

The Bad Business of Agriculture A Correlation Analysis on Employment Share and Agriculture Added Value Share in Ecuador

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Abstract: This research tries to identify a correlation relationship between agricultural added value share and the agricultural employment share. To do so, a correlation analysis using the Pearson's Correlation Coefficient is carried out. It has been found that the less the share of the agricultural added value in the Ecuadorean economy, the more the share of the employment in the sector which supposes that Ecuadorian agricultural workers get relatively poorer with respect to the others sector workers as time passes.

Keywords: Ecuador, agriculture, added value, employment share.

El Mal Negocio de la Agricultura Un Análisis de Correlación entre el Porcentaje de Ocupados y el Porcentaje de Valor Agregado Agrícola en Ecuador

Resumen: Esta investigación trata de identificar una relación de correlación entre el porcentaje de valor agregado que representa el sector agrícola en la economía ecuatoriana y el porcentaje de personas ocupadas en este sector. Para esto, se utiliza el coeficiente de correlación de Pearson. Los resultados indican que mientras menor es el porcentaje de generación de valor agregado agrícola en la economía ecuatoriana, mayor es el número de personas que se involucra en esta actividad económica lo que significa que los trabajadores agrícolas se vuelven relativamente más pobres con respecto a los trabajadores de otros sectores de la economía con el devenir del tiempo.

Palabras clave: Ecuador, agricultura, valor agregado, participación del empleo.

1. INTRODUCTION

Every national economy is composed by three economic sectors. The primary sector is the one that includes activities closely related to the use of natural resources. Agriculture, forestry and cattle raising are some examples of economic activities in this sector. The secondary economic sector is the one in which commodities are transformed in other goods. All the manufacture activities are enclosed in the secondary sector. Finally, all services, such as commerce, that are provided within an economy are represented in the third sector.

In the last decades, secondary and third sector have increased their share in the national economies all around the world; meanwhile, primary sector has decreased. Consequently, primary-sector economic activities, like agriculture, have become less attractive for businessmen since they have expected to make more money in the other two sectors.

Consequently, all first-sector activities have demanded less labor as time passes.

In the case of developed countries, first-sector economic activities are less attractive for making money, so less people get employed in these activities which leads to a decreasing first-sector labor demand tendency during last decades. This phenomenon is particularly interesting in the case of agriculture. As a matter of fact, around 2% of economically active population is employed in agriculture in developed countries. Furthermore, the modernization of the agriculture also has contributed to demand less labor in the first world. However, it could be possible that the dynamics of developed countries do not apply in the developing ones. This idea comes from the fact that the share of workers involved in agriculture is greater than 10% (for 2014) in developing economies.

Bearing in mind previous lines, this paper tries to identify how the agricultural business is going in the developing world. To do so, Ecuador has been considered as unit of analysis. In the following pages, reader can find a short but

precise literature review about the agriculture topic. Then, the methodology of our analysis is presented. After that, the results and the conclusions are presented

2. LITERATURE REVIEW

In order to study how the agriculture in Ecuador is going, it is planned to contrast the behavior of the employed workers rate in the agriculture sector and the variation of the agriculture added value contribution in the Gross Domestic Product in Ecuador. Properly said, it is wanted to know what happens with the agriculture added value share in the Ecuadorean economy when the proportion of the employees in this sector increases.

From an historical point of view, the Ecuadorean economy in particular, and the Latin American economies in general, has followed an agro-export and monoculture model. Even now, according to García Trujillo et al (1993) quoted in Machado (2004), developing countries devote 20% of their lands in order to produce their own food and the other 80% is for export production. In the middle of the 80's, ECLAC (1985) indicated that the Green Revolution has fertile land in Latin America since the countries of this region had the need of increasing their productivity in the short-run for incorporate their production in the global economy. However, not all the products of the Latin American countries were demanded in the global markets, but just some of them. This pushed to the monoculture specialization of Latin American countries. Furthermore, *modernization* of the rural Latin America brought scientific and technologic dependence of the advanced economies (Guerra, 1985; Palacios, 1998; Iglesias, 1999 quoted in Machado 2004).

When the agriculture land owners that could assimilate the modernization were the only ones able to develop, farmer economy became disarticulated. The changes in the land tenancy structure brought significant social differentiations between medium and great producers with respect to the small ones. Furthermore, the proletarianization of the farmer sector took place (Donizete and Thomas, 2002 quoted in Machado 2004).

According to ECLAC² (2014), the volume of agricultural added value in Latin America increased 2,7% which is less than the 4,3% of the Gross Domestic Product (GDP) growth in 2011. In such a sense, ECLAC classifies the Latin American and Caribbean countries in three groups according to their performance in the agricultural sector. Consequently, the first group, in which the countries with higher performance in the agricultural activity were identified, was composed by Chile, Jamaica, Bahamas, San Cristobal y Nieves, Honduras, Dominican Republic, Granada and Brazil. In the second group of countries, the growth of the agricultural added value was positive but less than the global GDP. In this group, countries like Ecuador, Uruguay, Surinam, Peru, Paraguay, Venezuela, Guatemala, Bolivia, Nicaragua, Colombia, Costa Rica and Guyana were classified. In the case of Ecuador. The GDP growth rate for

this year was 7,8 % and the added value growth rate was 5,2 %. Finally, the countries in where the agricultural added value decreased although the economy in general increase were classified in group three.

Our curiosity came from the previous paragraph. Indeed, authors started to wonder if this increase in the agricultural added value, especially in the first two groups of countries meant a significant improvement in the working and living conditions of the agricultural labor. To be more specific, I decided to reduce my unit of analysis, then I choose Ecuador as case of study for verifying the degree of correlation, not causality, between added value share and agriculture labor share in this country.

3. METODOLOGY

In order to perform the analysis, it is appropriate to use the so-called Pearson's Linear Correlation Coefficient which is widely used in order to verify the possible association between two variables. In the case of quantitative data, this instrument allows to get information about what happens with the values of a variable –if they increase or decrease– while the other variable increases. Another possibility is that there is no relationship at all between variables.

However, it is important to remark that this correlation coefficient does not necessarily provide a causality relationship between both variables but the degree of relationship between them.

The Pearson's coefficient (r) measures the degree of association between any two variables (x and y) and it can be calculated as the result of the covariance of the two variables divided for the multiplication of the standard deviations of the two variables, as seen Equation (1)

$$r_{x,y} = \frac{\sigma_{xy}}{\sigma_x \sigma_y} \quad (1)$$

For any pair of variables, the value of the r coefficient can take any value in the interval $[-1, 1]$. In the case that $r = -1$, it is said that there is a perfect negative linear relationship between both variables. On the other hand, if $r = 1$, then there is a perfect positive linear relationship between both variables. Finally, if $r = 0$, there is no linear relationship between both variables at all.

Basically, two use two time series variables for Ecuador are going to be used in the period 1990-2012:

- Added value of the agriculture sector as percentage of the Gross Domestic Product (*ADDEDVAL_AGRIC*); and,
- People employed in the agricultural sector as percentage out of the total of workers (*TOTAL_AGRIC*).

Moreover, it could defined another two employment sub-variables in order to have a gender approximation. First, it is

² Economic Commission for Latin America and the Caribbean.

possible to define a variable that represents the number of women employed in agriculture sector as percentage out of the female employment (*WOMEN_AGRIC*). In the same way, it can be defined other variable that captures men employed in agriculture sector as percentage out of the male employment in the Ecuadorean economy (*MEN_AGRIC*). Then, it is possible to calculate the Pearson's correlation coefficient of all the employment series with the agriculture added value share.

The data base that is going to be used in this study comes from the World Development Indicators (WDI) of the World Bank. Furthermore, our unit of analysis is going to be Ecuador. The time series are from 1900 to 2012. Data for the year 2002 is not available for the employment share variables; consequently, the information of this year is not taken into account in the correlation analysis.

4. RESULTS AND DISCUSSION

First, let's give a look to the evolution of the series in time:

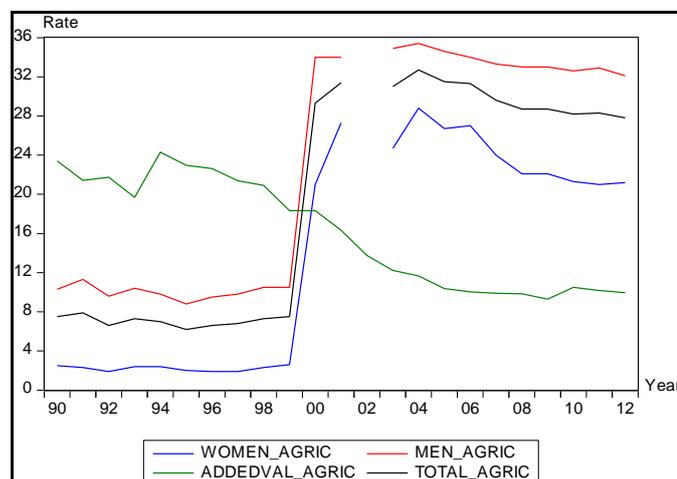


Figure 1. Evolution of the Agricultural Added Value Share and Employment Share series

It is important to notice that the agriculture added value as percentage of the Gross Domestic Product (GDP) has a negative slope in the whole period; however, when the Ecuadorean 1998-1999 crisis took place, the participation of the agriculture in the economy tends to decay faster. On contrary, when the crisis took place, the share of workers in the sector tend to increase. In order to understand this crisis, it is possible to say that the drop of the Ecuadorean total GDP was 31% between 1998 and 2000 measured in US dollars; furthermore, Ecuadorean currency had a devaluation of 216%, an inflation rate of 52%, a diminishing of the real wage of 23%, and outflows of private capitals equivalent to 15% of the GDP (Acosta, 2012). Going back to the analysis of our series, it can give us the idea that the Ecuadorean agriculture sector is like a “sponge” that absorbs workers when they lose their jobs in the other economic sectors, especially when crises appear.

It is interesting to point out that it seems very reliable the fact the agriculture is a business in charge of the poor in Ecuador. Indeed, the number of poor got more than doubled from 3.9

million to 9.1 million of inhabitants between 1995 and 2000 (UNICEF w/d quoted in Acosta 2012). By looking at Figure 1, one can notice that it is in this lapse of time when the number of people enrolled in agriculture increases exponentially.

A first idea that can be taken until this point is that when the economy is going good, the agriculture sector is not attractive for workers. This can be given by the fact that wages in rural areas are less competitive than in cities. However, when workers have no job opportunities in cities they look back to the agriculture as a live vest. In addition, it is important to mention that the rates of employment in agriculture (total, men and women) could have been even greater after the economic crisis, but hundreds of thousands of Ecuadoreans in working age emigrated from their country in order to get a job overseas (especially in Spain, United States, and Italy). Indeed, Jokisch (2002) demonstrate empirically that that considerable labor loss and capital infusion have not significantly altered household cultivation patterns. He found that land use and agricultural production of international migrant households is not significantly different from non-migrant households or households engaged in domestic circulation. This suggest that the remittances send by the emigrants are not used for improve agricultural habits nor invest in technology for the sector.

Coming back to our correlation analysis, once the Pearson's correlation coefficient has been applied to our pairs of variables, the following results are obtained:

	Addedval_agric
Women_agric	-0.888368
Men_agric	-0.902461
Total_agric	-0.897111

The previous Table 1 shows the core of our analysis. It can be appreciated the correlation coefficients (r values) between the agriculture added value as percentage of the GDP and the women employed in agriculture as percentage of the female employment (*WOMEN_AGRIC*), men employed in agriculture as percentage of the male employment (*MEN_AGRIC*), and total population employed in agriculture as share of the total employed population (*TOTAL_AGRIC*), respectively in the column of values. As it is possible to see, all the correlations are negative and very near to the value of -1. This indicates that there is a negative correlation between the share of the agriculture as percentage of the GDP and the employment in the sector. In other words, the less the contribution of agriculture in the national wealthy, the more the labor involved in the activity.

In the case of the $r = -0.888368$ indicates that the more women are working in the agriculture, the less the contribution of the agriculture in the generation of wealth in Ecuador. This relationship is even stronger for men where the $r = -0.902461$. This result suggest that when more men are getting involved in agriculture, the sector creates less wealth in comparison to the other economic activities.

5. CONCLUSIONS

In this paper, it has been empirically shown that the smaller the contribution of the agricultural sector share to the Ecuadorean economy, the greater the number of workers enrolled in this activity. However, it is important to remark, again, that this relationship implies correlation but not causality. It has been found that even though more people get involved in the activity, less share of the national wealthy goes to these people. Given this negative relationship over time, agriculture activities could become a less attractive activity for workers and investors in Ecuador.

Clearly, Ecuadorean agriculture employment dynamics are different from developed countries. Literature shows that when agriculture added value share decreases, employment share also decreases in developed countries; however, when the share of agricultural wealth creation decreases in Ecuador, it catches more employment. Our guess is that agriculture in Ecuador is not a business for making money, but a survival activity for Ecuadorean workers. Furthermore, this hypothesis is reinforced by the fact that when the Ecuadorean 1998-1999 economic crisis took place, more people get enrolled in the agriculture sector. Then, this economic activity is considered as a survival one in which workers get shelter in order to not starve and ensure their subsistence and their family too. Clearly, the precarious conditions in which small and medium farm economic activities take place in Ecuador indicates that the labor is not moving to this sector attracted by the high wages, but for a survival income. However, empirical research is needed to prove this last affirmation.

Moreover, the fact that Ecuadorean workers migrate from/to agriculture sector in a relatively easy way suggest that the labor employed has no high training nor experience in the activity.

Since it has been found that less the contribution of agriculture in the national wealthy, the more the labor involved in the activity, it is possible to conclude that the people involved in agricultural activities get relatively poorer with respect to the workers in other economic sectors as the time passes. Public policy is required in order to transform this reality before no one Ecuadorean is interested in agricultural activities.

Finally, it is important to remark, even though it has been done several times in this article, that the findings of this paper imply correlation but not causality. In order to establish a causality relationship between employment in agriculture and agriculture added value share, a linear regression model can be applied for example using a production function as economic model. However, it is not applicable for the Ecuadorean case since production functions are constructed in such a way that when the input increases (labor in agriculture in our case) the output also increases (agriculture added value share in our analysis) until a certain optimal point. Clearly, this behavior is not the one that drive the agriculture sector in the Ecuadorean economy, so the correlation analysis seems appropriate.

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