

The land of Oenoeuros

Wine as the source of regional inflation: the peculiar case of Rioja¹²

Mikel LARREINA, Fernando GÓMEZ-BEZARES

Universidad Comercial de Deusto

1. Introduction

Rioja wine region includes vineyards in southern Alava, in the south of the Basque Country, south-eastern Navarra and northern La Rioja³. Thus, the region is split into three different Autonomous Communities, being a very small part of both Basque Country and Navarre.

Rioja displays two main socio-economic features. First, it has recently experienced a strong growth in terms of social welfare; and second, it is strongly linked to the vine-growing and wine producing sector. This economic sector is not only the main Riojan characteristic, but also the engine of its economic development. In fact, the economic boom of Rioja wine that has taken place during the last decade has driven the region in such a way that it has evolved from being a rural and poor region in European standards (a middle level region in Spain) up to become the Spanish richest region under some indicators, with a GDP per capita over European average.

Riojan wine cluster has been the main force driving Riojan economic development in recent times (Larreina, 2006); simultaneously, it enjoys a leading role within the Spanish wine sector, accounting for 42% of the Spanish exports of quality wine by value. Nowadays, almost half of the wine being aged in Spanish wineries is held in Riojan “bodegas”⁴.

The dramatic economic impact of wine cluster in Riojan economy lies in the intense network of socioeconomic relationships around wine, far beyond its contribution to regional GDP, measured at 21% in a recent contribution (Larreina, 2006).

This paper summarizes the analysis of one aspect of this polyhedral relationship between wine and economy in Rioja region: the effect on the inflationary pattern caused by changes in the wine cluster.

Thus, the evolution of prices in both Spain and Rioja will be compared, stating that the relative inflation of the region (compared to Spanish average) markedly changed in the mid nineties.

An explanation to this shift in the region’s inflationary pattern is suggested, arguing that the vine growing sector is the main factor responsible for the acceleration of price increases. Both the higher price of grapes and the higher harvest volume in a given year, have a combined effect on regional demand of goods and services, as they increase the disposable income of families, affecting the regional level of prices.

When reviewing relevant literature, Alberola and Marqués (1999) statement shall be considered: there are quite a few works on regional differences of prices and inflation within a Monetary

¹ This paper argues that the unprecedented growth of vine-growing incomes has determined the consumption made by grape producers’ households and consequently, they have influenced price increase in Rioja.

² This paper builds on the work of M. Larreina’s Doctoral Thesis, “Estudio de la dependencia de la Economía riojana del vino Rioja” (2006). It may be consulted in the following site:

http://www.proquest.com/products_umi/dissertations/

Drs. J.P. Laka, M.A. Larreina and J.A. Madariaga and Prof. G.C. Reid are thanked for the very useful suggestions they have made. Any error contained in this paper should be attributed exclusively to the authors.

³ Although it may be slightly confusing, La Rioja Autonomous Community is not the Rioja wine region. Half of La Rioja territory does not belong to Rioja wine region and, at the same time, around one third of Riojan vineyards belong to the Basque Country and to Navarre, as many of the most prestigious wineries.

This paper will refer mainly to Rioja wine region, avoiding the existence of administrative borders within the region.

Anyhow, the main data used belongs to La Rioja Autonomous Community.

⁴ Usually, “aged” wine is the product with higher added value within wine market.

Union. A likely explanation is that a large majority of economists agree that the movements of prices in different regions of a Monetary Union (e.g., the EMU) are homogeneous, at least at the long term⁵.

These authors, Alberola and Marqués (1999), analyse the inflation differentials within the Spanish provinces, concluding that even though annual values may differ very little from one province to another, the accumulated effect over time of specific paces of price increases for certain provinces is statistically significant. Thus, these authors reject that inflation in Spanish province follows a “reverse to the average” model. As all the studied provinces share an identical monetary policy, with no restraints in movements of labour, capital, goods or services, Alberola and Marqués present a set of hypotheses linking the heterogeneous paces of inflation to the evolution of economic growth rates. Their conclusion is that the theories explaining changes in the effective exchange rate (e.g. the hypothesis Balassa-Samuelson) do not apply to the evolution of Spanish provinces’ inflation, at least during the period 1960-1998.

A similar argument is held by Wall and Zoega (2003). The authors find that inflation differences among the states in USA, together with specific rigidities in certain labour markets, explain the various natural rates of unemployment. Cecchetti, Mark and Sonora (1999) study the price disparities among large cities in the USA, finding that price evolution follow a reverse to the average pattern, at a rather slow pace. Nevertheless, they are not able to find a valid explanation to this evolution.

Álvarez and De los Llanos (1999) analyse the appropriate measurement of underlying inflation in Spain. In their paper, they point out that one of the most interesting measures of this variable consists in the signs extraction through a tendency-cycle analysis. Despite its higher complexity when compared to other models (as excluding non-processed food and energy products), Álvarez and De los Llanos consider that the adjustment made is a satisfactory way of analysing long term evolution of inflation. Depending on the methodology used to decompose the variable and eliminate punctual components and seasonality, small divergences in the estimate of tendency-cycle may arise.

This paper is organised as follows. Section 2 compares Rioja inflation to the Spanish average, stating the statistical significance of the inflation differential between the region and the national average. Section 3 states the change of the inflationist pattern of Rioja in the mid nineties. Section 4 studies the likely causes of this shift in the inflationary pattern, proposing the evolution of Rioja wine sector as its main explaining factor. Section 5 develops an econometric model that tests the hypothesis set previously, and presents the inference results. Finally, section 6 summarises the findings and discusses their implications.

2. Riojan inflationary pattern

Rioja was a low inflation region (compared to the Spanish provincial average) in the period between the democratic transition of the late seventies and the mid nineties⁶. Despite this, in the late nineties a sharp reversal took place, for which Rioja became a high inflation province. In fact, Rioja was one of the regions within the European Union with higher inflation during the period 1995-2002, although, due to the small size of the region, this has passed unremarked.

The comparison between annual inflation in Rioja and Spain is shown in table 1. As it can be seen, Rioja seemed to have higher inflation than Spain as a whole in the last subperiod.

⁵ Anyhow, this may be changing now, as Rabanal (2006) points out.

⁶ The inflation level in La Rioja will be a proxy to the Riojan inflation level. There are no data available regarding price levels in Rioja Alavesa or Rioja Navarra (the areas of Rioja wine growing region not belonging to La Rioja Autonomous Community). Furthermore, most of the consumption of these two areas is held in the region’s main city, Logroño (placed in La Rioja).

TABLE 1: Comparison between annual inflation in Rioja and Spain. 1979-2002

	Nº of years in which Rioja has more inflation than Spain	Nº of years in which Rioja has less inflation than Spain	Total
1979-1994	4	12	16
1995-2002	6	2	8
1979-2002	10	14	24

This change of inflationary pattern in Rioja has implied a sharper rise in the level of prices in this region than in the rest of Spain or the European Union, as it is shown in table 2. The rise was especially significant in the 1995-1999 period.

TABLE 2: Evolution of the price level in Rioja, Spain and the European Union 1995-2000

	Rioja	Spain	European Union
1-I-1995	100	100	100
31-XII-1999	116.52	115.17	108.39
31-XII-2002	129.20	127.77	116.05

In order to determinate the statistical significance of this higher inflation in Rioja than in Spain during the last period, the variable “relative differential in inflation” is defined, as in [1],

$$\frac{(\pi_{RIO} - \pi_{SP})}{\pi_{avgSP}} = \pi_{rd} \quad [1] \text{ where } \pi_{SP} \text{ is the monthly variation in prices in Spain; } \pi_{RIO} \text{ is the}$$

monthly variation in prices in La Rioja; and π_{avgSP} is the average of π_{SP} variable during the corresponding year. The HICP indexes, calculated by the Spanish Statistical Institute (INE), are used to measure the variation of price levels, both annually and monthly. Data from La Rioja Autonomous Community will be the proxy for the Rioja region values.

The variable used is “relative differential in inflation” as opposed to “differential in inflation” π_d as the 24 year period under analysis has experienced inflation values as high as 16% in the first years and as low as 3% in the last years considered. It seems clear that it is not equally significant a 0.5% inflation differential in the early eighties than the same inflation differential twenty years after. That is why we use the relative indicator. Furthermore, considering that in 22 observations, monthly price variation in Spain was zero, the relativizing factor has been the year’s monthly inflation average.

π_{rd} is a random variable that follows a normal distribution in the periods 1979-1994 and 1995-2002. It is particularly interesting noting that the hypothesis of a single normal distribution in the whole period 1979-2002 is rejected at 1% significance level. In table 3 the estimates of π_{rd} parameters in each period are shown.

TABLE 3: π_{rd} Parameters estimates

	Average (a)	Standard Deviation	Reject Normality (1% significance) (b)
1979-2002	8.164%	89.292%	Yes
1979-1994	1.081%	87.582%	No
1995-2002	22.330%	91.437%	No

(a) HICP monthly inflation index.

(b) Kolmogorov-Smirnov test is used.

As π_{rd} can not be considered normally distributed in the period 1979-2002, no hypothesis will be tested for this period. Thus, all hypotheses will be tested for each of the two shorter periods.

First, it will be tested that monthly inflation averages in Rioja and Spain are equal. Thus, it will be tested that the average of relative differential inflation is zero.

In the period 1979-1994, the monthly relative differential in inflation average is not significantly different from zero (t- value = 0.171; prob. value= 0.432). At the same time, during the period 1995-2002 this average is significantly different from zero; furthermore, the punctual value of the variable implies that Riojan inflation has been significantly above Spanish values.

Setting the following hypotheses for the second period,

$$H_0 : \pi_{rd \ 95-02} \leq 0$$

$$H_a : \pi_{rd \ 95-02} > 0$$

The null hypothesis tests the average of monthly relative differential inflation between Rioja and Spain being zero or bellow. The results reject this hypothesis at 1% significance (t- value = 2.393; prob. value= 0.009). Thus, it can be stated that Riojan inflation has been significantly higher compared to Spanish average in the late nineties and early 21st century.

3. Change of inflationist pattern in the mid nineties.

Next, we compare the relative differential in inflation average between Rioja and Spain in the two subperiods.

Setting the following null and alternative hypotheses,

$$H_0 : \pi_{rd \ 79-94} \geq \pi_{rd \ 95-02}$$

$$H_a : \pi_{rd \ 79-94} > \pi_{rd \ 95-02}$$

The hypothesis of higher (or equal) average of the relative differential average in the first period (1979-1994) than in the second period (1995-2002) can be rejected, at 2.5% significance level (t-value = 2.152; prob. value = 0.02).

Thus, the results of the first hypothesis test are confirmed. The pattern of Riojan inflation differential to Spanish average has varied between the first and second periods considered. In fact, it could not be rejected that both the Spanish and Riojan monthly inflation had the same average during the first period, while there is statistical evidence that Riojan monthly inflation average has been above Spanish during the second period.

An alternative analysis that can be used to corroborate this statement is that of contingency tables. Table 4 divides the data into two periods and classifies the months according to the inflation in Rioja compared to that in Spain.

TABLE 4: Comparison between inflation in Rioja and Spain.

	Riojan inflation higher than Spanish	Riojan inflation equal to Spanish	Riojan inflation lower than Spanish	Total
1979-1994	80	17	95	192
1995-2002	50	19	27	96
Total	130	36	122	288

This time, null and alternative hypotheses are as follows:

$$H_0 : p_{i,j} = p_{i.} \cdot p_{.j} \quad \forall i, j$$

$$H_a : p_{i,j} \neq p_{i.} \cdot p_{.j}$$

Where $p_{i,j}$ is the probability of a given datum of belonging simultaneously to both categories i and j (e.g., the probability of belonging to 1979-1994 period and having at the same time a positive inflation differential); $p_{i.}$ is the probability of a given datum of belonging to the category i of the time variable (period 1979-1994 or period 1995-2002); and $p_{.j}$ is the probability of belonging to category j of the inflation differential variable (inflation in Rioja higher, equal or lower than in Spain).

The null hypothesis is that both categories are independent, meaning that it is as likely to have higher inflation in Rioja during the first period as it is during the second.

This null hypothesis is rejected at 2.5% significance level (χ^2 value 8.427; prob. value = 0.018). Thus, it can not be rejected that there is a certain relationship between the two variables, in other words, that the inflationist pattern during the eighties and early nineties differs from the pattern stated since mid nineties.

The contingency table analysis confirms that there has been a shift in the pattern of inflation in Rioja that does not correspond to variations that occurred in the Spanish economy as a whole. There are certain factors specific to Rioja that may have appeared in the mid nineties and that have provoked a higher inflation in this region

Another analysis that may lead to a similar conclusion is that of time series. No ARIMA model has been found appropriate to define the relative inflation differential series. Nevertheless, studying the trend-cycle of both Riojan and Spanish inflation time series do confirm Rioja's inflationist behaviour.

Trend-cycle approach to time series eliminates temporary shifts; thus, it may determine the long term trend of a variable that suffers often punctual perturbations or seasonal oscillations (Espasa and Cancelo, 1993; Kaiser and Maravall, 2002). It is deemed to be the right way to analyse the underlying evolution of inflation.

Next, the monthly price level series of Rioja and Spain are decomposed into four main components (trend, cycle, seasonality and irregular component or white noise)⁷, permitting us to obtain the underlying evolution of price levels that may not be directly observed.

As this paper's aim is to compare the evolution of Spanish and Riojan inflation, the trend of prices in both is extracted from the observed data (in the period 1979-2002) through the tendency-cycle signal.

The isolation of tendency-cycle components in both Spanish and Riojan price level series lead to conclusions consistent with the previous analysis (hypotheses test and contingency tables). As it may be seen in figure 1, in which price levels at December 1978 have a 100 value, it seems clear that during the eighties and early nineties, the trend of price levels in both Spain and Rioja region were rather similar, even though the Spanish general level of prices was slightly higher than that of Rioja.

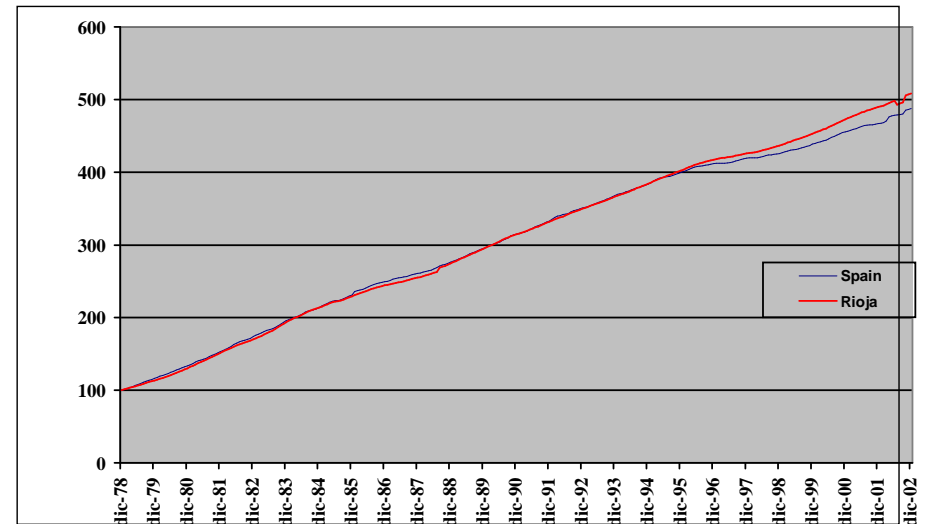
However, as it has already been stated before, there is a sharp change in the situation during the late nineties and early XXI century, when a progressive divergence between Spanish and Riojan inflation could be observed.

⁷ The irregular component accounts for punctual oscillations of the variable, following a random pattern; seasonality determines periodic variations that are repeated in a shorter-than-a-year pattern; cycle groups together the oscillations that systematically repeat in a several years pattern; and trend is the main long term evolution of the variable, depending on the economic framework of the territory.

As it may be quite hard to separate trend from cycle component, it is usual to analyse a variable's trend-cycle (Espasa and Cancelo, 1993).

The isolation of trend-cycle sign has been conducted with the TSW software, by Gómez, Maravall and Caporello.

FIGURE 1: Trend-cycle evolution of inflation in Rioja and Spain

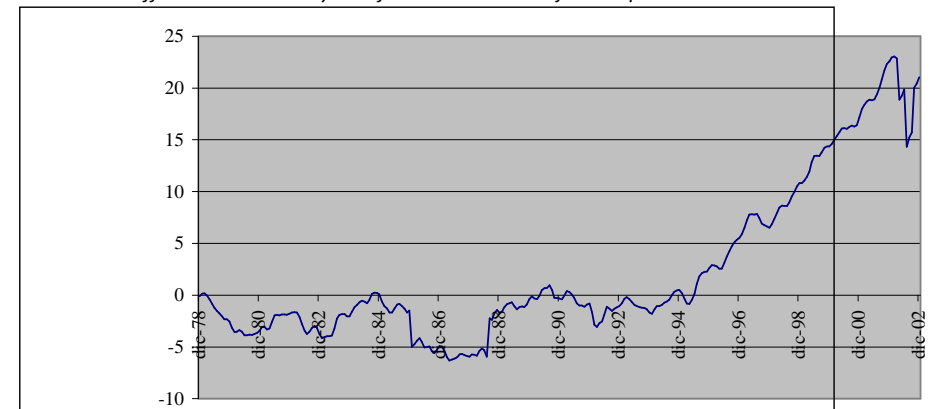


N.

B. De-seasonalised HICP monthly price indexes

This shift in inflation patterns is much more evident in Figure 2, where the difference between trend-cycle values in Riojan and Spanish price levels is shown. Until 1995, those differences were almost always negative and relatively small. From 1995, the difference is always positive and grows higher until 2001, in which the divergence is already important.

FIGURE 2: Differences in trend-cycle inflation between Rioja and Spain



4. Reasons for the shift in the inflationary pattern

Nobel Prize Winner Milton Friedman, affirmed that “inflation is always and everywhere a monetary phenomenon” (Friedman, 1968 and 1992). This may be a convincing explanation to general price evolution in national economies not facing a sudden and unexpected goods shortage or a strong demand increase (Barro and Grilli, 1994), situations in which shifts in price levels may be better explained by Keynesian models.

Considering that Rioja belongs to the same monetary area as the rest of Spain, with no restriction to capital movements and with strong socioeconomic linkages, it is difficult to explain the Riojan specific inflationary pattern through an increase in money supply in Euro zone (in peseta zone before 1999). Thus, it is a common consideration in other studies on regions or small countries within a common monetary area (Barro, 1997; Argy, 1994; Alberola and Marqués, 1999), that increases in monetary aggregates would eventually affect regional inflation in the same way as in the rest of the monetary zone. Therefore, considering the very small figures for Rioja compared to Spain (population, GDP, etc.), there should not be permanent differences between Riojan and Spanish inflation (as it is the case in the period 1979-1995), at least, due to monetary causes. Anyhow, there may be reasons for differentials in inflation within a monetary area, as it is shown below.

Recent research of inflation dynamics and cross-country differences within the EMU has focused on three main explanations (Rabanal, 2006):

- First of all, the Balassa-Samuelson effect, that is, the increase of productivity in the “tradable” sector of a certain economy engenders price increases in the “non-tradable” sector and therefore a higher overall inflation. As the higher productivity leads to an increase in marginal product of labour, demand of labour and wages in the “tradable” sector, wage increases are spread to the “non-tradable” sector. The higher wages that this sector must face (without any productivity improvement) provoke an upward pressure on prices in the “non-tradable” sector, thus leading to higher inflation (Altissimo, Benigno and Rodriguez-Palenzuela, 2005).
- Second, the asymmetries on national economies have also been used to explain different levels of pressure on prices. These economies may face “regional shocks” both in the demand-side and the supply-side, and these situations may engender inflation.
- Third, the heterogeneity of the inflationary patterns among the European countries and regions may explain the diverse evolution of prices, even engendering different inflationary effects in response to the same symmetric shocks, as the markets will react in different ways to them (Andrés, Ortega and Vallés, 2003; Angeloni and Erhmann, 2004).

Although there has been an increase in Riojan wineries’ productivity in the period considered, there has been no simultaneous pressure on wages in the non-tradable sector; hence Balassa-Samuelson effect can not be the explanation to the inflationary differential, at least via an increase in wages within the service sector, which is usually considered as the “non-tradable” sector. In table 5 the evolution of annual wages in Spain and Rioja during the 1996-2002 period is shown. While wages in the Rioja region remained in 2002 below Spanish average in all sectors, the Riojan “non-tradable” sector had experienced very little increase during the considered period, much lower than the increase in Spanish service sector’s wages. The wages in the tradable sector had been increased in Rioja more than in Spain as a whole, although an important differential between the average wages in both areas still remained.

TABLE 5: *Evolution of average annual wages in Spain and Rioja (1996-2002).*

€	SPAIN				RIOJA			
	Total	Industry	Construction	Services	Total	Industry	Construction	Services
1996	17,045.56	18,498.18	15,385.00	16,311.14	15,137.99	15,320.09	15,881.43	14,610.31
2002	17,118.36	19,386.59	15,438.04	16,679.42	15,582.15	16,525.19	16,227.53	14,723.85
96-02 growth	0.43%	4.80%	0.34%	2.26%	2.93%	7.87%	2.18%	0.78%

Current euros. Source: INE

At the same time, it is difficult to assess that product market structures in Rioja are different enough from those in the rest of Spain to explain different price dynamics. Furthermore, in Riojan case there has not been any specific regional shortage of goods and services putting pressure on prices, pointing to an increase of the aggregate regional demand as the main cause of relative high inflation.

In fact, as Rioja seems to be a region close to full employment⁸, a significant increase in aggregate demand on goods and services may well be translated into increases in level prices. This is especially true when considering those goods and services that are locally supplied and for which the suppliers may need some time to adjust their production to higher consumption (housing, health care, leisure activities, etc.).

Admitting that the stated shift in Riojan inflationary patterns may well be caused by an outstanding increase in regional demand with no correspondence to the national evolution of aggregate demand, a new question arises: what is the cause of the higher demand?

This paper’s hypothesis is that the main change in the Riojan economy in recent years, the outstanding evolution and growth of the Rioja wine cluster, is connected to the inflationary differential experienced in the Rioja region.

The recent evolution of Rioja wine cluster has increased disposable income in thousands of families (Larreina, 2006). Supplementary incomes from vineyards and wineries have joined the typical sources of household revenues (wages, pensions and investment returns) during the last decade. In years 1998 and 1999 these “supplementary incomes” have even become the main source of income for most of the families owning vineyards⁹.

Despite the growing demand backed by the higher disposable incomes, inflation has not run out of control in Rioja thanks to both the absorption of thousands of immigrants into the region (who have enlarged the Riojan labour market, limiting the pressure on wages) and the closeness to bigger regions furnishing Rioja with goods and services.

Table 6 shows the evolution of immigrant population in both Rioja and Spain as a whole, during the late nineties and the first decade of XXI century. Being almost inexistent in 1996, immigration accounts nowadays for more than 11% of Riojan population. The increase of immigrant population has been quicker and sharper in Rioja than in Spain as a whole. It must be noted that in table 6 we are considering only registered immigration, and Rioja is said to have a higher proportion of non-registered immigrants than the rest of Spain.

⁸ Regional unemployment rate is below 4%. A recent survey conducted by Eurostat placed the regional capital, Logroño, as the city with the ninth lowest unemployment rate in the European Union, out of 258 cities (Eurostat, 2004). Unemployment rate in Logroño is slightly over 3%. No other Spanish city has a similar rate of unemployment.

⁹ In year 1999, a very large harvest was paid in Rioja at almost 3 € per kilo of grapes, when the average price in early nineties had been 100 pesetas (0.6 €) and harvests had been much shorter.

TABLE 6: Foreign immigrants as a share of population in Rioja and Spain (1996-2006)

	Rioja	Spain
1996	0.79 %	1.37 %
2002	5.43 %	4.73 %
2006	11.44 %	9.27 %

Source: INE

As it has been already highlighted, since the mid nineties Rioja wine cluster has experienced an overwhelming transformation that has modified the whole Riojan economy and society. This “great leap” of Rioja wine (Larreina, 2006) shall be analysed in order to quantify some of these changes, so that the reader may be able to understand the regional importance of the sector’s recent evolution.

First of all, the upgrading of Rioja wine cluster has been common to all the socioeconomic agents connected to it: from vinegrape producers to wine elaborators, ageing wineries, vitiviculture suppliers, linked enterprises, etc.

Thus, Riojan wineries number has exploded in recent years, doubling its figures in just ten years. The ageing capacity, measured by the number of 225-liter oak casks placed in the region, has more than doubled, reaching more than a million oak casks in 2002 (1,200,000 in 2006)¹⁰. The ageing of wine is one of the most value adding techniques in the industry, so this increase is quite significant and remarkable. In fact, Rioja is supposed nowadays to be the region with the highest ageing capacity in the world. At the same time, wineries have seen their profitability rise, while opening up new markets. Heavy investments have been made in Rioja, many of them into building new wineries designed by the utmost recognised architects (Gerhy, Calatrava, Mezières, Hadid, Moneo, Quemada...). This evolution has not been ignored by financial investors, who have conducted several M&A and have also established new wineries.

Suppliers have also evolved in a significant way: regional based companies have been able to consolidate their business and to expand beyond the regional boundaries into other wine-producing regions. Simultaneously, main foreign supplier companies have moved to Rioja region and built there facilities to produce auxiliary products for this region’s wine sector (casks, corks, machinery...).

Even the structure of the sector has changed in this period. The newly formed “Interprofessional Association”, closely linked to the 77 years old “Consejo Regulador” (Regulatory Council of the Appellation d’Origine Rioja), is in charge of the relations between vinegrowers, wineries, supporting institutions and suppliers. The Strategic Plan launched in 2005 stated that the wine cluster accounted for a 21% of the region’s GDP (Organización Interprofesional del Vino Rioja, 2005). Other features show the region’s great concern with the economic impact of wine sector, as the biennial World Wine Forum that takes place in Rioja, the recently OIV’s World Congress held in Logroño¹¹ or the regional politicians’ role in defining Europe’s wine policies¹².

Nevertheless, the most relevant change to the evolution of prices in the region is related to the grape producing sector. There are around 20,000 vineyard owners within a region counting some 310,000 inhabitants.

¹⁰ All data regarding Appellation d’Origine Rioja figures has been obtained from the Consejo Regulador de la Denominación de Origen Calificada Rioja.

¹¹ The OIV is the International Organisation for Wine and Vine.

¹² Mr. Pedro Sanz, regional president of La Rioja, is the President of the Development Committee in the European Committee of the Regions. He has promoted an intense debate in the wine legislation and Common Market Organisation.

During the period 1992-2002, the land under vines has increased by 30%, totalling some 62,000 hectares at the beginning of 2003. Due to simultaneous changes in the ways of cultivating the vineyards, grape harvest has increased much more: by 75% in the same period. This increase in grape production together with a sharp increase in grape prices led to a dramatic elevation of viticulture incomes.

Although the wine sector has changed in many ways, the Agrarian Production of the vineyards will be used as the variable explaining the shift in Riojan inflationary pattern. In figure 3 the evolution of average income of a Riojan vinegrower is shown. It can be seen that income experiences a sharp increase from early nineties’ values, reaching a maximum in 1999 when the average vine grower income for selling their grapes was above 30,000 euros.

It must be added that in the seventies and eighties (up to 1987), vineyards were not profitable in Rioja; many years in this period vineyards were even ruinous, impoverishing the land owners (Tamames, 1972; Jaime y Baró, 1972; González Larraina et al., 1984). Years 1987 and 1988 made a shift in this general trend, and thereafter grape income increased, making viticulture more and more profitable.

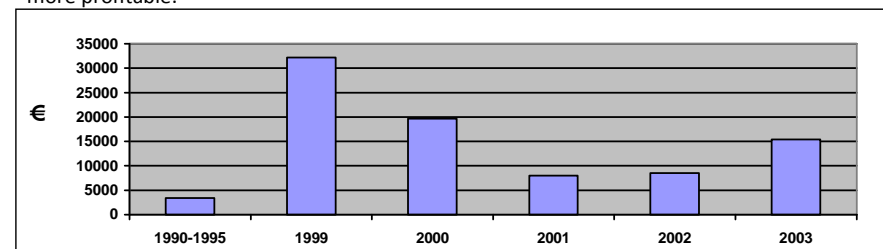


FIGURE 3: Revenues from vine-growing activity. Average vineyard owner.

Considering that the production costs were static during the period, the income increase that has been experienced between the early nineties and the late nineties and early XXI century, has directly engendered a rise in both household disposable incomes and investments.

Furthermore, the number of vineyard owners has increased heavily, from just 12,000 people in the mid eighties (17,000 in the early nineties) to around 20,000 people in 2002. Simultaneously, region’s population did not increase until very recently, when thousands of immigrants have arrived in Rioja, in a major demographic movement begun in 2000. Thus, the percentage of population owning vineyards in Rioja increased continuously during the late eighties and nineties. Nowadays, between one fifth and one fourth of the Riojan families own vineyards.

Another point to consider is that most of the vine-growers have a different main occupation, combining the culture of vineyards during the weekends and holidays with a job in the public administration, industry or private service sectors (or with a pension, if they are retired). Thus, for many families viticulture income is just a complement to their main income sources¹³.

Finally, the impact of wine in Rioja can not be compared to its effect in Spain as a whole. Let us consider per capita values of wine sales; thus, the increase of Rioja wine sales during the nineties left the sales of wine over 3,500 euros per Riojan in 2002. Meanwhile, the wine sales per inhabitant in the rest of Spain were only 50 euros per person in 2002. In fact, in the period 1992-2002, per capita value of wine sales increased in almost 2,300 euros in the Rioja region, while it increased in only 30 euros in Spain. Table 7 shows the evolution of wine sales per capita during the nineties and early XXI century.

¹³ The family income in 2000 in La Rioja was around 36,000 euros. Thus, the grape income, although supposed “secondary”, has been in many years an important source of income to families owning vineyard.

TABLE 7: Evolution of wine sales per capita in Rioja and the rest of Spain (1992-2002)

€	Rioja	Rest of Spain
1992	1,284	21
2002	3,565	51

Current euros. Source: INE, Consejo Regulador DOCa Rioja

The increase in disposable income in Rioja due to higher wine sales has been dramatic during the nineties and early XXI century. For this reason, we will model the relative differential in inflation using as explanatory variable the variations in the wine sector occurred in Rioja, not considering the simultaneous variations in the other Spanish wines, whose effect in the rest of Spain's economy are negligible.

5. Vineyard Agrarian Production as an explanation of the inflationary differential.

In order to support our interpretation that Rioja wine evolution is the main reason for the specific inflationary pattern of Rioja, an econometric model is tested.

In this model, the 20,000 vineyard owners and their families are fuelling the regional aggregate demand of goods and services, thus putting a pressure on price levels. The large demand of these families, due to the increase in their disposable income since the mid nineties, accelerates the whole regional economy. Their demand has also induced a higher consumption of families not directly linked to wine and a higher investment by companies offering all kind of services. This has been a demand shock specific to Rioja, and that may explain the uncommon inflationary pattern of the region.

The model proposed is that of equation [2]
$$\frac{(\pi_{SP}^* - \pi_{RIO}^*)}{\pi_{SP}^*} = \alpha + \beta \times \Delta PFAV \quad [2]$$

where π_{SP}^* is the annual variation of price level in Spain¹⁴; π_{RIO}^* is the annual variation of price level in Rioja; and $\Delta PFAV$ is the annual variation of the agrarian production linked to vine-growing in Rioja¹⁵.

This model includes both the increases of grape prices and the rise in production. The intercept is the structural differential in inflation of Rioja compared to Spain in absence of increases in the Agrarian Production.

As the harvest usually takes place in September and October and the payments by the wineries are made three to six months after delivery, the value of production considered to determine price levels will be that of the year before¹⁶.

The theoretical basis of the linkage between Riojan differential in inflation differences and the increase of the PFAV occurred the year before, is the following:

- Income from selling grapes of a given harvest is received within the first semester of the following year
- Money obtained selling the grapes increases the disposable income of the vineyard owners' households and induces an increase in consumption through the year in which the money is received.

¹⁴ See that in this section the annual inflation rate is used.

¹⁵ The PFAV summarises the evolutions of viticole sector in Rioja being a good proxy of the wine cluster behaviour. To calculate PFAV data has been collected from the Regulatory Council of the Appellation d'Origine Rioja (tons of grapes harvested and prices paid for them).

¹⁶ It should be noted that by no means it is suggested that wine provokes directly an increase of the "shopping basket" prices (its weight in the shopping basket is quite low, in fact). It does provoke it indirectly, via the increase of disposable income and consumption within the families owning vineyards.

A linear regression (ordinary least square) is conducted over the 1979-2002 data to check whether this relationship really exists or not. The result of this analysis is given in table 8.

TABLE 8: Estimates of the model [2]. 1979-2002 period

	Estimate	Standard Deviation	t exp.	Significance
Intercept (a)	-0.039	0.0252	-1.547	0.1338
Slope (b)	0.142	0.0532	2.669	0.0142

The estimates follow Student-t distribution, with 22 degrees of freedom¹⁷. The estimates significance is high for the "b" parameter (the slope) and is low for the "a" parameter (the intercept). In fact, it can be accepted that the intercept has a null value.

The coefficient of determination R² of the model estimated is 0.2438. Thus, the variations in grape agrarian production in Rioja may explain up to 24% of the relative inflationary differences observed in the period 1979-2002.

Testing the structural stability of this model through the Chow test, a break point arises in 1987¹⁸; once more there are evidences that some sort of structural change has occurred recently in Riojan economy.

Chow test results show that α parameter, β parameter or both have varied in the period 1987-2002 when compared to the period 1979-1987. Thus, both periods will be analysed separately, running again the linear regression for each period.

Analysing the period 1979-1987, no relationship between the increases in grape harvest value and the inflationary differential arises¹⁹. Thus, the model is rejected for this period. This rejection is consequent with our explanation: as in the seventies and early eighties vineyard incomes were very low (until 1987), they could not impulse regional consumption²⁰.

The result is clearly different in the 1987-2002 period, in which a significant relationship between wine and inflation is shown. A linear regression (OLS) is conducted over the 1987-2002 data, the results are shown in table 9.

TABLE 9: Estimates of the model [2]. 1987-2002 period

	Estimate	Standard Deviation	t exp.	Significance
Intercept (a)	-0.018	0.0252	-0.719	0.4833
Slope (b)	0.175	0.0483	3.630	0.0027

The estimates follow a Student-t distribution, now with 14 degrees of freedom. The "a" estimate is not significant and can be accepted to be zero. On the other hand, the "b" estimate is highly significant.

The model's coefficient of determination R² is 0.4848, what may be interpreted as that the model summarised in equation [2] explains almost half the variability of the annual relative differential in inflation between Rioja and Spain in the period 1987-2002. Figure 4 shows the relationship between both variables in this period.

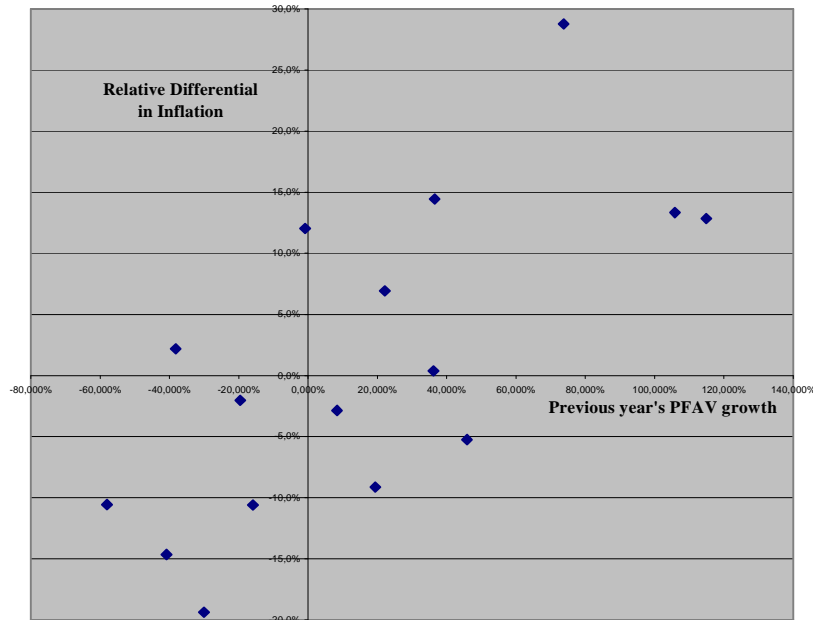
¹⁷ There is data for 25 years; thus, 24 different annual increases. As two parameters are estimated, the degrees of freedom are 22.

¹⁸ It must be noted that 1987 was the year in which the structural change in Rioja wine cluster started.

¹⁹ We are conscious of the small size of the sample. Nevertheless, we consider that the conclusions that may be obtained of this regression are valid and very useful to understand the recent evolution of the Rioja region.

²⁰ Furthermore, it should be noted the short sample used, with only 9 data.

FIGURE 4: Differential in inflation and previous year's PFAV growth. 1987-2002



The previous model shows that it can not be rejected that the intercept is zero. Thus, another model is tested, in which there is no structural difference between Spanish and Riojan inflation, apart from wine-related factors. Equation [3] reflects this relation:

$$\frac{(\pi^*_{ESP} - \pi^*_{RIO})}{\pi^*_{ESP}} = \beta \times \Delta PFA \quad [3]$$

The testing of the model results in a coefficient of determination R^2 with a 0.469 value. That is, the model accounts for almost half of the variations of the relative differential in inflation between Rioja and Spain. Estimates are shown in Table 10.

TABLE 10: Estimates of the model [3]. 1987-2002 period.

	Estimate	Standard Deviation	t exp.	Significance
Slope (b)	0.165	0.045	3.643	0.0024

The implication of the model is that, in absence of growth in the grape harvest value in Rioja, inflation in the region would be similar to that in Spain. Thus, it could be equal to the Spanish inflation, higher than that or even lower. However, Spanish inflation would be the best proxy to Riojan inflation.

Some other models have been tested in which variables relating to wineries (e.g. overall invoicing or wine price growth) have also been included. Unfortunately, these models experience multicollinearity problems and do not add significant explanatory capability. Models in which only wineries-related variables are included explain a much lower percentage of the variable variations, having a maximum coefficient of determination of 38%.

6. Concluding discussion

In this paper a model explaining the differential pattern of price increases in Rioja has been developed. The most relevant findings of this analysis are that in recent times Riojan economy and society have experienced two uncommon features:

- There has been a statistically significant growth in Riojan inflation when compared to Spanish average value.
- There has been a close link between the variations of the grape harvest value in one year and the Riojan inflation differential the following year. This link appears in 1987, when the Rioja wine cluster starts to grow. There is no sign of such a link in the period before 1987, in which revenues from vineyards were quite low. Furthermore, the sharp increase in grape harvest value in the late nineties accelerates the relative increase of Riojan inflation compared to that of Spain.

The cause and effect relation between these two phenomena (growth in wine agrarian production and inflationary differential) lays in the widespread ownership of vineyards in Rioja and the increase in disposable income that a large number of Riojan families have experienced.

Considering that production costs did not vary in the 1990-2002 period, the increase of prices and the rise in productivity have resulted in higher profits for the vinegrowers, most of which for have primary sources of income different from the vineyards, as they work in the industrial or service sector (or are pensioners). It is noteworthy that the increase in productivity in the wine sector has engendered a higher inflation in the region, but not through an increase in wages (as the classical Balassa-Samuelson effect) but through an increase in agrarian rents. Rents, and not wages, have increased household incomes in Rioja.

The effect of the increase in Riojan household income has been to fuel aggregate demand in goods and services at the regional level. The demand shock, within an economy enjoying full-employment, has had two different consequences: upwards tensions in prices (especially for goods and services supplied in a regional basis) and a certain "pull effect" in foreign immigrants, that have entered the Riojan labour market in thousands.

That is, oenoeuros (the constant flow of money from outside the region to the Riojan wineries and vine-growers) are the cause of Rioja's recent higher inflation comparing to Spain.

7. References

ALBEROLA, E. and J.M. MARQUÉS (1999): *On the relevance and nature of regional inflation differentials: the case of Spain*, Documento de Trabajo nº 9913, Banco de España, Madrid.

ALTISSIMO, F., P. BENIGNO and D. RODRÍGUEZ-PALENZUELA (2005): "Long run determinants of inflation differentials in a Monetary Union", NBER Working Paper 11473.

ALVAREZ, L.J. and M^a. DE LOS LLANOS (1999): *Underlying inflation measures in Spain*, Documento de Trabajo nº 9.911, Banco de España, Madrid.

ANDRÉS, J., E. ORTEGA and J. VALLÉS (2003): "Market Structure and Inflation differentials in the European Monetary Union", Documento de Trabajo 0301, Madrid.

ANGELONI, I. and M. ERHMANN (2004): "Euro area inflation differentials", ECB working paper 388.

ARGY, V. (1994): *International Macroeconomics. Theory and Policy*, Routledge, London.

BARRO, R.J. (1997): *Macroeconomics*, The MIT Press, Cambridge, Massachusetts.

BARRO, R.J. and V. GRILLI (1994): *European Macroeconomics*, MacMillan Press, London.

- CECCHETTI, S.G., N.C. MARK and R. SONORA (1998): *Price level convergence among US cities: lessons for the European Central Bank*, Working Paper 32, Österreichischer National Bank, Wien.
- CONSEJO REGULADOR DE LA DENOMINACIÓN DE ORIGEN CALIFICADA RIOJA (several years): *Memoria*, Consejo Regulador, Logroño.
- ESPASA, A. and J.R. CANCELO (1993): *Métodos cuantitativos para el análisis de la coyuntura económica*, Alianza Editorial, Madrid.
- EUROSTAT (2004): *Demographic, economic and social data on 258 cities across Europe*, Eurostat, Brussels.
- FRIEDMAN, M. (1968): "Inflation: Causes and Consequences", *Dollars and Deficits*, Prentice-Hall, Englewood Cliffs.
- FRIEDMAN, M. (1992): "La inflación: su causa y su remedio", en *Paradojas del dinero*, Grijalbo, Barcelona.
- GÓMEZ-BEZARES, F. and M. LARREINA (2003): "Una valoración del sector vinícola riojano", *Cuadernos de Gestión vol.3 N.1 y N.2*, pags. 143-167.
- GONZÁLEZ LARRAINA, M. et al. (1984): "Problemática y posibilidades del vino en La Rioja", *El Campo Riojano*, Cámara Agraria Provincial de La Rioja.
- GUJARATI, D (1997): *Econometría*, McGraw Hill, Santa Fe de Bogotá.
- JAIME Y BARÓ, A. (1972): *Consideraciones sobre la evolución de los precios de la uva y del vino Rioja en el período 1.967-1.971*. III Jornadas Técnicas sobre la vid y el vino, Logroño.
- KAISER R. and A. MARAVALL (2002): *Notes on Time Serie Analysis, ARIMA Models and Signal Extraction*, Documento de trabajo nº12, Banco de España.
- LARREINA, M. (2006): *Estudio de la dependencia de la economía riojana del vino Rioja*, Doctoral Thesis, Universidad de Deusto, http://www.proquest.com/products_umi/dissertations/
- LARREINA, M. and F. GÓMEZ-BEZARES (2004): "El precio de la uva y del vino como explicación de las particularidades de la inflación riojana", *IV Simposio Internacional de Historia y Civilización de la Vid y el Vino*, Haro.
- LARREINA, M., GÓMEZ-BEZARES, F. y M.A. LARREINA (2004): "El distrito vitivinícola riojano", *IV Foro Mundial del Vino*, Logroño.
- OIV (2003): "Situation et statistiques du secteur vitivinicole mondial en 2.001", *Bulletin de l'OIV-Office International de la Vigne et du Vin n°21*
- ORGANIZACIÓN INTERPROFESIONAL DEL VINO RIOJA (2005): *Plan Estratégico de la Denominación de Origen Calificada Rioja*, Logroño.
- ORTEGA, E. (2003): "Persistent Inflation differentials in Europe", Documento de Trabajo 0305, Madrid.
- RABANAL, P. (2006): *Explaining inflation differentials between Spain and Euro area*, La Caixa Economic papers, Barcelona.
- TAMAMES, R. (1972): "Estudio del sector vitivinícola de Rioja", en *Estudio sobre el desarrollo socioeconómico de la provincia de Logroño*, IBERPLAN, Logroño.
- WALL H.J. y G. ZOEGA (2003) : *US Regional business cycles and the Natural Rate of Unemployment*, Working Paper 30-A, Federal Reserve Bank of St. Louis,