HOW IS INCOME DISTRIBUTED AMONG THE FACTORS OF PRODUCTION?

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Abstract

This paper gives an overview of the distribution of income among the factors of production with a specific view on the case of Albania. It presents some literature about the distribution of income and explains in detail the concepts of the personal distribution of income and of the functional distribution of income. Then it goes into the specific analysis of income distribution in Albania. For the preparation of this paper a lot of available data for the overall economic situation of Albania have been used. Mainly, the data are gathered from the publishing of international financial organizations like the World Bank and International Monetary Fund and also from the publishing of Albanian Central Bank and the Albanian Institute of Statistics. The data were taken for a period of 14 years, from 1997 to 2010. The data used are output, labour (no. of employees) and capital (foreign direct investment). These data are integrated into the Cobb-Douglas production function. Excel programme has been used to elaborate the data. From the regression model, it is shown that labour contributes to 77 percent of the income and capital accounts for 23 perent of the income in Albania. As a conclusion, the Cobb-Douglas production function can be used in the case of Albania and it gives results that are similar to the original CD function.

Keywords: *Income, distribution, Albania.*

Introduction

Income distribution is an important issue in many different countries. The disparity between the rich and the poor people is very high. This is a cause for many social conflicts. The aim of this study is to analyze the causes of the disparity in the income distribution.

There has been no specific study regarding the income distribution in Albania so this study will be a first step towards the studying of this important issue.

The data have been collected by the publications of the most important institutions in Albania, specifically from the Albanian Institute of Statistics and the Central Bank of Albania. Also, more general data have been taken from international institutions like the World Bank and the International Monetary Fund.

The organization of this study is easy to understand. Firstly, it will be given a general overview about the concepts of the personal income distribution and

functional income distribution, by looking at the past literature. Then the data and the research methodology used throughout the study will be explained in details. Then focus will move on to the specific application in Albania and about the results found. Finally, some concluding remarks and the references used will be given.

This study will try to answer some major research questions:

How has the concept of income distribution evolved through the years?

Does Albania have a similar production function to that of the United States of America?

How much does labour and how much does capital contribute to the income of Albania?

Theory Of Income Distribution

The distribution of income is a very important topic in economics. The well being of all the citizens around the globe depends on it. There are two ways to look at the income distribution. These two ways are the personal distribution of income and the functional distribution of income. Personal distribution of income means the distribution of income among various individuals in a society. It shows how the inequality of income emerges in a country. On the other hand, the theory of the functional distribution of income studies how the various factors of production are rewarded for their service. It studies how prices of factors such as rent of land, wages of labour, interest on capital and profit of entrepreneur are determined. In this study, main focus will be given to the functional distribution of income.

The focusing on the functional distribution of income does not mean that the personal distribution of income is not an important matter. On the contrary, it is gaining importance now more than ever due to the disproportional division of income between different classes of people. Table 1 shows the ratio of the total income received by the 20 percent of the population with the highest income (top quintile) to the total income received by the 20 percent of the population with the lowest income (lowest quintile) for the countries of the European Union for the years 2005-2010.

Table 1: Ratio of the income received by the top quintile to that of the lowest quintile

	2005	2006	2007	2008	2009	2010
EU(27 countries)	5.0	4.9	5.0	5.0	4.9	5.0
EU (15 countries)	4.8	4.7	4.9	4.9	4.9	5.0
Belgium	4.0	4.2	3.9	4.1	3.9	3.9
Bulgaria	3.7	5.1	7.0	6.5	5.9	5.9
Czech Republic	3.7	3.5	3.5	3.4	3.5	3.5
Denmark	3.5	3.4	3.7	3.6	4.6	4.4
Germany	3.8	4.1	4.9	4.8	4.5	4.5
Estonia	5.9	5.5	5.5	5.0	5.0	5.0
Ireland	5.0	4.9	4.8	4.4	4.2	5.3
Greece	5.8	6.1	6.0	5.9	5.8	5.6
Spain	5.5	5.3	5.3	5.4	6.0	6.9
France	4.0	4.0	3.9	4.3	4.4	4.5
Italy	5.6	5.5	5.5	5.1	5.2	5.2
Cyprus	4.3	4.3	4.4	4.1	4.2	4.4
Latvia	6.7	7.9	6.3	7.3	7.3	6.9
Lithuania	6.9	6.3	5.9	5.9	6.3	7.3
Luxembourg	3.9	4.2	4.0	4.1	4.3	4.1
Hungary	4.0	5.5	3.7	3.6	3.5	3.4
Malta	3.9	4.0	3.9	4.2	4.0	4.3
Netherlands	4.0	3.8	4.0	4.0	4.0	3.7
Austria	3.8	3.7	3.8	3.7	3.7	3.7
Poland	6.6	5.6	5.3	5.1	5.0	5.0
Portugal	7.0	6.7	6.5	6.1	6.0	5.6
Romania	4.9	5.3	7.8	7.0	6.7	6.0
Slovenia	3.4	3.4	3.3	3.4	3.2	3.4

Slovakia	3.9	4.1	3.5	3.4	3.6	3.8
Finland	3.6	3.6	3.7	3.8	3.7	3.6
Sweden	3.3	3.6	3.3	3.5	3.7	3.5
United Kingdom	5.9	5.4	5.3	5.6	5.3	5.4
Iceland	3.5	3.7	3.9	3.8	4.2	3.6
Norway	4.1	4.8	3.5	3.7	3.5	3.4
Croatia	4.7	4.4	4.5	4.5	4.3	5.6

Source:Eurostat,
http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/dataset?p_product_code=TESSI180accessed on (02.05.2012).

As can be seen from the table, the differences between incomes are striking. In the European Union the top quintile gets as income almost five times what the lowest quintile gets. In some countries such as Latvia, Lithuania and Portugal the ratio of the income of the top quintile to that of the lowest quintile is as high as seven. Clearly, this is a huge difference and it may be a cause for social conflicts in these countries. This would be a really interesting study but however but it would need entrance into the complicated realm of ethical issues. Abstention from that temptation will be practiced though and focus will be given instead only to economical issues.

The distribution of income has much to do with the meaning of value. Economists since Adam Smith have been thoroughly interested in this issue. One of the most important maxims regarding value in Economics is that provided by Adam Smith in his Wealth of Nations (Smith, 1776):

> "The word value, it is to be observed, has two different meanings, and sometimes expresses the utility of some particular object, and sometimes the power of purchasing other goods which the possession of that object conveys. The one may be called value in use; the other, value in exchange. The things which have the greatest value in use have frequently little or no value in exchange; and, on the contrary, those which have the greatest value in exchange have little or no value in use. Nothing is more useful than water: but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it."

It is well known that Adam Smith maintained a labour theory of value (Smith, 1776):

"The real price of everything, what everything really costs to the man, who wants to acquire it, is the toil and trouble of acquiring it. What everything is really worth to the man who has acquired it, and who wants to dispose of it, or exchange it for something else, is the toil and trouble which it can save to himself, and which it can impose upon other people. Labour was the first price--the original purchase-money that was paid for all things. In that early and rude state of society, which precedes both the accumulation of stock and the appropriation of land, the proportion between the quantities of labour necessary for acquiring different objects, seems to be the only circumstance which can afford any rule for exchanging them for one another. If among a nation of hunters, for example, it usually cost twice the labour to kill a beaver which it does to kill a deer, one beaver should naturally exchange for, or be worth two deer. It is natural that what is usually the produce of two days', or two hours' labour, should be worth double of what is usually the produce of one day's, or one hour's labour."

According to David Ricardo though, another influential writer in the history of economics, Adam Smith has no where analyzed the effects of the accumulation of capital, and the appropriation of land, on relative value (Ricardo, 1821):

"It is of importance to determine how far the effects which are avowedly produced on the exchangeable value of commodities, by the comparative quantity of labour bestowed on their production, are modified or altered by the accumulation of capital and the payment of rent."

Ricardo talks throughout his book about the accumulation of capital. He maintains that:

"Even in that early state Adam Smith refers to, some capital, though possibly made and accumulated by the hunter himself would be necessary to enable him to kill his game. Without some weapon, neither the beaver nor the deer could be destroyed, and therefore the value of these animals would be regulated, not solely by the time and labour necessary to their destruction, but also by the time and labour necessary for providing the hunter's capital, the weapon, by the aid of which their destruction was effected."

A great deal of controversy in the history of economics has occurred due to the problem of rent and more specifically on the reason why rent existed in the first place. These two authors gave very different reasons for the existence of rent. Adam Smith believes that the rent of land is a monopoly price (Smith, 1776):

"The rent is not at all proportioned to what the landlord may have laid out upon the improvement of the land, or to what he can afford to take; but to what the farmer can afford to give."

He further develops his ideas in another paragraph (Smith, 1776):

"Rent enters into the composition of the price of commodities in a different way from wages and profit. High or low wages and profit are the causes of high or low

price; high or low rent is the effect of it. It is because high or low wages and profit must be paid, in order to bring a particular commodity to market, that its price is high or low. But it is because its price is high or low; a great deal more, or very little more or no more, than what is sufficient to pay those wages and profit, that it affords a high rent, or a low rent, or no rent at all."

On the other hand, David Ricardo takes a completely different approach to the problem of rent. He does not believe that high rent is the effect of high price, but rather it is the contrary fact that holds true.

In one of his brilliant paragraphs Ricardo states that the reason why raw produce rises in comparative value is because more labour is employed in the production of the last portion obtained, and not because a rent is paid to the landlord (Ricardo, 1821):

"The value of corn is regulated by the quantity of labour bestowed on its production on that quality of land, or with that portion of capital, which pays no rent. Corn is not high because a rent is paid, but a rent is paid because corn is high."

Everyone recognizes the advantages of rent. Ricardo expresses the general opinion when he states that (Ricardo, 1821):

"Nothing is more common than to hear of the advantages which the land possesses over every other source of useful produce, on account of the surplus which it yields in the form of rent. Yet when land is most abundant, when most productive, and most fertile, it yields no rent; and it is only when its powers decay, and less is yielded in return for labour that a share of the original produce of the more fertile portions is set apart for rent."

There is a parallelism in here between land and all the other natural resources. The only difference is that land is scarcer than any of these other resources. In Ricardo's words (Ricardo, 1821):

"If air, water, the elasticity of steam, and the pressure of the atmosphere, were of various qualities; if they could be appropriated, and each quality existed only in moderate abundance, they as well as the land would afford a rent, as the successive qualities were brought into use. With every worse quality employed, the value of the commodities in the manufacture of which they were used would rise, because equal quantities of labour would be less productive. Man would do more by the sweat of his brow, and nature performs less; and the land would be no longer pre-eminent for its limited powers."

Both of the authors have made great contributions to the field of economics. However, both of them had many mistakes in their theories. Nonetheless, they have provided the foundations over which other economists have worked on establishing a general theory of value, of income and of distribution.

Income is one of the most important economic indicators for every country, group of countries, continent and even for the world as a whole. If the income is increasing, the general well being of the citizens is increasing as well. If we can

think of the overall income as a pie, it means that the pie is getting greater; however, this does not mean that the division of the pie is getting more equal. Even though income may be greatly increasing some social groups' income may increase by a lower rate than the average or may even decrease. That is, the increase of the overall income does not necessarily mean that each factor of production is benefiting proportionately to that increase.

One of the main reasons for the writing of this study is actually to find out how the increase in the overall income is being distributed to the population. How much is each factor of production contributing to the continuous increase of income? To better answer this question a more detailed discussion on the specific factors of production is needed.

The four generally recognized factors of production are land, labour, capital, and entrepreneurship. In a literal sense, anything contributing to the productive process is a factor of production in itself. However, economists seek to classify all inputs into a few broad categories, so standard usage refers to the categories themselves as factors. Before the twentieth century, only three factors making up the classical triad were recognized. These were land, labour, and capital. Entrepreneurship is a fairly recent addition. One intuitive basis for the classification of the factors of production is the manner of payment for their services: rent for land, wages for labour, interest for capital, and profit for entrepreneurship.

Even though it is fairly recent, entrepreneurship is a very important factor of production. It is not only economically important, but socially important as well. Economically, entrepreneurship invigorates markets. The formation of new businesses leads to job creation and has a multiplying effect on the economy. Socially, entrepreneurship empowers citizens, generates innovation and changes mindsets. These changes have the potential to integrate developing countries into the global economy.

For all the people around the world, supreme importance attaches to one economic problem — that of the distribution of wealth among different claimants. Is there a natural law according to which the income of society is divided into wages, interest and profits? If so, what is that law? This is the problem which demands solution and to which an answer will be provided in this study.

John Bates Clark (1899) shows that the distribution of the income in any society is controlled by a natural law, and that this law, if it worked without friction, would give to every agent of production the amount of wealth which that agent creates:

"However wages may be adjusted by bargains freely made between individual men, the rates of pay that result from such transactions tend to equal that part of the product of industry which is traceable to the labour itself; and however interest may be adjusted by similarly free bargaining, it naturally tends to equal the fractional product that is separately traceable to capital. At the point in the economic system where titles to property originate, where labour and capital come into possession of the amounts that the state afterwards treats as their own, the social procedure is true

to the principle on which the right of property rests. So far as it is not obstructed, it assigns to everyone what he has specifically produced."

However, it is somehow difficult to divide exactly the income in a clear way between all the factors of production. In Clark's own words:

"Nearly every man's income is more or less composite. Labourers own some capital, capitalists perform some labour, and entrepreneurs usually own capital and perform a kind of labour."

As was said before, there are four factors of production. They are land, labour, capital, and entrepreneurship. However, land may be treated as a special case of a capital good. This is somehow an unusual approach if taken into consideration that the prevalent theory is that land rent is totally different from wages, interest and the entrepreneur's profit, in that the income from land is a differential gain fixed by a law of its own, which does not apply elsewhere. Clark brilliantly expresses this viewpoint when he states that:

"The rent of a particular piece of ground is measured by comparing its product with that which can be had from the poorest piece that is utilized by the application of the same amount of labor and capital."

So, it may be considered that the rent of a piece of land is an interest for the use of that kind of capital good. The wages for labour and the interest of capital can also be seen as differential incomes. The well-known Ricardian formula can be used for determining their values. Let us suppose that there is an unused portion of land. It is first introduced one unit of labour, then another and another more. It will be seen that the first unit of labour will produce a large amount of income, the second a little less, the other units of labour still less and so on. This happens because of the law of the diminishing marginal returns, which is a law of economics stating that as the number of new employees increases, the marginal product of an additional employee will at some point be less than the marginal product of the previous employee.

The same result will follow the other way around though. Let us suppose that there are some units of labour. It will be first introduced one unit of capital, then another and another more. It will be seen that the first unit of capital will produce a large amount of income, the second a little less, the other units of capital still less and so on. So the law of diminishing marginal returns functions exactly in the same way for capital as well.

In order to separate what part of the income is to be attributed to labour and what specific part to capital, the law of the final productivity of the factors of production has to be used. As was said before, if ten units of labour are put to work with a fixed amount of capital all but the last unit will create a surplus. The sum of these surpluses is the part of the income that can be attributed to labour only. The other part is to be attributed to capital.

John Bates Clark has brilliantly caught this point (Clark, 1899):

"Labour, as thus applied to land, is subject to a law of diminishing returns. Put one man on a quarter section of land, containing prairie and forest, and he will get a rich return. Two labourers on the same ground will get less per man; three will get still less; and, if you enlarge the force to ten, it may be that the last man will get wages only. If the men are hired by the owner of the land at the prevalent rate of wages, what has happened is that the force has been enlarged till the last man produces only what is paid to him."

Again Clark in another paragraph (Clark, 1899):

"All the earlier men in the series create surplus products, over and above the amount created by the last man. They get only what the last one produces, and the farmer-landlord gets the remainder. What goes to the owner of the land is the sum of a series of remainders that are made by taking, in each case, the product that is attributable to one of the earlier men as a minuend and the product that is imputable to the last man as a subtrahend."

In the same way, it can be measured that part of the income that is to be attributed to capital when different units of capital cooperate with a fixed proportion of labour. So, from the above discussion it can be seen that wages and interest are both determined by the law of final productivity.

Not a single word has been written yet about the profit of the entrepreneur. What was discussed above was a static condition. There were no changes in the overall structure of the economy and also there was perfect competition. Therefore, there was no place for profits in this abstract world. The profits enter into our picture when the overall economic structure is dynamic. According to John Bates Clark, there are five important changes going on in the world (Clark, 1899):

"Population is increasing, capital is increasing, industrial methods are changing, the modes of organizing labor and capital for productive purposes are changing, human wants are multiplying and refining."

These dynamic movements have different effects on the part that each factor of production takes from the overall income. Let us take a look at each of them. Let us start with an increase of population. This increase of population will cause the rate of wages to fall in terms of the amounts of goods that each worker can have.

An increase in capital will cause a decrease in the rate of interest. Labour, on the other hand, will profit from this increase of capital because each unit of labour will have more capital to work with.

If there is an invention, there will be more profits in the economy. At first, these profits will be grasped by the entrepreneurs, but in the long run they will go towards increasing the rate of wages. In Clark's own words (Clark, 1899):

"If, instead of occurring at intervals considerably separated, the improvements in industrial methods were continually taking place, —if one followed another so closely that, when the second occurred, the fruits of the first were only beginning to make their impression on the earnings of labour, — then, as a result, we should

have the standard of wages moving continuously upward and actual wages steadily pursuing the standard rate in its upward movement, but always remaining by a certain interval behind it."

It is these dynamic movements that create the profits of the entrepreneurs. Whenever there is an invention, the first to profit from it are the entrepreneurs. Only when enough time has passed and the new invention has become a usual part of the production process that the profits go towards increasing the wages of the labour.

Literature Review

Factors of production are the inputs used to produce goods and services. The two most important factors of production are capital and labour. Capital is the set of tools that workers use. Labour is the time people spend working.

The available production technology determines how much output is produced from given amounts of capital and labour. Economists express this relationship using a production function. Letting Y denote the amount of output, we write the production function as:

Y = F (L, K).

The production function reflects the available technology for turning capital and labour into output. If someone invents a better way to produce a good, the result is more output from the same amount of capital and labour. Thus, technological change alters the production function.

The distribution of national income is determined by factor prices. Factor prices are the amounts paid to the factors of production. In an economy where the two factors of production are capital and labour, the two factor prices are the wage workers earn and the rent the owners of capital collect.

The more labour the firm employs, the more output it produces. The marginal product of labour (MPL) is the extra amount of output the firm gets from one extra unit of labour, holding the amount of capital fixed. It is expressed as:

MPL = F (L + 1, K) – F (L, K).

This equation states that the marginal product of labour is the difference between the amount of output produced with L + 1 units of labour and the amount produced with only L units of labour.

Most production functions have the property of diminishing marginal product: holding the amount of capital fixed the marginal product of labour decreases as the amount of labour increases.

When a firm is deciding whether to hire an additional unit of labour, it considers how that decision would affect profits. It therefore compares the extra revenue from increased production with the extra cost of higher spending on wages. The increase in revenue from an additional unit of labour depends on two variables: the marginal

product of labour and the price of the output. Because an extra unit of labour produces MPL units of output and each unit of output sells for P dollars, the extra revenue is: P x MPL.

The extra cost of hiring one more unit of labour is the wage W. Thus, the change in profit from hiring an additional unit of labour is:

ΔProfit = ΔRevenue - ΔCost = (P x MPL) – W.

The firm hires labour until the next unit would no longer be profitable, i.e. until the MPL falls to the point where the extra revenue equals the wage. The firm's demand for labour is determined by: P x MPL = W.

This can also be written as:

MPL = W / P.

W / P is the real wage - the payment to labour measured in units of output rather than in dollars. To maximize profit, the firm hires up to the point at which the marginal product of labour equals the real wage.

The firm decides how much capital to rent in the same way it decides how much labour to hire. The marginal product of capital (MPK) is the amount of extra output the firm gets from an extra unit of capital, holding the amount of labour constant:

MPK = F (L, K + 1) – F (L, K).

Thus, the marginal product of capital is the difference between the amount of output produced with K + 1 units of capital and that produced with only K units of capital.

Like labour, capital is subject to diminishing marginal product.

The increase in profit from renting an additional machine is the extra revenue from selling the output of that machine minus the machine's rental price:

ΔProfit = ΔRevenue - ΔCost = (P x MPK) – R

To maximize profit, the firm continues to rent more capital until the MPK falls to equal the real rental price:

MPK = R / P.

The real rental price of capital is the rental price measured in units of goods rather than in dollars.

Before continuing with the application of the Cobb-Douglas production function in Albania, a discussion of the results of the United States of America is needed. In 1928, the economist Charles Cobb and the mathematician Paul Douglas published a study in which they modeled the growth of the American economy during the period from 1899 to 1922. They considered a simplified view of the economy in which the production output is determined by the amount of labour involved and the amount of capital invested. While there are many other factors affecting economic performance, their model proved to be remarkably accurate.

The function they used to model production was of the form:

P (L, K) = b Lα Kβ

where:

P = total production (the monetary value of all goods produced in a year)

L = labour input (the total number of person-hours worked in a year)

K = capital input (the monetary worth of all machinery, equipment, and buildings)

b = total factor productivity

α and β are the output elasticities of labour and capital, respectively. These values are constants determined by available technology.

The assumptions that were made by Cobb and Douglas can be stated as follows:

If either labour or capital vanishes, then so will production.

The marginal productivity of labour is proportional to the amount of production per unit of labour.

The marginal productivity of capital is proportional to the amount of production per unit of capital.

Results for the United States of America

Cobb and Douglas used the method of least squares to fit the data and came up with the following result:

P (L, K) = 1.01 (L0.75) (K0.25)

So, this result shows that 75 percent of the increase in income is due to labour and only 25 percent of the increase is due to capital.

Up to now production has been looked upon from the supply side. A different way, but which gives the same result is to look at production from the demand side. Even though in this study a regression of a Cobb-Douglas production function will be performed, that is, it will be looked at production from the supply side it is still important to know how demand determines production. There are four main components of the demand for goods and services. Those are consumption, investment, government purchases and net exports.

Households receive income from their labour and their ownership of capital, pay taxes to the government, and then decide how much of their after-tax income to consume and how much to save. Economists define income after the payment of all taxes, Y – T, to be disposable income. Households divide their disposable income between consumption and saving.

Economists assume that the level of consumption depends directly on the level of disposable income. A higher level of disposable income leads to greater consumption. Thus:

C = C (Y – T).

The marginal propensity to consume (MPC) is the amount by which consumption changes when disposable income increases by one dollar. The MPC is between zero and one: an extra dollar of income increases consumption, but by less than one dollar.

Both firms and households purchase investment goods. Firms buy investment goods to add to their stock of capital and to replace existing capital as it wears out. Households buy new houses, which are also part of investment.

The quantity of investment goods demanded depends on the interest rate, which measures the cost of the funds used to finance investment. For an investment project to be profitable, its return must exceed its cost. If the interest rises, fewer investment projects are profitable, and the quantity of investment goods demanded falls.

Government purchases are the third component of the demand for goods and services. The federal government buys guns, missiles, and the services of government employees. Local governments buy library books, build schools, and hire teachers. Governments at all levels build roads and other public works. All these transactions make up government purchases of goods and services.

If government purchases equal taxes minus transfers, then G = T and the government has a balanced budget. If G exceeds T, the government runs a budget deficit. If G is less than T, the government runs a budget surplus.

Sales of a country's goods and services to buyers in the rest of the world during a particular time period represent its exports. Imports are purchases of foreign-produced goods and services by a country's residents during a period.

Net exports are negative when imports exceed exports. Negative net exports constitute a trade deficit. The amount of the deficit is the amount by which imports exceed exports. When exports exceed imports there is a trade surplus. The magnitude of the surplus is the amount by which exports exceed imports.

In this part many countries are being studied. Data about output, labour and capital have been taken in order to test the Cobb Douglas production function. In many countries the results show similarities in conclusion with the results of the orginal Cobb Douglas production function. In some others some qualifications are needed in order that the production function conforms to the original Cobb Douglas production function.

In the United States, according to Charles Cobb and Paul Douglas, the labour share was 75%. The period under study was from the year 1899 to the year 1922. Has the labour share changed much since their findings?
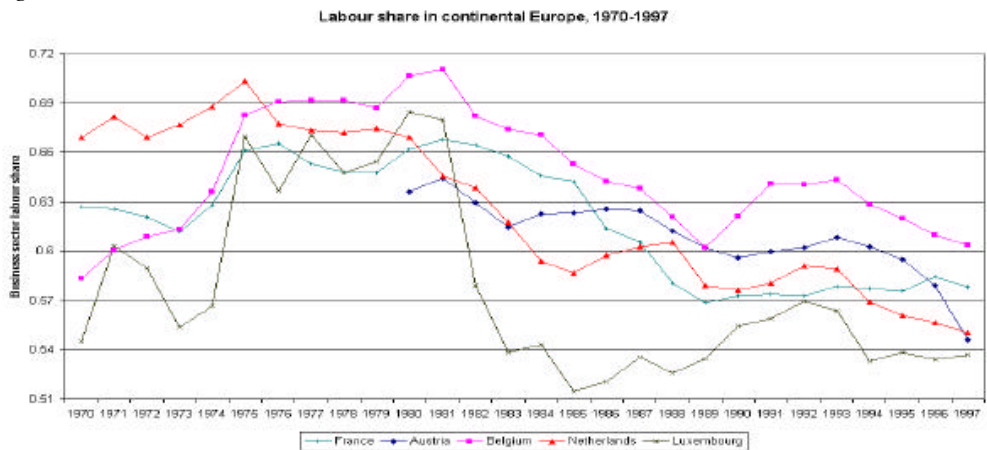
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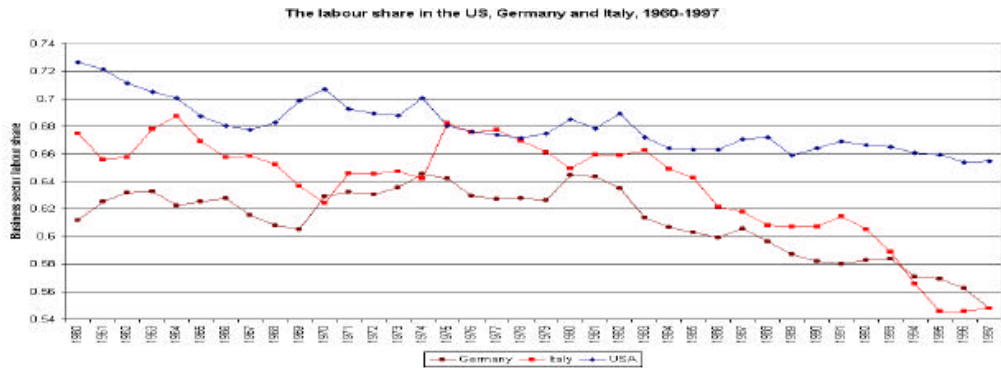
The labour share in the US, Germany and Italy, 1960-1997

Source: Giammarioli Nicola et al., "European Labour Share Dynamics: An Institutional Perspective", EUI Working Paper ECO No. 2002/13, p. 5.

From the above graph, we can see that in the United States, the labour share in the economy has fluctuated around 70 percent. For Germany and Italy the values are slightly lower and they seem to be decreasing in the nineties.
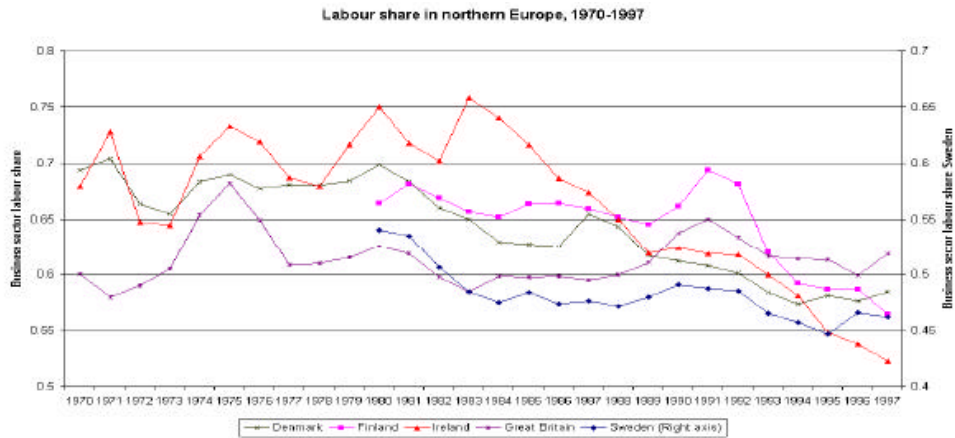
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Labour share in continental Europe, 1970-1997

Source: Giammarioli Nicola et al., "European Labour Share Dynamics: An Institutional Perspective", EUI Working Paper ECO No. 2002/13, p. 5.

In continental Europe, the labour share is lower, ranging from 55 percent to 70 percent.

Figure 3:

Labour share in northern Europe, 1970-1997

Source: Giammarioli Nicola et al., "European Labour Share Dynamics: An Institutional Perspective", EUI Working Paper ECO No. 2002/13, p. 6.

In northern Europe, the labour share has been decreasing in the nineties.

Figure 4:

Labour share in southern Europe, 1970-1997

Source: Giammarioli Nicola et al., "European Labour Shape Dynamics: An Institutional Perspective", EUI Working Paper ECO No. 2002/13, p. 6.

In southern Europe, the labour share has been fluctuating around 60 percent.

Is Cobb-Douglas the Right Production Function to Use?

The Cobb-Douglas production function is often used to analyze the supply-side performance and measurement of a country's productive potential. This functional form, however, includes the assumption of a constant share of labour in output, which may be too restrictive for a converging country like Albania. Harrison (2002) shows that labour shares of countries in a panel based on United Nations data are rather volatile over time.

Also from the figures in the preceding section it can be seen that the labour shares have changed during the years both in the United States of America and in Europe.

Dana Hajkova and Jaromir Hurnik (2007) apply a more general form of production function and allow the labour share to develop according to the empirical data. For the period from 1995 to 2005, the authors do not find any significant difference between the calculation of the supply side of the Czech economy by the Cobb-Douglas production function and a more general production function.

Jurgen Antony (2010) shows that the Cobb-Douglas production function, combined with perfect competition, fulfills the necessary and sufficient conditions for a twofold maximization problem. This problem can be seen as maximizing at the same time the present values of consumption expenditure out of labour income and out of capital income.

Even more, Bhanu Murthy (2002) maintains that even in the face of imperfections in the market, the Cobb-Douglas production function does not introduce imperfections on its own. This production function facilitates computations and has the properties of explicit representability, uniformity, parsimony and flexibility.

Jones (2003) gives an argument related to the distributional properties of labour and capital augmenting technologies providing a long run production function that is Cobb-Douglas.

So, from all the above considerations it can be concluded that the Cobb-Douglas production function may be confidently used in order to estimate the labour share and the capital share in the production function of the economy of Albania.

Albanian Application

In economics, a production function describes an empirical relationship between specified output and specified inputs. A production function can be used to represent output production for a single firm, for an industry, or for a nation. In this

study, interest is focused on the production function for a nation, specifically for Albania.

In most applications of production functions, the input variables are simply labour (L) and capital (K). It is generally assumed that a production function, F (L, K), satisfies the following properties:

F (L, 0) = 0, F (0, K) = 0 (both factor inputs are required for output)

dF / dL > 0, dF / dC > 0 (an increase in either input increases output)

At a given set of inputs, the production function may show decreasing, constant, or increasing returns to scale:

If F (kL, kK) < kF (L, K), there are decreasing returns to scale

If F (kL, kK) = kF (L,K), there are constant returns to scale

IF F (kL, kK) > kF (L, K), there are increasing returns to scale

Constant returns to scale imply that the total income from output production equals the total costs from inputs.

The general form of the production function is Q = f (L, K) where Q = output, L = labour and K = capital. Although, a variety of functional forms have been used to describe production relationships, attention will be focused only on the Cobb-Douglas production function. However, there are some problems with this production function.

The Cobb-Douglas production function does not lend itself directly to estimation by the regression methods because it is a nonlinear relationship. Technically, an equation must be a linear function of the parameters in order to use the ordinary least-squares regression method of estimation. However, a linear equation can be derived by taking the logarithm of each term. That is, the production function becomes of the form:

log Q = log A + a log L + b log K.

Generally, there are three types of statistical analyses used for the estimation of a production function. These are: time series analysis, cross-section analysis and engineering analysis. In time series analysis, the data for the amount of various inputs used in various production periods in the past and the amount of output produced in each period are taken into consideration. In cross-section analysis, the data for the amount of inputs used and output produced in various firms or sectors of the industry at a given time are taken into account. In engineering analysis, data supplied by the engineers are used.

In this study, the time series analysis will be used. It is a more appropriate analysis for studying the full economy of such a country as Albania. However, this type of statistical analysis has some limitations. This time series analysis is restricted to a relatively narrow range of observed values. Another limitation is the assumption

that all of the observed values of the variables pertain to one and the same production function. In other words, a constant technology is assumed.

Theoretically, the production function includes only efficient combinations of inputs. If measurements were to conform to this concept, any year in which the production was less than nominal would have to be excluded from the data. However, it is very difficult to find a time series data, which satisfy technical efficiency criteria as a normal case.

In addition, there are both conceptual and statistical problems in measuring data on inputs and outputs. A decision has to be made on choosing between gross value and net value. It seems better to use net value added concept instead of output concept in estimating the production function. The data on labour is mostly available in the form of number of workers employed or hours of labour employed. The number of workers data may not reflect underemployment of labour, as they may be occupied, but not productively employed.

The data on capital input has always posed serious problems. Net investment i.e. a change in the value of capital stock, is considered most appropriate. Nevertheless, there are problems of measuring depreciation in fixed capital, changes in quality of fixed capital, changes in inventory valuation, changes in composition and productivity of working capital, etc.

Keeping in mind all these problems though, it is still important to make a study on the distribution of income among the factors of production in Albania. This study has never been done before so this should be a first step into that direction.

The data used in this linear regression have been taken from the Statistical Institute of Albania (INSTAT) and from the World Bank. The data have been collected from the year 1997 until the year 2010. For the output, the data taken from the Statistical Institute of Albania are used. As regarding the labour data, the number of the people employed in the private non-agricultural sector has been taken into consideration. In Albania, in the agricultural sector there are a lot of people working but that are not registered so that is why a decision was made to exclude those labourers from the calculations. Since they make up most of the part of the overall labour force, it can be concluded that the data on the overall labour force published by INSTAT are not reliable. Unfortunately, there was no data available for the hours of labour employed. As regarding capital, data on the amount of foreign direct investment are taken into account. These data were taken from the World Bank database. Since the amount of domestic investment is negligible, the use of the foreign direct investment gives the true picture of the amount of capital flowing into Albania. In order to estimate the linear regression, "Microsoft Excel" programme has been used.

The Regression Analysis

The data that were found and which will be used in the regression analysis are as below:

Table 2: Database for the regression analysis

Year	Capital (FDI)	Output	Labour
1997	59,810	576,036	120,382
1998	51,491	693,974	111,354
1999	41,230	809,747	102,675
2000	143,041	903,110	116,024
2001	199,997	1,002,397	205,267
2002	122,991	1,083,616	207,742
2003	135,150	1,154,199	211,169
2004	207,643	1,280,648	213,000
2005	150,037	1,401,806	214,935
2006	179,182	1,525,496	224,058
2007	329,936	1,739,537	229,900
2008	424,228	2,001,152	238,975
2009	474,994	2,143,531	236,838
2010	577,545	2,294,878	244,255

Sources:
http://www.instat.gov.al/graphics/doc/tabelat/Treguesit%20Ekonomik/Llogarite%20Kombetare/LLK2012/T3.xls, accessed (11/05/2012)

http://www.instat.gov.al/graphics/doc/tabelat/Treguesit%20Sociale/Punesimi/PUN%202011/t1.xls, accessed (11/05/2012)

http://databank.worldbank.org/ddp/home.do?Step=3&id=4, accessed (12/05/2012)

The Cobb-Douglas model has the following form:

Q = A (Lb) (Kc)

As was said before, if b + c = 1, the Cobb-Douglas model shows constant returns to scale.

If b + c > 1, it shows increasing returns to scale, and if b + c < 1, it shows diminishing returns to scale.

Equivalent is a linear function of the logarithms of the three variables:

log (Q) = log (A) + b log (L) + c log (K) or

ln (Q) = ln (A) + b ln (L) + c ln (K)

If we assume constant returns to scale the equation becomes:

$$ln (Q) = ln (A) + b \ln (L) + (1-b) \ln (K)$$

However we can transform this equation into:

$$ln (Q) = ln (A) + ln (K) + b [ln (L) – ln (K)]$$

$$ln (Q/K) = ln (A) + b \ln (L/K)$$

$$ln (Q/K) = \beta 1 + \beta 2 \ln (L/K)$$

This is the equation which will be used in the regression process, and the coefficients of which will be found.

RESULTS

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.907542
R Square	0.823632
Adjusted R Square	0.808935
Standard Error	0.036294
Observations	14

ANOVA

	Df	SS	MS	F	Significance F
Regression	1	0.07382	0.07382	56.03959	7.37E-06
Residual	12	0.015807	0.001317		
Total	13	0.089627			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.03941	0.014593	2.70054	0.01929	0.007614	0.071205	0.007614	0.071205
X Variable 1	0.769215	0.102754	7.48596	7.37E-06	0.545332	0.993097	0.545332	0.993097

The value of the intercept or ln (A) is equal to 0.04. This means that A equals 1.01.

The value of X variable or b is 0.77. Therefore, the value of (1 – b) equals 0.23.

So, the estimated model is Q = 1.01 (L 0.77) (K 0.23). The significance level α = 5 percent will be used.

X Variable = 0.77 → This means that when the labour force increases by 1 percent the output increases by 0.77 percent.

R^2 = 82.36 percent → This shows that 82.36 percent of an increase or a decrease in the output is explained by the model, i.e. by an increase or a decrease in the amounts of labour and capital.

Interecept's P-value = 0.02 → This means that the intercept's value is statistically significant for α = 5 percent.

X Variable's P-value = 0.00 → This means that the labour's value is statistically significant for α = 5 percent.

H0: β_1 = 0, insignificant model

Ha: $\beta_1 \neq 0$, significant model

The t criterion is used for the verification of the hypothesis. The value of the observed t is 2.701, meanwhile the value of the critical t for the degrees of freedom (n – k) 13 with the significant level α = 5 percent is 1.771. The observed t is greater than the critical t, so the hypothesis H0 can be refuted. The hypothesis that the

coefficient is equal to zero cannot be accepted. In this way, it can be concluded that the model is significant.

H_0: $\beta_2 = 0$, insignificant model

H_a: $\beta_2 \neq 0$, significant model

The value of the observed t is 7.486, whereas the value of the critical t for the degrees of freedom (n – k) 13 with the significance level $\alpha = 5$ percent is 1.771. So, the value of the observed t is greater than the value of the critical t. The hypothesis that the value of the coefficient is equal to zero cannot be accepted. In this way, it can be concluded that the model is significant.

F statistics is used to test the hypothesis that the variation in the independent variables explains a significant proportion of the variation in the dependent variable. Thus, F statistics can be used to test the null hypothesis that all the regression coefficients are equal to zero against the alternative hypothesis that they are not all equal to zero. Null hypothesis is going to be accepted if the value of the observed F-statistics is smaller than the value of F-table. In this case $\alpha = 0.05$. There are 14 observations so n = 14. The F distribution for each level of statistical significance is defined in terms of 2 degrees of freedom (df). These are k – 1 for the numerator and n – k for the denominator. So when finding F-table value k – 1 = 2 - 1 = 1 must be taken for numerator and n – k = 14 – 2 = 12 for the denominator. The critical F value from the table is $F_\alpha = 0.05$:(1, 12) = 4.75.

The observed F value is 56.04. Since the observed value of the F statistics exceeds the critical value of 4.75 for the F distribution with 1 and 12 df, the null hypothesis is rejected. It can be concluded that there is a statistically significant relationship between the independent variable and the dependent variable.

Conclusion

To conclude, this study analyses the distribution of the income among the factors of production. This has been a highly controversial topic for a long time because of the important repercussions it has.

The Cobb-Douglas production function seems a proper production function to use in order to calculate the shares that labour and capital contribute to the production. This production function facilitates computations and has the properties of explicit representability, uniformity, parsimony and flexibility. It is applicable both to well developed countries and to converging economies.

In Albania, the labour gives a more important contribution towards the increase of Albania's output than does capital. Specifically, the shares are 77 percent for labour and 23 percent for capital.

A way in which this study can be extended would be to include in the production function intangible factors of production like: human capital, social capital and technological capital.

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