author to be analyzed in the framework of the Solow model is Robert Malthus. The main component in Malthus´s theory is population growth, and for him, population growth should be avoided. In his theory, he did not consider an increase of the efficiency of labor as a factor to maintain the income per capita constant over time. In his eyes, land was a fixed factor. That would be an obstacle for bigger populations that could not be avoided indefinitely by labor efficiency. Also, an increase in capital was avoidable, since it would stimulate population growth, which would be a problem due to the diminishing marginal product per capita.

Given this information, when it comes to the supply of goods and the production function, in the Malthus model, output is stated as a function of capital and labor.

$$Y = F\,(K, L\,)$$

The production function is still characterized by constant returns to scale and the law of diminishing returns still applies to each factor.

The next step when elaborating the Malthus model is to introduce the population growth. However, a difference with Smith is the omission of the efficiency of labor rate g, due to the introduction of land as a fixed factor. This can be represented in the following way:

$$\Delta k = sf(k) - (\delta + n)k$$

where n is population growth. This means that to keep k constant, the investment per worker needs to grow to provide for the depreciation and the increase in workers, that is why Malthus advocated that population growth rate should be controlled.

The next stage is to explore, graphically, how the Solow model can reflect how Malthus understood the economic growth theory. Figure 2.7 illustrates the production function, the investment function, the depreciation of capital and the population growth. It represents the situation that Malthus considered desirable in order to maintain the standards of living.

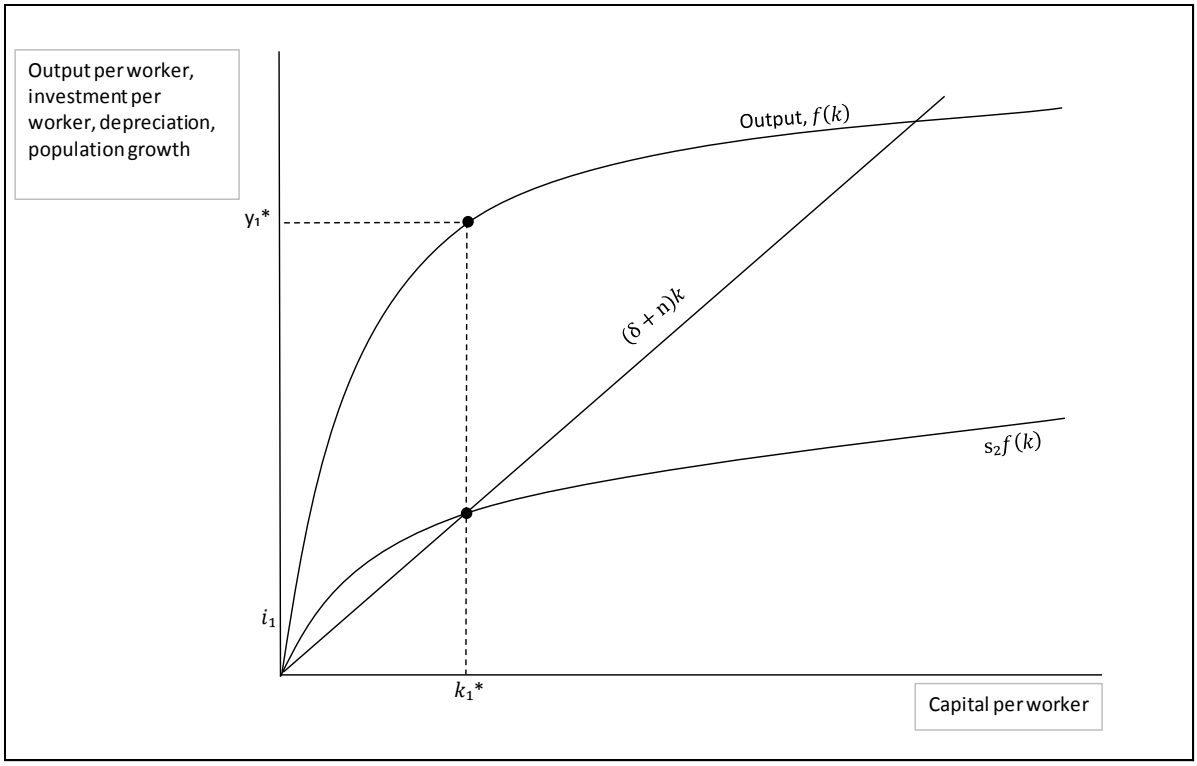

Figure 2.7. We previously examined, when analyzing Quesnay´s theory, a rate of population growth equal to zero, $n = 0$, in the economy. However, in Smith´s or Malthus´ theory this is not the case. As we noted before, the growth in the number of workers has as a consequence a decrease of capital per worker. Malthus thought that the amount of investment should be enough to keep the capital stock per worker constant in order to maintain wages and the living standards. This is $\Delta k = 0$ or $sf(k) = (\delta + n)k$. Malthus presented a stable steady-state where investment of the capital stock per worker exactly balances the negative effects of population growth and depreciation. By accomplishing this, population growth, capital per worker and output per worker are constant. However, the number of workers is growing at rate, n, and total capital and total output grow at the same rate, n. Malthus thought that this was the way to keep the standards of living constant: to keep a steady-state stable at $k*$ with and investment, $sf(k)$, that offsets the effects of depreciation and population growth $(\delta + n)k$.

Nowadays, we still see in developing countries how high population growth rates reduce the capital stock per worker, and in consequence, the output per worker.[75]

Finally, to explain David Ricardo's view on economic growth, I will use the same framework that was used when analyzing Smith's theory, since they agreed extensively in many aspects of economic growth theory.

The production function stays as

$$Y = F\ (K, L\ x\ E)$$

In Ricardo´s theory, the efficiency of labor and increases of labor productivity were of vital importance.

[75] Weil, David N (2008), p. 87-99

When it came to population growth, Ricardo was of the same of opinion as Malthus. He thought that with the accumulation of capital, population would grow in the long run, due to an increase of living standards. However, Ricardo did not present the same solutions as Malthus. He thought an inevitable, less productive land would be cultivated, reducing the capital per worker, and the output per worker, but increasing the total output. At the end, Smith, Malthus, and Ricardo had the same purpose, but different solutions.

Figure 2.8 illustrates the production function, the investment function, the depreciation of capital and the changes that the economy experiences when moving forward to a new steady state.

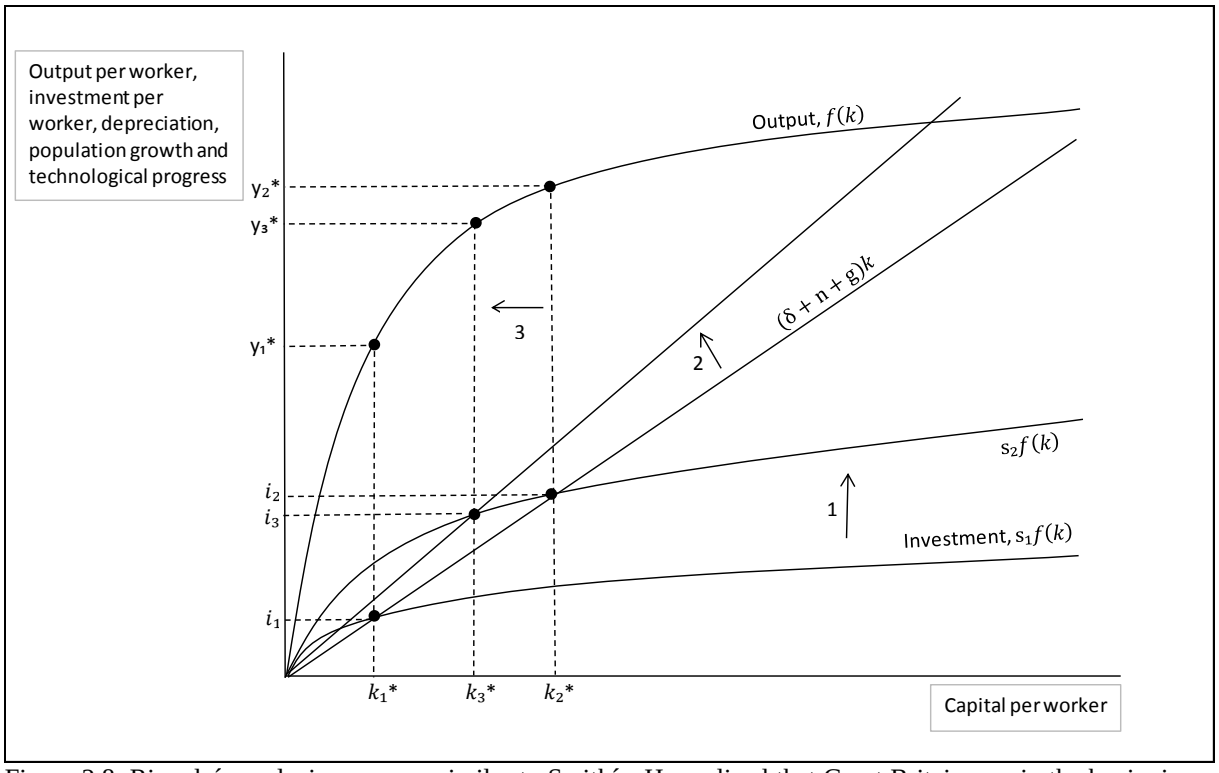

Figure 2.8. Ricardo´s analysis was very similar to Smith´s. He realized that Great Britain was in the beginning of the capitalization process. The economy was moving from $k_1 *$ to $k_2 *$. Profits were high, and the population was experiencing an increase in wages and prices. However, after reaching $k_2 *$, population would rise, and it would rise faster than the demand of labor. Wages would come back to the initial state and prices too. Profits would be reduced, and after reaching $k^3 *$, the accumulation of capital would stop.

The main difference of Ricardo compared to Smith and Malthus was the solutions they presented to improve the conditions of living. Ricardo agreed with Smith on the matter of creating accumulation of capital again. However, while Smith pointed out the role of the institutions to regulate competition and protect national industries, Ricardo was of the opinion that the government should not, in any case, regulate the market. Instead, it should boost the savings in those sectors were the country had a comparative advantage. However, both suggested international trade as a solution; Smith in order to improve the division of labor and expand the market, and Ricardo in order to exploit the comparative advantage of the country to exchange manufactures for foodstuffs and relieve the population from the shortage of food. With respect to Malthus, we have already seen the main differences. While Malthus thought that population should be controlled in order to have a stable steady state

with good condition of living, Ricardo saw population increasing. His solution, as we have seen, was to increase the supply of food through trade. He was also of the opinion that wages would return to the subsistence level after population adjustments.

7. Conclusions

The aim of this thesis was to clarify how the classical economic growth theory evolved and how external events affected this evolution. The work has been based on written literature, trying to simplify, as much as possible, the theory.

As we have seen, classic theory of economic growth is based on the existence of an economic activity that generates a surplus. The success of the growth process depends on the reinvestment of this surplus. This surplus also represents the main source for government income. Classical economics were pioneers when explaining the connections among the three sectors of any economy: agriculture, the manufacturing sector and commerce. Also, they were pioneers studying the relation between the government and the economic activity.

Quesnay was the first one of these great economists. For him, agriculture was the only sector capable of generating a surplus. It was of vital importance to relieve the farmers from taxes, so they could reinvest their profits. His proposal was to increase foodstuff prices, to have richer farmers, but at the expense of the population in the cities. This was not really a popular theory in the 18^{th} century. The idea was that with increases of capital in agriculture would benefit all the statements of society.

Adam Smith introduced that the manufacturing sector and commerce were also capable of producing profits. The three sectors were productive according to Smith. For him, growth was the consequence of the consumption in productive sectors. Smith, younger than Quesnay, lived in England, a country with less regulation than Quesnay's France. Under this circumstance he was able to explain that the prices in the economy are flexible, and vary according to the different amounts of supply and demand. Prices would allocate production in the three sectors, and also the internal consumption of the country and the exports. The economy that Smith proposed was able to suffer adjustments and represent the forces of the market. Smith thought that investment of capital would go to any place capable of generating profits, and no matter where the origin of this surplus was. Smith also introduced the diminishing returns in agriculture, something that Quesnay did not realize.

The diminishing returns in agriculture gained importance with Robert Malthus and his theory of population. Without food there would not be growth, and he pointed out agriculture as priority, agreeing with Quesnay. He thought that the reinvestment of the surplus should be directed to increase agricultural output. The difference with Quesnay's theory was that Quesnay was considering constant returns and Malthus was foreseeing diminishing returns. However, agriculture was the foundation for any healthy economy for both. The manufacturing sector also had importance in Malthus' argument, as the demand of foodstuff should not be just compound of farmers, it should be higher than that so the farmers would have an incentive to produce more than for their own consumption, otherwise the economy would stagnate. This was the reason why Malthus was also defending the importance of the unproductive sectors to increase the effective demand.

Ricardo agreed with Smith's theory about the market, and with Malthus theory about diminishing returns. He defended that corn should be imported in order to avoid the use of the unproductive land, and be able to assign this capital to the productive manufacturing sector. He defended three major points: reduction in taxes, importation of food, and capital accumulation in agriculture to encourage an increase profits. Malthus was agreeing just with the last one. Ricardo was in favor of low taxes and low public (unproductive) expenditures. Agricultural diminishing returns would decrease profits and the rate of capital accumulation, and in consequence, economic growth. But investment in agriculture and the manufacturing sector could delay this declining in profits. The investment in the manufacturing sector, according to Ricardo, would increase profits because of the reduction of unit costs, but not necessarily increase the rate of employment. Ricardo believed that mechanization should be a process that other nations would adopt sooner or later, so it was necessary not to fall behind. He also expected that mechanization would increase profits, and this would stimulate the employment again, and at this point, the demand of labor would be even bigger than before the mechanization took place. Ricardo saw that the whole society would experience the advances in the manufacturing sector in the long term.

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