REAL EXCHANGE RATE AND LABOUR MARKET: A SYSTEM DYNAMICS APPROACH

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ABSTRACT

The way from a close economy to an open one has several implications about the behaviour of different economic variables. Especially, the influence that decisions of free trade have on the employment is important, if as objective of economic policy is pursued full employment and well-being. In this work, we attempt to analyse how the liberalisation of the markets influences the activity rate of different productive sectors of a small economy, as well as, on the employment. For this, we have built a dynamic model, using system dynamics methodology, that collects different aspects of the labour market. The results obtained by the model are compared with the real data for the Spanish region of Castilla y León, during the period 1980 - 1990, for thereafter, to analyse the impact that on the variables of the labour market could have had other measures.

INTRODUCTION

The impact that the liberalisation of the markets causes on the employment of an economy, is a question to analyse if the economy presents high unemployment levels and as objective of economic policy it is pursued the opening of the markets as well as full employment. Different regions of the European Community, characterised by a level of inferior development than the average, are implicated in this matter and look with preoccupation which can be the result of these measures on the evolution of its economic variables.

Not all the authors coincide on the influence that the liberalisation of the markets has on employment in an economy. Authors like Viñals (1996), or the European Commission itself (1996) advocate by a positive influence; however, classics in the analysis of unemployment like Layard et al. (1994) do not recommend this measure to fight against it. Gual (1997) maintains that the liberalisation of the markets does not has a decisive influence in employment and wages, but rather, its influence is more evident on composition of employment and wages by sectors.

Numerous macroeconomics models and theories of the global economy suggest that there is a high degree of interdependence between international economic policies and all part of a national economy, and that there is a circular chain of causal links between them. In particular, unemployment is not foreign to this interrelations. No model denies the existence of a direct and indirect interdependence between changes in domestic and foreign employment and trade

and capital flows. Employment policy affect trade flows and therefore trade and employment in other countries. In this sense Rothschild (1993) affirms that the objectives of foreign economic and employment policy are interdependent and cannot be carried out in isolation from each other.

It is not our objective in this paper, to develop theories on the impact that measured of liberalisation have in an economy, only we attempt to approximate to the problem. For this, we consider a small economy with three productive sectors: the traded goods sector, the non-traded goods sector and the agricultural sector. In the literature, we can find different issues considering that the economy is split into two productive sectors. Like examples of this, we can cited the papers of McDonal et al. (1985), Harris et al. (1970) or Agénor el al. (1998); in all them, the labour factor is fundamental for theirs analysis but while for the first two references is admitted that the economy can present unemployment, the last paper supposes that the wages of a sector are adjusted with the purpose of avoid it, though short-run constraints introduce the possibility of unemployment in the traded goods sector.

The incorporation of the third sector in this paper, it is because we seek a model that collect aspects of a small economy within the European Community and the treatment that this last provides to the agricultural sector, with the maintenance of direct and indirect measures to the production, allow us to consider to the agricultural sector as a productive sector in some special way. If the economy is national, it is evident that the agricultural sector does not has an important weight within it; however, in a regional economy with not excessive population, the agricultural sector has its importance, that it can be shown when we observe the contributions of this sector to the GNP or the percentage of active population that this sector occupies. For example, in the Spanish region of Castilla and León, which is located geographically to the Northwest of Spain, and in 1986, the contribution of the agricultural sector to regional GNP was 11,76 % and employed almost 16 % of active population.

Also, the incidence that the liberalisation of the markets has in the agricultural sector, sector bound to the rural world, does not only have economic implications but it also has consequences of environmental and social character. The fall of demand for labour in the agricultural sector can be one of the causes that originates the abandonment of these areas not only of active population, but of full population. On the other hand, the migration from the rural world to the urban areas, where generally reside population that develops its activity within services sector or industrial sector, produces other and new problems.

This paper, in first place, analyses the factors that determine labour supply and demand in each one of the sectors in which we have divided the economy and the incidence that on them have the wages and the exchange rates. This analysis allow us to observe different causal loops emerging from the variables selected of labour market that permit us to build a dynamic model. The model provides results from the values that the exchange rates pick, being them considered as exogenous variables. Our objective is not to analyse the causes that lead to the modification of the relative prices between goods, but rather knowing that it occurs, we only attempt to analyse their effects on the selected variables of the labour market. We consider two exchange rates; one of them relates the prices between traded goods and not-traded goods and the other one, relates the prices between traded goods and agricultural goods.

If the values of exogenous variables coincide with the historical data for the region of Castilla and León during the period 1980-1990, decade that includes the year that Spain

incorporated into the UE, by simulation of the model, we obtain the behaviour of activity rates by sectors and unemployment of the economy, which both of them are compared with the historical data of the region to study. After, we analyse the errors between the simulated data and historical to measure the goodness of fit. Finally, once the model had been validated, the paper explores the results obtained by the model when the exchange rates take different values to historical ones, which other economic conditions assume.

FEEDBACK LOOPS

We consider that none of the sectors has problems for excess or for defect of productive capacity, being labour the only one productive factor in the non-traded goods sector and agricultural sector; but additionally, we include an efficiency factor in the traded goods sector, negatively related to the real wages in the non-traded goods sector and agricultural sector.

The traded goods, that we will identify with industrial goods, are interchangeable with the rest of the economies and their prices are determined in the world markets. The prices of the non-traded goods, which are only used to domestic consumption, are fixed by economy itself. We will make correspond non-traded goods with the goods taken place in the service sector. The identification between traded and industrial goods and non-traded goods and services is done with the purpose of data treatment, because is not totally realistic the assumption of that all industrial goods are interchangeable and none service it is. On the other hand, the prices of agricultural goods spend for two stages in the period of analysis; previous to introduction of Spain inside E.U. the prices are determined by economy itself and later, they follow the Community rules that practically stabilised the prices if we refer to the cereals being this product the most cultivated in the region.

The necessary labour force for the whole productive process is obtained from the same active population pool that we suppose increases, during the simulation period, with a rate next to 7% which coincides with the growth rate of the region to study.

In an attempt of simplifying the interrelationships among the different sectors, we begin establishing the principal relationships between the traded goods sector and non-traded goods sector. In this first stage, we suppose, following to Agénor et al., that the active population that it does not find job in the traded goods sector finds it in the non-traded goods sector, admitting a perfect mobility across sectors. Thus, the non-traded goods sector will have a labour supply that together with the exchange rate between these goods will originate a wage in the sector. This wage has a direct influence on the wage of the traded goods sector and both, together with the wage in agricultural sector, will determine the efficiency factor. This factor and wages determine labour demand in the traded goods sector that, at the same time, determines labour supply in the non-traded goods sector, being completed the cycle.

In this first stage, unemployment has been forgotten incidentally and we are considered that the non-traded goods sector determines instantly a wage to equilibrate its demand and its supply for labour. In this way, we assume that the firms in the traded goods sector determine both wages and employment while market forces fix wages in non-traded goods sector.
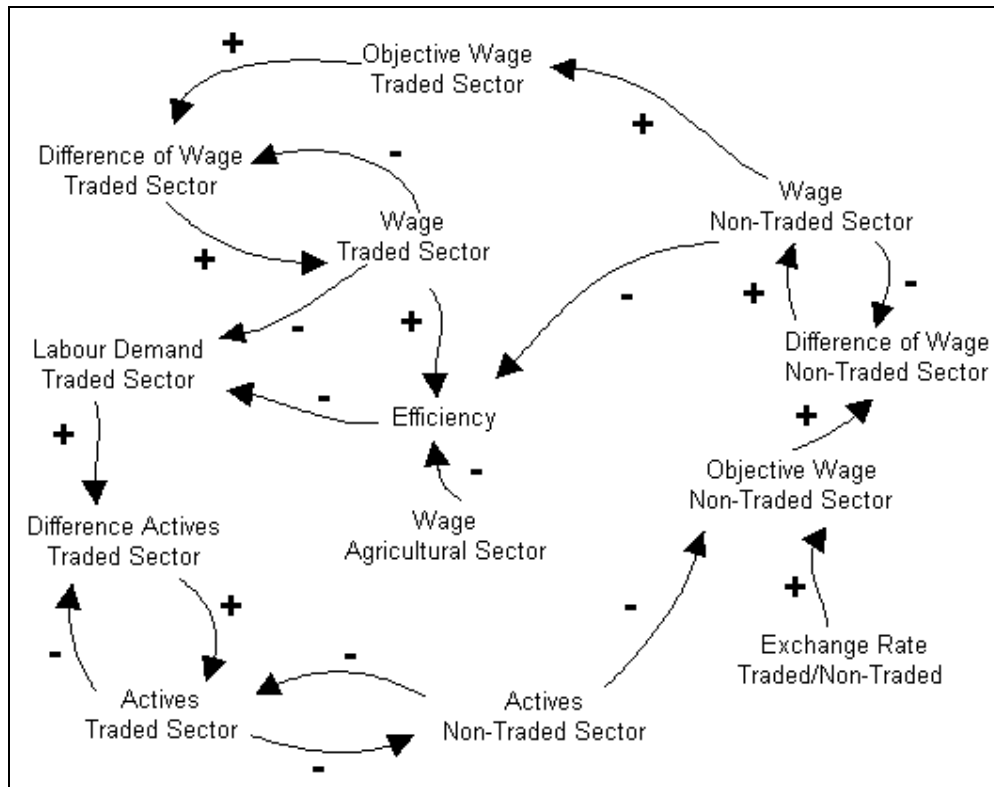
Figure 1

However, if the exchange rate between traded goods and non-traded has quick variations, the wages in the goods sector non-traded will present the same type of variations since the relationship between them is considered instantaneous. To lessen the possible fluctuations in the wages by sharp variations effect in the relative prices, we will suppose that the real wage in the sector is obtained from a delayed process of the wage on the one which directly impacts the exchange rate. This delayed process is considered also upon relating the wages of the two sectors and within traded goods sector, to the relationship between its demand labour and their current workers. The first delay tries to taking into account to the two sectors can have not simultaneous modifications of wages. The second delay prevents reallocations of labour force very rapid. In the figure 1 we show the cycle between these variables.

If the wages in the traded goods sector, when taking efficiency into account, they are highest than the wages of the others two sectors, as in Harris et al., it seems logical that the workers of the others two sectors prefer to go to work to it. Note that we are supposing that the whole active population is able to occupy any type of job. Thus, if for example, all the workers are busy and it is known that there is a vacant position in the traded goods sector, numerous workers would abandon their current sector unnecessarily due to the problems in transmission of the information. To eliminate this possibility we admit that the economy can have unemployment. In this way, if labour demand in the industrial sector grows then, workers what look for a job will be integrated in the sector. But, if demand decreases then the process will follow the opposite sense.
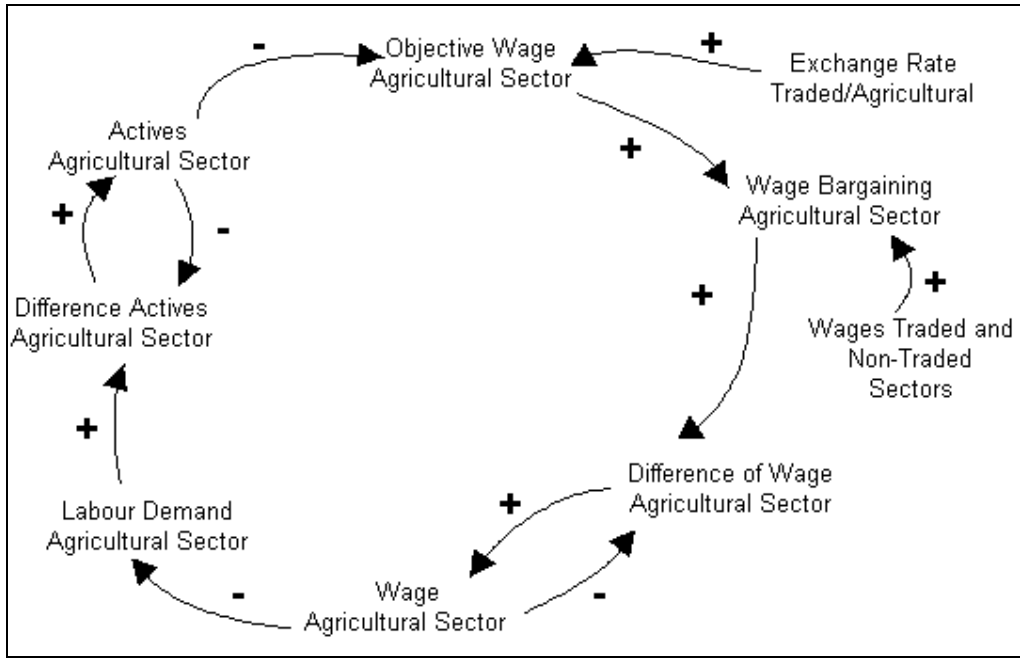
Figure 2

The process to determine the wages in the non-traded goods sectors and agricultural is similar. In both, we will suppose that a central union acts in them bargaining with the firms for the settling of the wages; then, to find the wage bargained in each sector we need take into account the wage that want the firms and the wage that wants the union in each sector. For the first wage acts the corresponding exchange rate and the number of workers that, in that moment, each sector occupies. On the other hand, we will suppose that the union proposes a wage taking into account, in each sector, the wage of the others two sectors. The intention is to suppose that the wages of the three sectors are related. Thus, if the wage of two sectors is modified, afterwards or more soon, the wage of the other sector also will change. However, in the non-traded goods sector furthermore we included the current unemployment in the economy as new variable by the union for its proposed of wage. This characteristic in the non-traded goods sector, it can be justified by be the sector linked to urban area and to maintain, in certain form, the flexibility in their wages. In this way, the union acts of different form in each sector upon considering their own characteristics.

Depending on the power of the union, each sector will have a wage that will determine labour demand in each one of them. The figure 2 shows the cycle that permits us to connect, in the agricultural sector, the active population that occupies the sector with its bargained wage, where of new, we return to consider an adjustment process. Similar causal diagram can be made with the non-traded goods sector, but in this case, furthermore we will need to include the variable unemployment. In the traded goods sector we suppose that the union does not act due to the labour productivity, dependent of the relative wages.

In Europe the trade unions are very important within labour market. In many Europe countries, more than 75 % of the active population has wages bargained by the trade unions. Normally, the union bargains the wages with the firms of the sectors to obtain the greater possible wage. However, the wages objective is not the only one objective, since if the trade union pressure is strong, some workers could lose their positions.
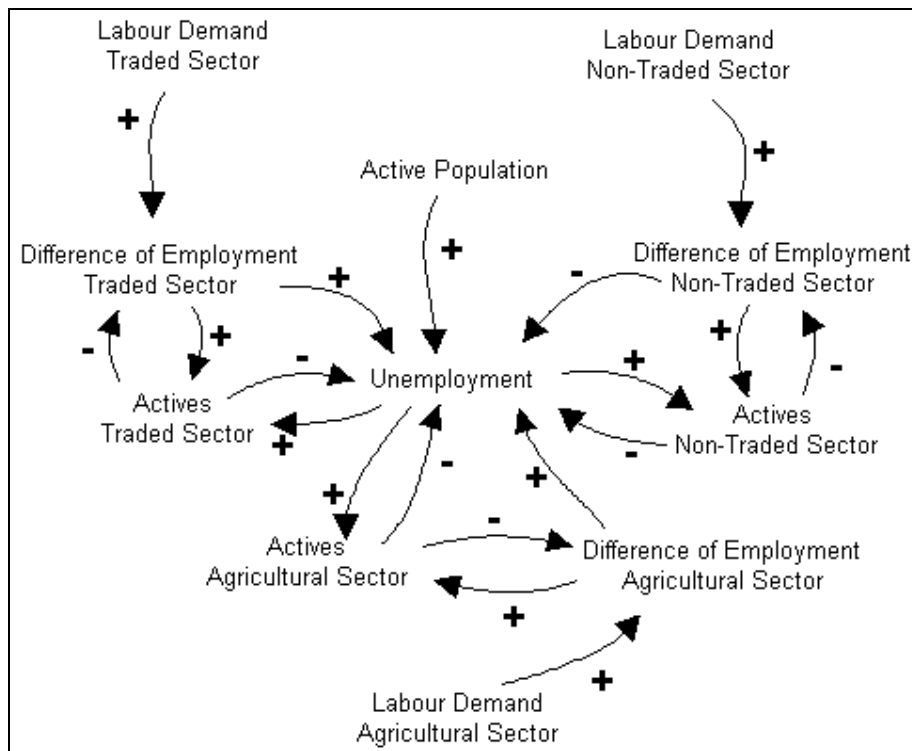
Figure 3

Unemployment plays an important role in the causal diagram because through it we can connect the population occupy in each sector. Modifications in labour demand or in labour supply, in any sector, generates movements of population occupy in them and of opposite sign in the variable unemployment. The figure 3 shows the interconnection among the population occupy by sectors and unemployment. However, unemployment is not the only one variable that links the sectors. The wages of the three sectors constitute other interconnection way they arise to consider the presence of the trade union in the non-traded goods sectors and agricultural sector as well as upon determining the efficient factor in the traded goods sector.

VALIDATION OF THE MODEL

From the causal diagram previously obtained, we built a flow diagram with seven levels corresponding to unemployment in the economy, real wages in each sector and active population occupy in them. To obtain the results from the dynamic model, we estimate parameters, initial conditions for the levels and we take as inputs the historical data of the exchange rates for the regional sectors during the period of simulation. The figure 4 illustrates the historical evolution of these exchange rates, where it can be observed a first period of growth until reaching an inflection, next year 1985, for thereafter the relative prices begin to decrease.

The model implemented in Powersim 2.5 software was highly successful because to run it is possible to prove that they did not emerge problems neither by the side of labour demands nor by the side of labour supply. The following figures, from 5 to 8, show the historical behaviour and obtained it by simulation of the activity rate of the traded goods sector, non-traded and

agricultural, respectively. The last graph collects the evolution of unemployment in the economy.
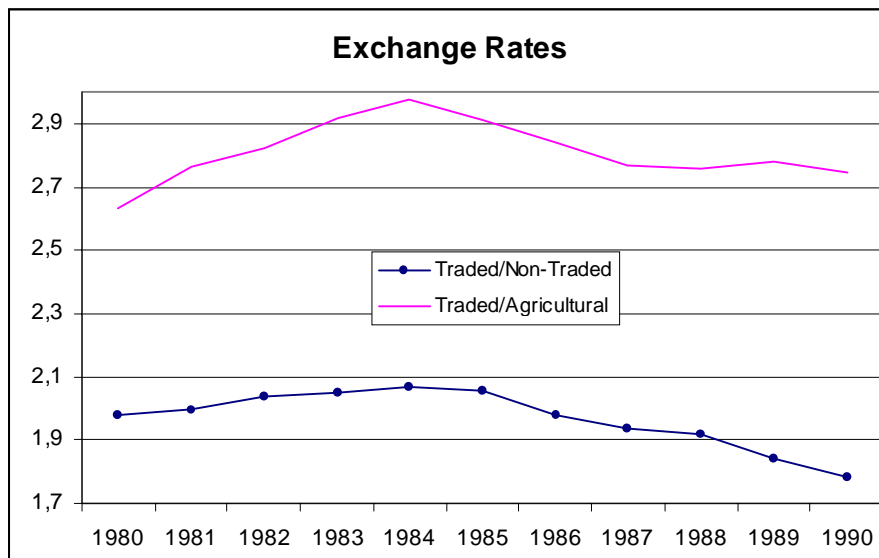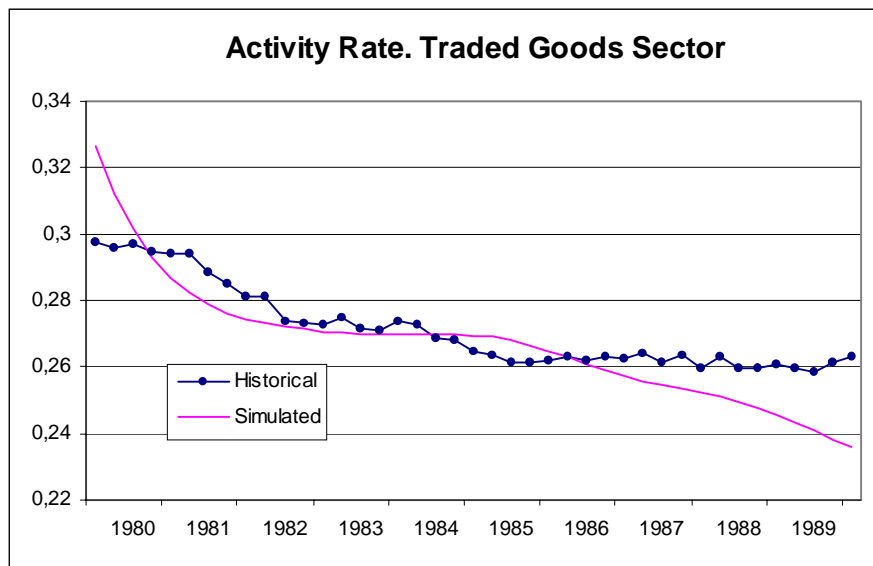
Exchange Rates

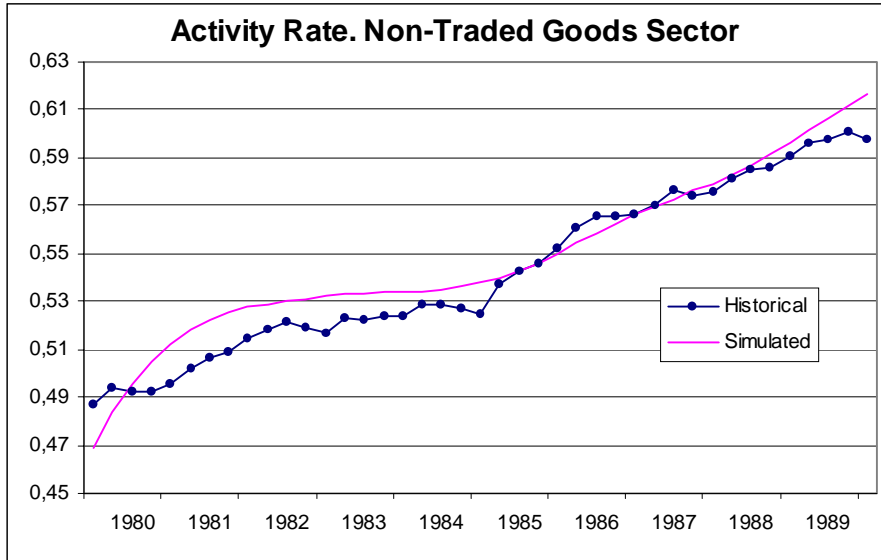Figure 4

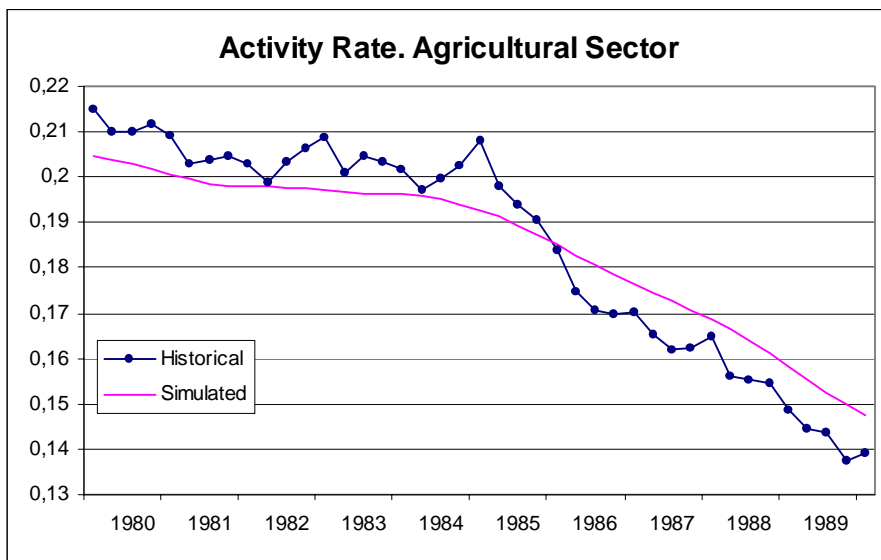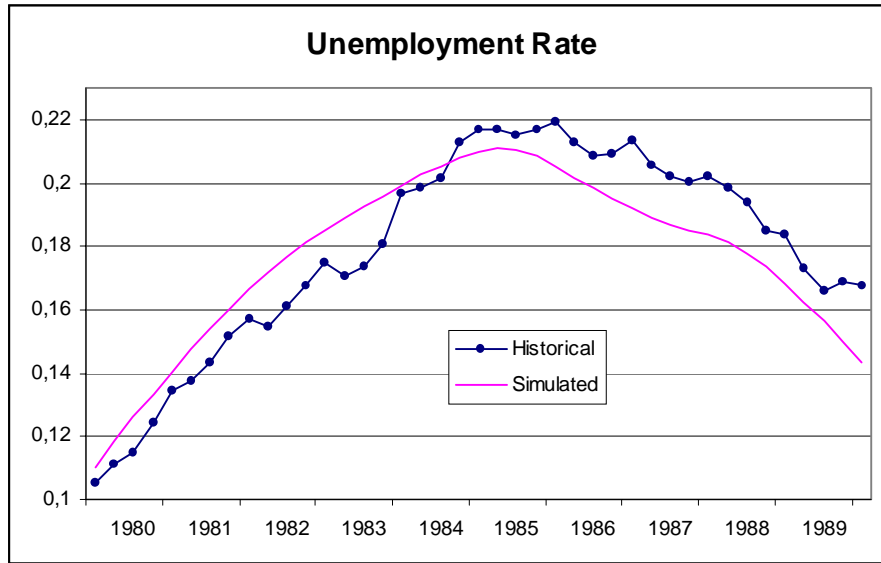**Activity Rate. Traded Goods Sector**

Figure 5

Figure 6

Figure 7

Figure 8

The table following summarises the values reached by mean-square-error (MSE), Theil´s statistics (U^M, U^S and U^C) and root-mean-square-percent-error for these four level variables.

	MSE	RMSPE	U^M	U^S	U^C
Industry Sector	1.1 E-4	3.8	0.15	0.33	0.51
Service Sector	9.5 E-5	1.8	0.33	0.00	0.66
Agricultural Sector	6.2 E-5	4.5	0.00	0.81	0.17
Unemployment	0.00	7.3	0.03	0.15	0.80

We observe that the activity rates, in all the analysed sectors, present a value of RMSPE not superior to the 5%. The unemployment rate is the variable that presents a greater RMSPE; however, there is no systematic errors, as the splitting of MSE proposed by Theil demonstrates, because 80% of the error is due to the third component, associated with the covariance, non being significatives the errors bias and of variance (Sterman, 1984).

The simulated values, in all the cases, continue the trend of the historical data. The activity rate for the industrial sector reduces, though the decrease is more evident in the simulated behaviour than in the real and at the end of the period of simulation. The percentage of occupy in the services sector grows in a way linear in second half of the period. The agricultural sector maintains, during all the period, a progressive decrease of busy population. The unemployment data, obtained by simulation, capture the trend change that the real data show toward half of the period, providing at the end of the period an inferior unemployment to the real. The historical data of the unemployment are referred to unemployment of the regional economy including more productive sectors than considered them in this paper. Also the model was submitted to an analysis of the sensibility on the parameters and the initial conditions of the levels, non being observed a remarkable sensibility.

EXPERIMENTS WITH THE MODEL

The results obtained by the dynamic model depend on the values that take the exogenous variables, but the model can be submitted to other inputs being capable of producing answers. We study, now, how the activity rates in the sectors and unemployment of the economy are modified, if we consider two different series of inputs.

In the first place, we suppose that the exchange rate between traded goods and non-traded goods, during all simulation, continues the same trend that present the historical data during first half; the other exchange rate is maintained in the real values. The modified rate, by so much, grows during all the period. This situation implies that the economy modifies the prices of the non-traded goods and retains the external conditions to it. We recall that the economy itself fixes the prices in the non-traded goods sector.

To simulate the model with this assumption we find some difference behaviour in the studied variables. The activity rate in the service sector presents a stationary behaviour as if it would be governed for a simple negative loop. This evolution can be explained by the presence of a loop in the model between wage and employment in the sector due to trade union. The activity rate in the industrial sector grows and in the other sector decreases but slowly. The population occupied at the end of simulation is distributed in a way different from as makes it the model. There is more active in the industrial sector and in the agricultural sector, but less in the services sector. The unemployment rate shows a growing behaviour, during all the simulation, reaching at the end high values.

The second simulation exercise, supposes that the European Community adopts an agricultural prices strategy so that, the exchange rate between traded and agricultural goods, during all simulation, continues the same trend that shows this rate during first half of the period. Of new we assume that, the other exchange rate does not vary with respect to the historical values.
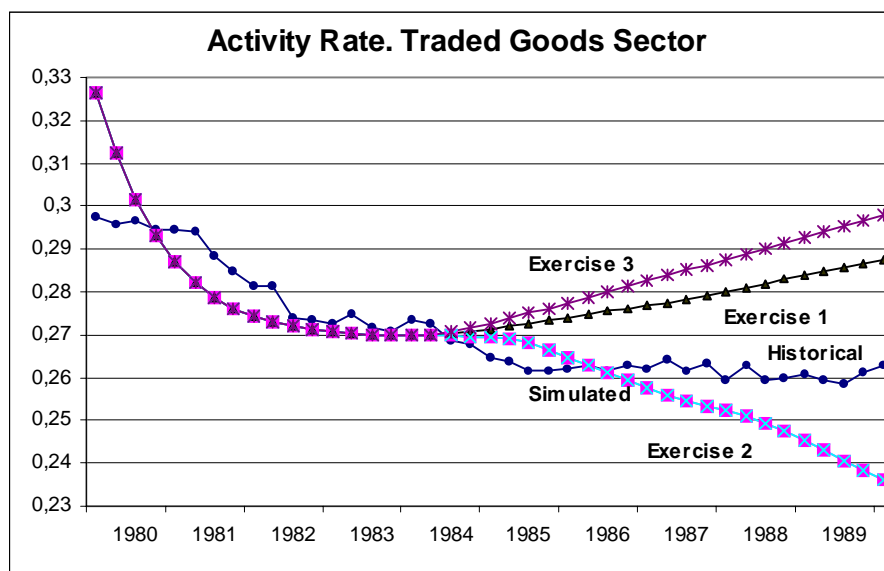

Figure 9

With this assumption, the quantitative and qualitative behaviour of activity rate for service sector does not defer of the results generate by the model. Either exist very meaningful variations in the trend of the agricultural rate. However, the activity rate in the industrial sector suffer at the end of simulation a fort decreasing. The behaviour of the unemployment shows a change in trend reaching an inflexion point. The values that takes at the end of simulation are inferior to show by the model.
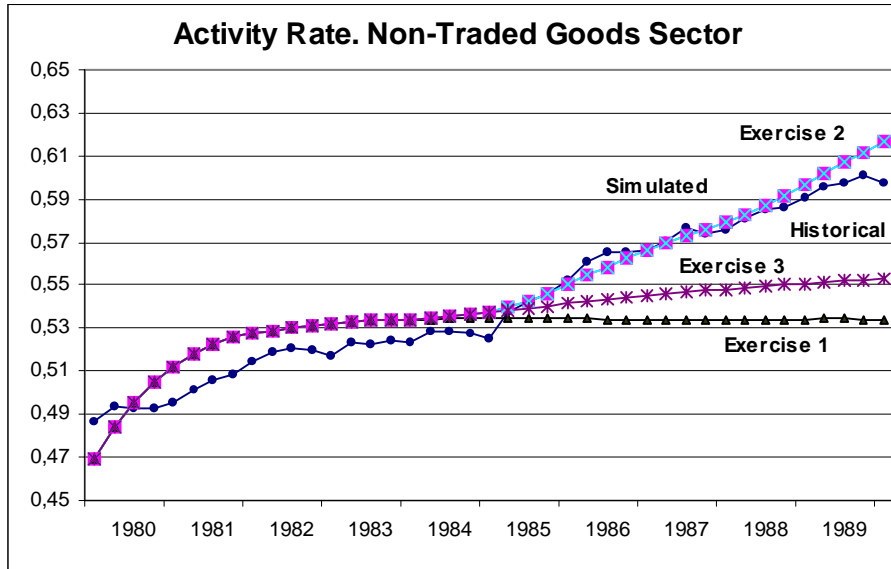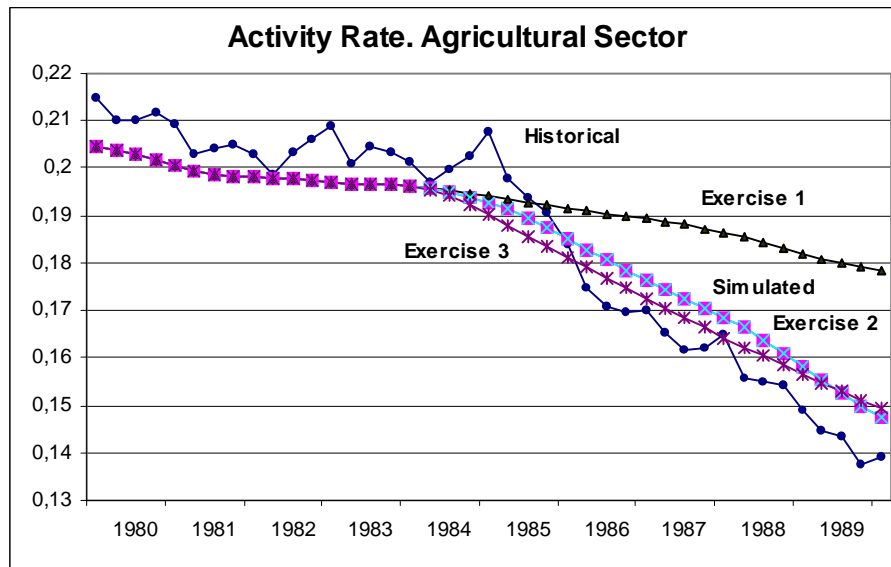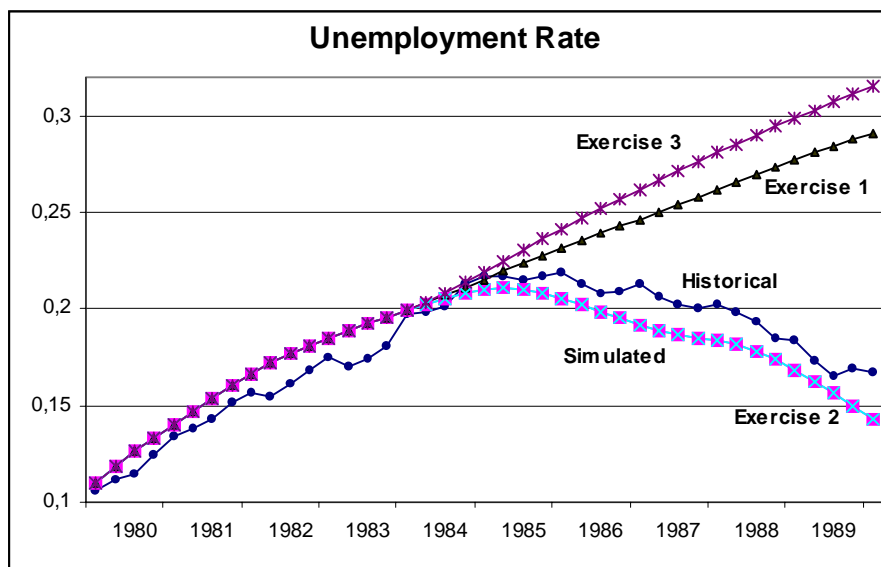

Figure 10

Figure 11

Unemployment Rate

Figure 12

From the results obtained with the simulation exercises, we can establish some consequences on the behaviour of occupy in the sectors and unemployment. In this sense, the exchange rate between traded goods and non-traded goods has an important influence on the behaviour of the unemployment rate what it does not occur with the exchange rate between traded goods and agricultural goods. Furthermore, independently of exchange rate modified, always the activity rate in service sector grows and the activity rate in agricultural sector decreases. The activity rate in industrial service has sensibility about what rate is modified. This last rate can grows or decreases without suffer alterations theirs prices.

The figures from 9 to 12 presents the behaviour of the activity rates for the sectors and unemployment of the economy. Each graph collects four path corresponding, in each case, to the evolution provided by the model, for the first exercise, for the second and the last path supposes that the exchange rates continue the trends of the exchange rates modified in the first and second exercise.

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