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# *Document de travail*

## **HAVE POLICY DISTORTIONS SPILLED OVER ACROSS WINE MARKETS? : EVIDENCE FROM THE FRENCH WINE SECTOR**

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## **Have policy distortions spilled over across wine markets?:**

### **Evidence from the French wine sector**

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#### **Abstract**

This paper investigates cross-market effects of policy instruments that were implemented in the table and quality wine market as one of the pillars of market intervention in Europe's Common Market Organisation (CMO) for wine. We explore two hypotheses regarding the spill-over of distillation policy distortions and quality downgrading. Empirical evidence from France, the largest producer of quality wines in Europe, provides support for the hypothesis that distillation policy distortions in the quality wine market have spilled-over to the table wine market. As predicted by our second hypothesis, we find evidence for quality downgrading, a phenomenon that has so far received little attention in the wine economics literature.

JEL Codes: Q11, Q18

**Key words:** Common Market Organisation for wines, distillation, spill-over effects, quality downgrading, France, heterogeneous panel

## **1. Introduction**

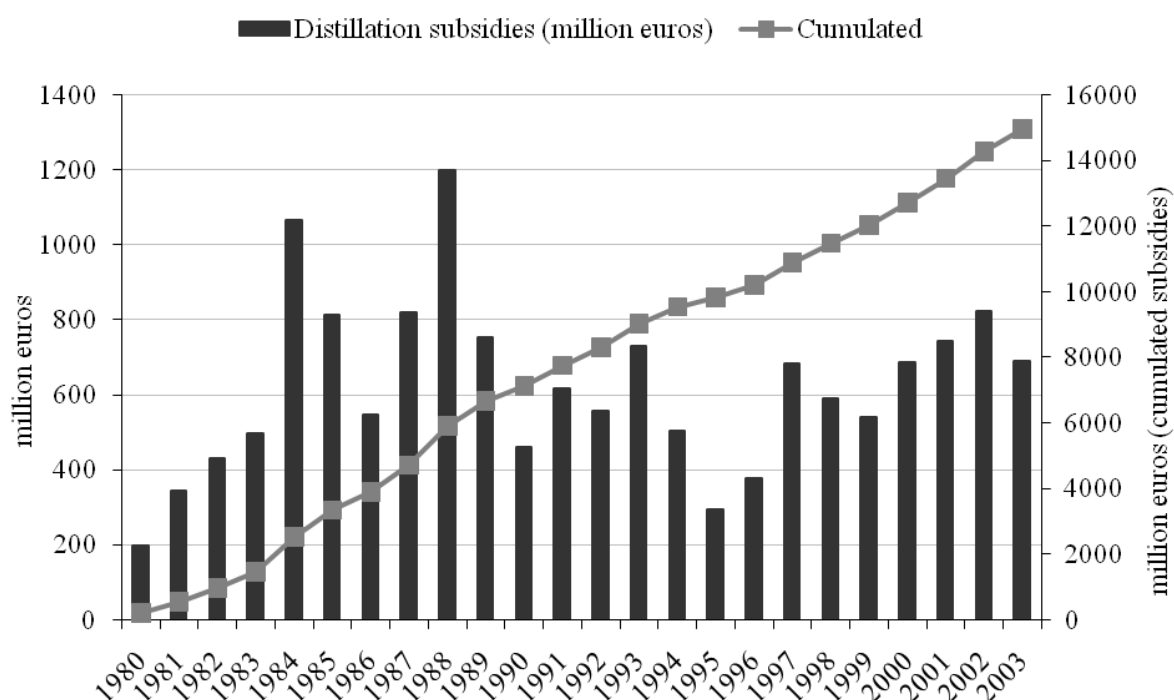
The European Union (EU) introduced a wine regime in 1962 to support producers' income and to address the implications of declining wine demand in Europe. The regime divided wines into two major categories: "quality wine produced in specified regions", also known as "quality wine PSR" (thereafter, wines PSR), and "table wines" (European Commission, 2006a).<sup>1</sup> Soon after the introduction of the EU wine regime, a structural surplus emerged during the 1970's in the market for table wines (Mart, 1987). In response, a series of distillation measures were put into place during the 1984/85 marketing year. The European Court of Auditors reviewed the consequences of these policy measures, to conclude that they were a disguised and expensive method of disposing of surplus wine, that they did not encourage producers to improve the quality of table wines, and that distillation interventions transferred the problem of structural surplus from the wine market to the alcohol market (Mart, 1987). Since this early criticism of these policy measures, their economic implications appear to have been largely ignored, although their negative budgetary impact has continued to be significant. This paper addresses several economic consequences of distillation measures and quality downgrading in the context of France. It explores whether policy distortions have spilled-over across wine markets, focusing on the introduction of distillation support measures for quality wines in 1999. As Figure 1 shows, the cumulated budgetary cost of the distillation interventions has reached €15 billion over the period 1980–2003, which represents about two third of total European Agricultural Guidance and Guarantee Fund (EAGGF) expenditures for wine (total of €23 billion).<sup>2</sup>

**Figure 1: European Agricultural Guidance and Guarantee Fund (EAGGF) expenditures (Guarantee section) on distillation interventions (Million EURO)**

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1. This distinction was effective during the period we cover in this paper, 1980—2006. It has been revised since with implementation of the 2008's reform of the European wine market.

2. The EAGGF is composed of two sections, the Guidance section and the Guarantee section. Within the framework of the European economic and social cohesion policy, the EAGGF supports rural development and the improvement of agricultural structures (European Commission 2008a, b).



Sources: 1980–1984 (Bartoli and Boulet, 1989), 1985–1998 (ONIVINS, 1994, 1998, 2000), 1999 (Innova, 2004) and calculations of the authors.

More than twenty-five years since the Court's report has been published, the complex and inefficient system of distillation and support measures (Duncan and Greenaway, 2008) was finally undergoing significant revisions when a 2007 European Commission proposal for a reform of the CMO for wine was accepted by the Council and Parliament in 2008. The implications include the stepwise phasing out of support for by-product distillation, potable alcohol and dual-purpose grape distillation, as well as crisis distillation measures by 2012 (European Commission, 2010, 2006c, 2007a, b; Council of the European Union, 2007; Europa, 2009).<sup>3</sup>

This reform could be considered as a milestone for a number of reasons. Faced with a continuously falling EU wine consumption of table wines (despite rising consumption levels of wines PSR), slow export growth (at a lower rate than imports since 1996) and rapid import growth (since 1996 the volume

3. For emergency (crisis) distillation, the funding is due to fall from a maximum of 20% (2008) to a maximum of 5% of the national funding budget over four years to 2012 (European Commission, 2010).

of wine imports into the EU-25 has been growing at a rate of 10% a year), the Commission predicted that excess wine production will reach 15 percent of annual production by 2010/11 (European Commission, 2006c).<sup>4</sup> The implementation and long use of various distillation measures to deal with excess table wine production has led to a number of market distortions. Since crisis distillation measures for table wines were designed to act as support measures, they can be expected to increase the wholesale prices of table wines. On the other hand, by allowing inefficient producers to maintain their activity due to distorted wholesale prices, their production activities are likely to depress table wine prices further. The implication of these side-effects is that one may question the effectiveness of distillation measures as income support measures, and wish to go beyond analyses of budgetary expenditure related to distillation (e.g. Spahni and Labys, 1992) by focusing on spill-over effects that can result in significant by-product distortions. As many scholars have shown before (e.g. Helmberger and Chavas, 1996), government intervention in one segment of a sector is likely to spread to another sector, for example in terms of production and price repercussions. Therefore, a hierarchy of desirable policies can be established based on by-product distortions, i.e. when private costs exceed social opportunity costs (Corden, 1997). Also in the context of the CMO for wine, it is to be expected that the closer the intervening policy is to the point of divergence between private and social marginal costs, the lower will be the by-product distortions in terms of labor and consumption distortions, as well as trade biases (Corden, 1997).

## **2. Objectives and literature**

Considering a significant policy change in the marketing campaign of 1999/2000, which allowed EU wine producers to apply distillation measures to quality wines PSR from 2000/2001 onward, the following sections aim to analyze effects of distillation measures on markets for table and quality wines PSR. The objective is to identify the extent to which negative side-effects of distillation policy

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4. This estimate does not account for the quantities distilled with aid to the potable alcohol sector. The European Commission most commonly uses the ratio between the change in stock levels between the beginning and the end of the harvesting period and production as an indicator of surplus. Using this measure for the 2008/2009 harvesting campaign leads to an excess in wine production of 2.11% for all wines (4.54% if we exclude wine PSR: [http://ec.europa.eu/agriculture/markets/wine/facts/winehist\\_fr.pdf](http://ec.europa.eu/agriculture/markets/wine/facts/winehist_fr.pdf)).

measures have emerged, in particular whether distillation policy distortions spilled-over across wine markets. Considering that the practice of quality downgrading has so far been neglected in the wine economics literature, the analysis focuses on the implications of both distillation and quality downgrading in the context of French wine production.<sup>5</sup>

With regard to the incidence of quality downgrading, it is noteworthy that wine production from acreages devoted to table wines cannot be sold as quality wine while the converse is true, an issue that seems to have been overlooked in previous analyses: Article 39 of EC regulation 1623/2000<sup>6</sup> states that “A table wine which has been the subject of a storage contract may not subsequently be recognized as a [wines PSR] or used in making a [wines PSR], ...”. The converse is not true as stated in Article 56 of EC’s 1493/1999 reform whereby a “producer may [...] downgrade a [wine PSR], in particular to a table wine.”<sup>7</sup> Further, some flexibility existed regarding the transfer of planting rights of vines devoted to the production of table wines (Journal Officiel, 1998). Although article 4 of the text states that those table vines cannot be planted on production areas previously devoted to the production of quality wines PSR, rare exemptions could always be granted by the National Office of Geographical Indications, as stated in Article 4.<sup>8</sup>

We concentrate our analysis on France for three related reasons. First, because of France’s overall market significance in terms of the production of table and quality wines PSR in Europe (47.3% in terms of value; average of 2002–2006: European Commission 2007c). Second, we anticipate to be able to generalize some of our findings beyond France, because France is an intermediate case

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5. Quality downgrading consists of suppressing the right to label a wine as quality wine PSR. In France it is the suppression of the right to label a wine as ‘AOC’ wine. This wine is then marketed like ‘Vin de Table’ or ‘Vin de Pays’. In general, downgrading a premium quality wine to a lower quality wine implies this latter to be sold at a lower price.

6. The text is available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000R1623:EN:NOT>, accessed March 24, 2011.

7. The text is available at <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:179:0001:0001:EN:PDF>, accessed March 24, 2011.

8. See also <http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000223326&categorieLien=cid> which shows legal evidence that the aforementioned derogation is still applicable). The last regulation (EC 479/2008, Article 92) in force since August 2009 maintained this right until 31st July 2010.

between Italy and Germany in terms of its production volumes of quality and table wines.<sup>9</sup> Compared to France, quality wines PSR occupy a larger share of the wine sector in Germany, whereas the proportion of table wines is larger in Italy.<sup>10</sup> Third, France was chosen because of significant recent trends in terms of wine inventories and wine exports since 1998. As Figure 2 shows, the deterioration of the recent market situation for French quality wines PSR is related to the widening gap of declining exports and rising inventories, together with a rather stagnant consumption pattern.

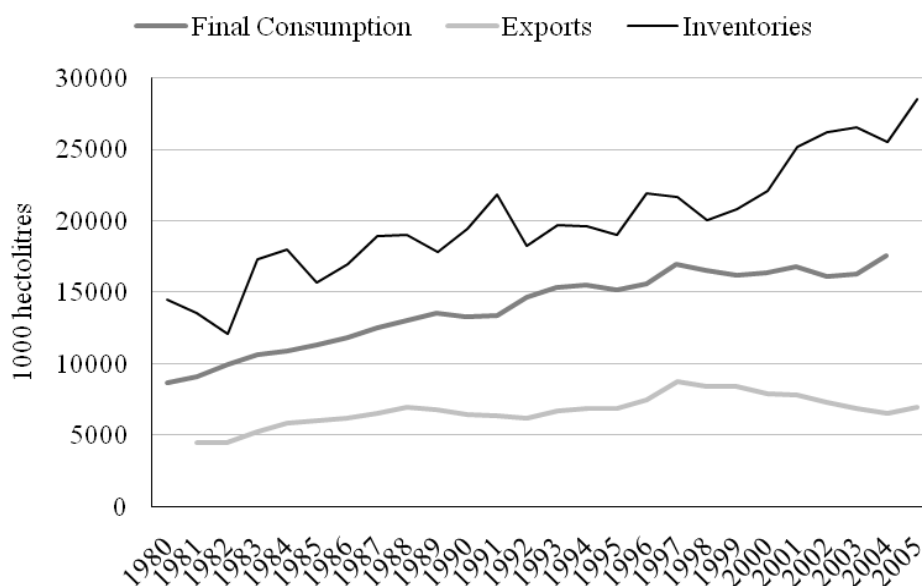
**Figure 2:**            **Situation in the market for quality wines PSR in France (in hl)**

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9. For example, in the 2005/2006 harvesting campaign, the ratio of the domestic consumption of quality wines PSR to total consumption in volume equals about 52% (the data are available online at <http://www.onivins.fr/pdfs/216.pdf>).

10. This intermediate position of France has also been pointed out by Jayet *et al.* (1998) and Perretti (1997). As in other EU countries, geographical location and grape variety are factors governing the classification of German wines. A further factor, however, distinguishes the German scheme from any other. The sugar content of the grapes when harvested is the primary factor governing the classification of a German wine. This implies that any vineyard in Germany is potentially eligible to be awarded wine PSR for its wines if the grapes are ripe enough.

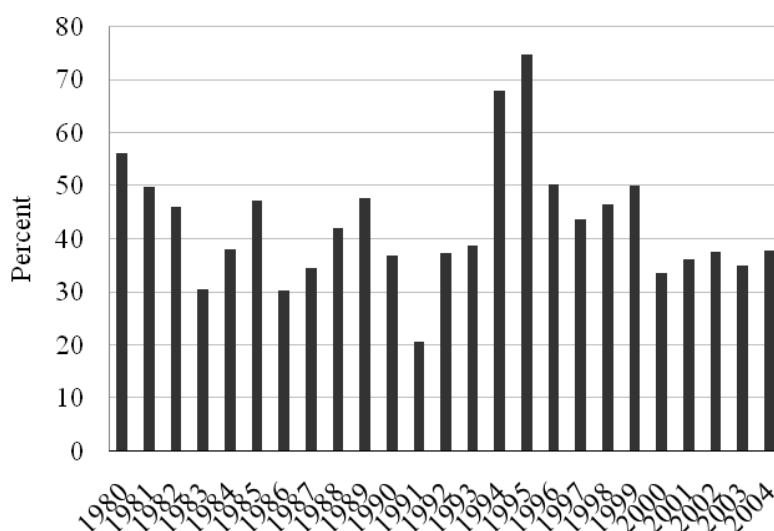




Sources: 1980–1984 (Bartoli and Boulet, 1989), 1985–2005 (ONIVINS and Viniflor, 1994, 1998, 2000, 2007).

As we would expect from the above developments in the French wine sector, France contributes significantly to the distillation surpluses in Europe (Figure 3).

**Figure 3:** French wines as proportion of total EU wines allocated for distillation (in percent; table and wines PSR)



Source: European Commission (2008a, b).

However, given the diversity of the French wine growing regions in terms of volume and quality, the following analysis distinguishes three key producing regions (Aquitaine, Burgundy and Languedoc-Roussillon), and explores the extent to which distillation policy distortions and downgrading affected those regions in distinctly different ways.

In contrast to our focus on EU distillation measures and quality downgrading, previous analyses of the EU wine market have largely focused on modeling the implications of price and quantity interventions under the assumptions of product homogeneity in the market for table wines (Salies, 2003) and for wines differentiated by quality (Jayet et al., 1998; Perretti, 1997). Jayet et al. (1998) also provide an analysis of distillation in a model of wine trade between European countries, as well as EU trade with foreign countries. The authors show that a 16% decrease in the administrative floor price for table wines sent to distillation implies a decrease of five to six percent in the price of wines PSR. Jayet (2001) investigates the welfare implications of a set-aside program combined with support prices vs. an export subsidy program. The author addresses the regulator's problem of determining the optimal set-aside premium for table wine acreages when producers vary with respect to yields, under the assumption that yield information is private (imperfect competition). The analysis suggests that when producers are price takers, market intervention can under certain conditions be welfare enhancing.

Our paper contributes to the above literature by analyzing spill-over effects across wine markets related to distillation and quality downgrading. Our first hypothesis is that production spill-over effects can be identified in the market for quality wines PSR as a result of downgrading. Our second hypothesis is that subsequent to a policy change in the marketing campaign of 1999/2000, which allowed EU wine producers to apply distillation measures to quality wines PSR from 2000/2001 onward, these distillation policy distortions have spilled-over effects across wine markets. Our analysis of time series data and distinct segments of the French wine sector suggests that the

effectiveness and efficiency of the CMO for wine is likely to have diminished further since the introduction of a crisis distillation scheme for wines PSR in 1999.

The remainder of the paper is structured as following. Section (3) provides a more detailed discussion of distillation measures and downgrading in the context of France, also highlighting a producer perspective on these measures. Section (4) offers an econometric model to analyze distillation measures and downgrading, their impact on the market for table wines, as well as policy implications. Section 5 concludes.

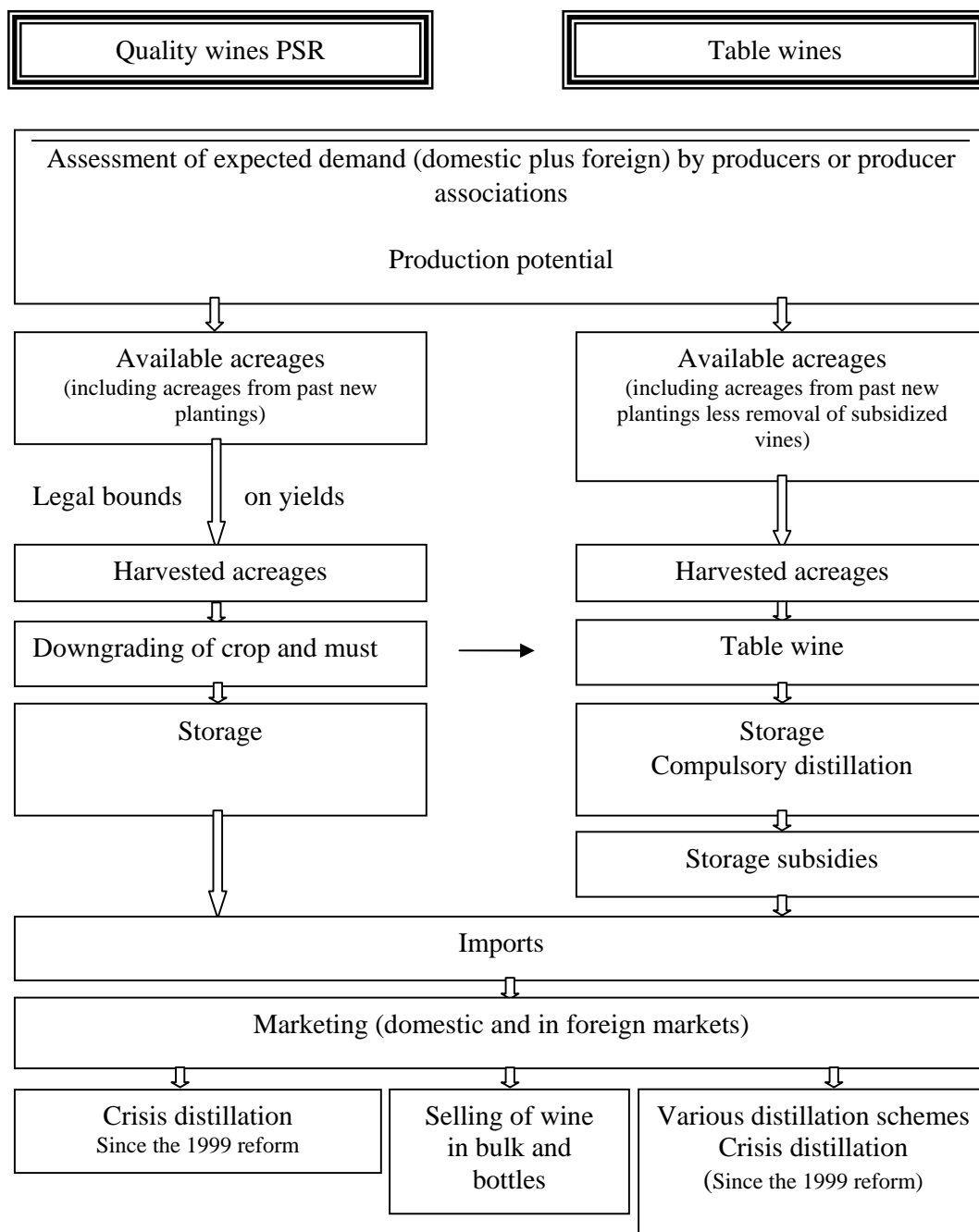
### **3. Distillation policies, quality downgrading and producer implications**

The following sections take a producer perspective on the key policy variables affecting table wine and quality wine PSR production, and discuss distillation policies and downgrading in the context of the three key producing regions of France. The aim is to provide a better understanding of both table and quality wine PSR markets.

#### *3.1. Producer implications related to distillation and downgrading*

Taking a producer perspective, the following flow chart (Figure 4) summarizes the key factors affecting producer decisions in the French table wine and quality wine PSR markets as they relate to distillation and downgrading, and displays what key regulatory measures were available until recently to producers at different stages of the production process. It shows in particular the role of downgrading of crop and must, and the anticipated implications on the table wine market.

**Figure 4:** Flow chart of key factors affecting producer decisions under the CMO for wine



Source: own, based on European Commission (2006a, b, c); EC regulation 1623/2000.

### 3.2. Types of EU distillation measures and their adoption in France

The CMO for wines distinguishes four different types of distillation, two of which are voluntary, and two of which are compulsory to wine producers.<sup>11</sup> First, there are compulsory distillation measures for surplus wines from “dual purpose grapes” (mainly wines from Charentes), which must be distilled if their quality falls below a certain level. Second, compulsory distillation exists for lees and marc, by-products of wine making, with the goal of avoiding over-pressing of grapes and thereby improving wine quality. Third, since 2001, the internal market measures include voluntary “crisis distillation” of table wines, and since the 1999-2000 marketing campaign crisis distillation for wines PSR. Fourth, there are voluntary distillation programs for the distillation of table and wines PSR into potable alcohol for use in the spirit drinks industry. The overall policy objective of all of the above distillation measures is to support producers’ income by creating price floors through supporting the market price for wine and products made from wine, although it is well established that such price floors are generally not only inefficient, but also ineffective measures for achieving producer price support (Just, Hueth and Schmitz, 2004; Helmberger and Chavas, 1996).

At least since 2006, the Commission has explicitly recognized that distillation measures are not only “outdated market support measures” (European Commission, 2006b), but that they also entail negative consumption externalities (public health issues) due to the artificial lowering of wine spirits prices (European Commission, 2006c). Further, even before the adoption of the 2007 reform package proposal, the Commission had acknowledged that it is necessary to update and simplify the labeling systems (European Commission, 2006b), an issue that has been raised by many studies before (e.g. Steiner, 2004; Salies, 2005). It is thus not too surprising that the abolition of distillation measures and the simplification of the labeling scheme are two cornerstones of the CMO reform by the Commission. The adoption of these two cornerstones becomes all the more compelling if we consider the financial implications of the above distillation and related price measures on the EU

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11. See European Commission (2006a, pp. 37–44) for a detailed description of these four measures. It is also important to note that, in the case of France (and for 2006), the amount of table wine distilled could not exceed 450hl, and the subsidy could not exceed €5,000 per producer. As for wines PSR, only the latter applies (Journal Officiel, 2006).

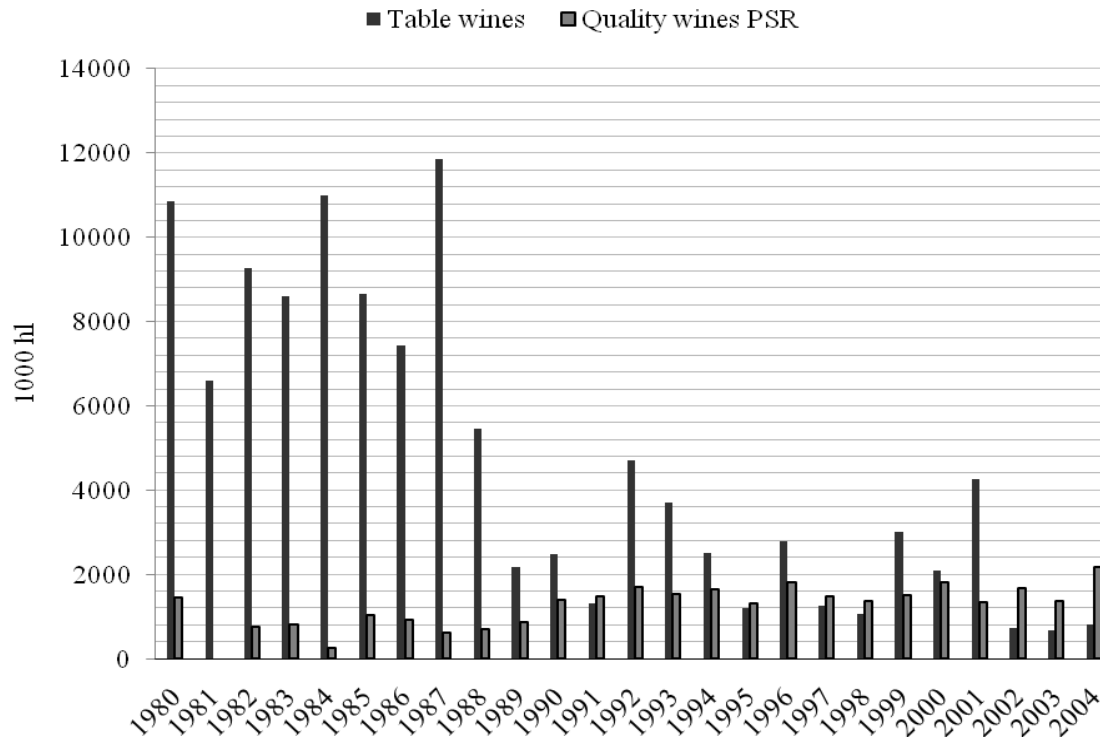
budget. In 2003, a year in which comparatively low volumes of table wines were distilled, the EU's budget for the total wine sector was about 1.213 billion Euros (Innova, 2004, p. 51), 57% of which were spent on distillation measures and must utilization.<sup>12</sup>

The significance of the above distillation and related price measures on wines PSR can be made more transparent if we consider the French wine sector in more detail. Figure 5 shows that compared to the distillation of table wines, which has declined significantly between 1980 and 2005, the distillation of quality wines PSR shows an upward trend during the same period. Since we are most interested in the period between 1999 and 2006, we consider the distillation of table and wines PSR in the above three French key producing regions in more detail.

**Figure 5: Distillation of table wines and quality wines PSR in France (1000 hl)**

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12. These figures were unchanged in 2005: 1.267 billion and 56%, respectively (see Viniflor, 2008b). In 1998, the various forms of distillation represented an even larger portion of expenditure with approximately 61 percent; disposal of alcohol required about 21 percent, and aid for musts approximately 18 percent of the EU wine's budget (DEFUSCO, 2007; Innova, 2004). Aid for the use of grape must as grape juice, for enrichment or "home-made wine-kits" were expected to reduce wine quantity and to balance enrichment costs for producers in southern and northern wine growing zone (see Innova, 2004, p. 45), but the share of this measure in the annual EU budget has been on average 13% for more than twenty years.

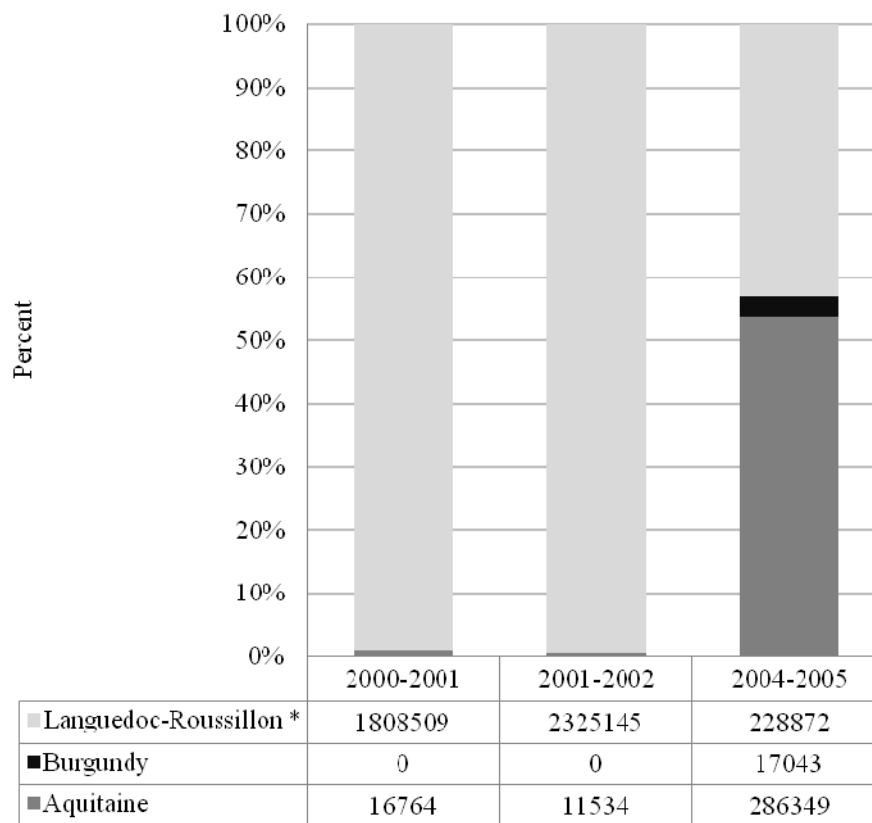


Source: European Commission 2008a, b

### 3.3. Quality downgrading and crisis distillation

When the French market for quality wines PSR went into disequilibrium in the mid 1990s, it was perceived necessary by European regulators to intervene. Voluntary “crisis distillation” of table and quality wines PSR has received significant response from Aquitaine and Burgundy in the 2004/2005 marketing year (Figure 6 and 7). Figure 6 also shows that Languedoc-Roussillon mainly relied on voluntary crisis distillation in earlier marketing years.

**Figure 6:** Voluntary Crisis Distillation of table wines for three harvesting campaigns and in three regions of France (in hl; Aquitaine, Burgundy, Languedoc-Roussillon)

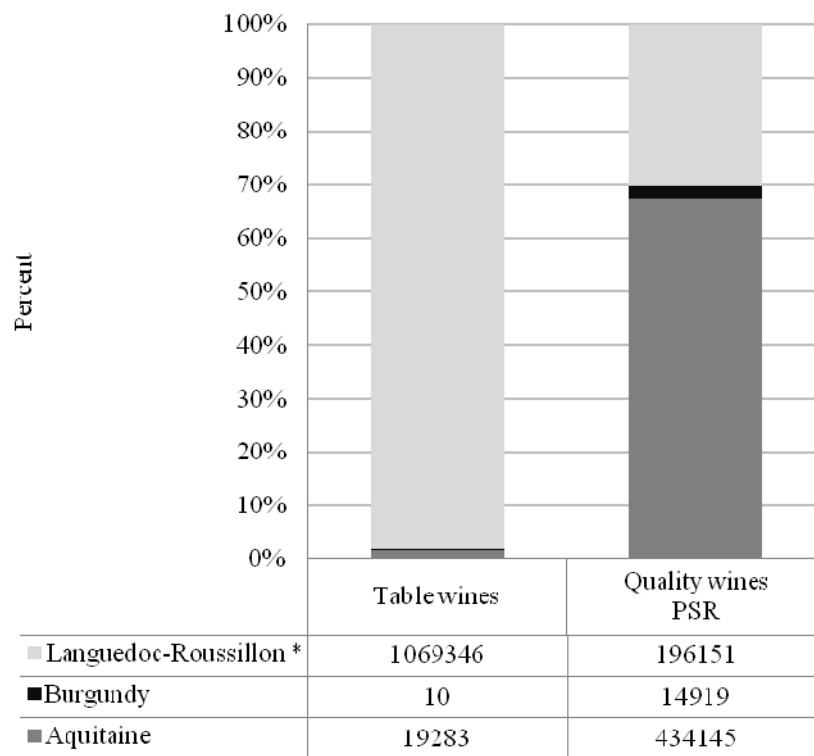


\* Amounts in hl. Source: Viniflor, various years.

Figure 7 provides a more disaggregate picture for the 2005/06 harvesting campaign, suggesting that the introduction of voluntary crisis distillation for wines PSR became attractive to producers in Aquitaine and Burgundy only four years after the introduction of the distillation support program in the marketing campaign of 1999/2000.

**Figure 7: Voluntary Crisis Distillation for table and quality wines PSR in three regions of France (in hl, Aquitaine, Burgundy, Languedoc-Roussillon), 2005/2006 harvesting campaign**



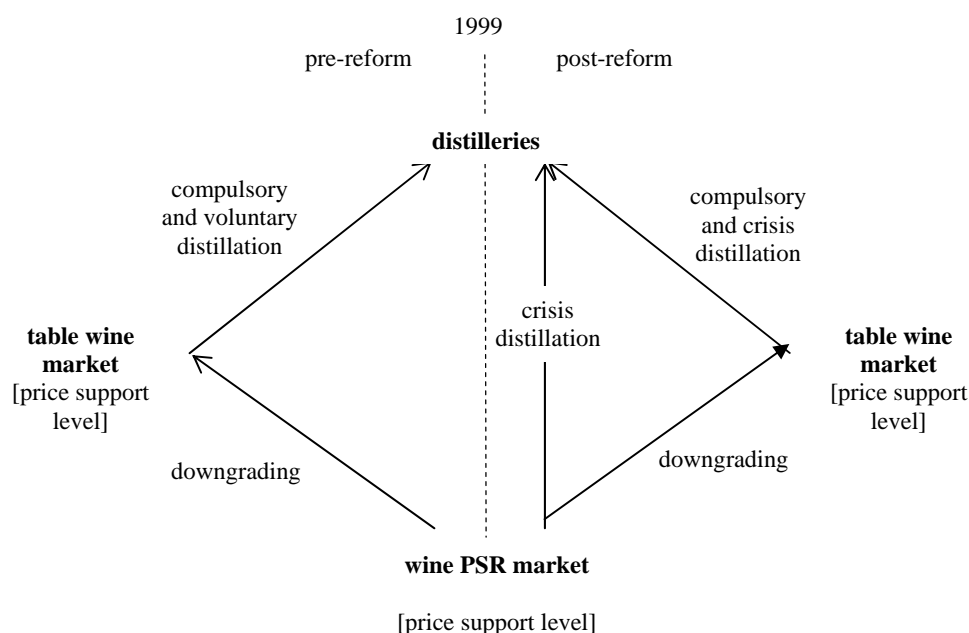


\* Amounts in hl. Source: Viniflor, various years.

As the following sections emphasize, this delayed adoption of voluntary crisis distillation for wines PSR can be related to the level of support prices for wines PSR destined for distillation, to the production share of PSR wines in a given region, as well as to the practice of quality downgrading before voluntary crisis distillation became available for PSR wines. To begin with, the delayed adoption of voluntary distillation of wines PSR in 2005/06 despite the availability of voluntary crisis distillation since 2000/2001 can be rationalized with the fact that the European Commission authorized EU producers to send 1.5 million hl of wines PSR for distillation at a price of €3 only during the marketing year of 2005/2006. The French government elevated this price by adding an extra subsidy of €0.35 cents per liter (Assemblée Nationale, 2006), which most likely made distillation further attractive to producers.

As evident from Figures 6 and 7, the introduction of crisis distillation for quality wines PSR with the 1999's reform has had a differentiated effect across French regions. Given the larger share of wine PSR in Aquitaine and Burgundy, it is not surprising that volumes of table wines distilled are low in those two regions. In the 2004/2005 harvesting campaign, these two regions used crisis distillation for their table wines in larger amounts than in 2000/2001 and 2001/2002, when Burgundy did not rely on the crisis distillation measure for table wine. The significant rise in table wine going to crisis distillation during the 2004/05 campaign and the significant shift that occurred during the 2005/2006 campaign when Aquitaine and Burgundy started applying the crisis distillation measure to quality wines PSR (Figure 7) appears striking, but could further be explained by quality downgrading (see our definition in footnote 5). However, data on downgrading is not publicly available which prevents us from quantifying its magnitude, yet we can infer from the 1999's EU legislation as well as Bohle et al. (2010) and Perretti (1997) that it was common practice to downgrade surpluses of quality wines PSR as table wines until the introduction of the 1999 reform. The introduction of voluntary crisis distillation then provided quality wine PSR producers with one more degree of freedom beyond the practice of downgrading: to sell their wine to distilleries. In sum, we conjecture that the interplay of downgrading and crisis distillation incentives for PSR wines contribute to explaining the delayed and regionally differentiated uptake of voluntary crisis distillation for wines PSR. Figure 8 aims to make this interplay of downgrading and crisis distillation more transparent. The dashed line separates the pre- from the post-implementation phase of voluntary crisis distillation for wines PSR. The solid arrows show the materials flows, highlighting voluntary crisis distillation (arrow going south-north) as the distinguishing feature of the 1999 reform. The entries in brackets [...] highlight the role of varying levels of support prices.

**Figure 8:**        **The introduction of crisis distillation and downgrading**



In order to rationalize the varying amounts of quality downgrading further, consider that price support for quality wines PSR sent to distillation is generally less attractive than that for table wines. The former is below the average market price for quality wines PSR while for the latter, the price subsidy is above the average market price for table wine. For example, for the same marketing year in 2005/2006, the price in euro per hectolitres for 1 degree of alcohol was slightly less than 3€ when considering both the EU and French government subsidies (Assemblée Nationale, 2006).

In order to more formally analyze the hypothesized policy spillovers between table and quality wine PSR markets, the next section employs an econometric approach.

#### **4. Data and econometric model**

Our time series database covers the period from 1980 to 2006, and includes data on regional climate, wine crop volume and wine acreage. Weather variables were obtained from Météo France

(<http://www.meteofrance.com>) and aggregated to annual variables. Variables for crop and acreages were obtained from VINIFLHOR.<sup>13</sup>

We consider a model that allows us to capture potential spillover effects from the market of wines PSR to the market for table wines (equation (1)). The model relates table wine crop ( $tw_{it}$ ) to table wine acreage ( $a_{it}$ ), and climate variables for the three key producing regions of France, namely Aquitaine, Burgundy and Languedoc-Roussillon (a more detailed discussion of climate variables follows below). The crop for wines PSR is also used as a right hand variable ( $qw_{it}$ ) since we would expect that as more wine PSR is downgraded, a positive effect of the crop of wine PSR variable will impact the market for table wines. However, with the policy changes implemented after the 1999's CMO reform, it could be expected that most surpluses in the market for wine PSR are distilled, and that downgrading is used to a lower extent.<sup>14</sup> We try to control for this downgrading effect by using a spline regression approach (Poirier and Garber, 1974), which allows for a change in the slope coefficient by interacting the variable for wine PSR crop. The relationship between table wine crop and wine PSR crop is thus assumed piecewise continuous (linear) with its slope changing one year after the introduction of the 1999's reform.<sup>15</sup> We would expect that if the spillover effect from wines PSR to table wines is stronger than the negative correlation in the evolution of crops over time (evident in Figure 9, below, particularly for Aquitaine and Burgundy), a positive relationship results between wines PSR and table wines in regions where quality downgrading affects the market for table wines.

The selection of weather data is critical for our estimation. Since temperature has an effect on wine yields, we conjecture that weather variables could be employed for explaining crop output through

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13. <http://www.viniflor.fr/>.

14. Nevertheless, we cannot control for this downgrading effect directly, since data on downgrading is not made public and yet downgrading was not forbidden over the time period considered in this paper.

15. We consider a lag of one year. Although the reform was adopted in 1999, it started being implemented in the 2000/2001 harvesting campaign.

their effect on yields.<sup>16</sup> We employ therefore weather variables as they have been used before by Byron and Ashenfelter (1995) and more recently by Ashenfelter (2008). We chose French weather stations from that city of a given region, for which the share of wine production was on average highest for the period from 1981 through to 2007. We consider the total rain fall in January and February ( $R_{1it}$ ). Given the importance of the weather during the growing season (Ashenfelter, 2008), we also consider two further rain variables to capture differences across regions, namely total rain during the period August–September ( $R_{2it}$ ) and during the period October–March ( $R_{3it}$ ). The effect of temperature is captured by using one sixth of the sum of monthly average temperatures in degrees Celsius over the period October–March ( $TEMP_{it}$ )<sup>17</sup> and the sum of differences between maximum and minimum temperatures from October to March ( $DIFF_{it}$ ). Following Byron and Ashenfelter (1995), we also consider the square of  $TEMP_{it}$ ,  $TEMP_{it}^2$ . The estimated equation can be stated as follows (all variables in small letters are in natural logarithm):<sup>18</sup>

$$tw_{it} = \beta_1 + \beta_2 a_{it} + \beta_3 qw_{it} + \beta_4 D_t + \beta_5 D_t s_{it} + \beta_6 R_{1it} + \beta_7 R_{2it} + \beta_8 R_{3it} + \beta_9 TEMP_{it} + \beta_{10} (TEMP_{it})^2 + \beta_{11} DIFF_{it} + V_{it}. \quad (1)$$

The difference between  $qw_{it}$  and the log level of wine PSR crop in 2000 is denoted as  $s_{it}$ ;  $D_t=1$  for  $t \geq 2000$  and 0 otherwise, and  $V_{it}$  is the error term.

16. We thank a referee for suggesting to consider the sum of differences between maximum and minimum temperatures. We notice that yield variations can be significant. For France as a whole, crop yield decreased by 27% in the 1988–1989 harvesting campaign relative to the previous campaign, and it increased by 10% in 1996–1997 relative to 1995–1996.

17. Our definition of monthly average temperature is standard and identical to that in Byron and Ashenfelter (1995):  $.5 \times (\text{maximum temperature} + \text{minimum temperature})$ . This formula is calculated for each day then averaged over all days of a given month.

18. All regressions and tests were performed with STATA, version 10.

Due to the small number of cross sectional units (three balanced regions,  $i = 1, \dots, N = 3$ , with  $t = 1, \dots, T = 26$  years in each region),<sup>19</sup> pooling of the three regions is appealing as it would significantly increase the degrees of freedom. However, as suggested by several authors (e.g. Baltagi, 2005: 201), it is worthwhile to consider a heterogeneous panel before imposing false homogeneity on the model's coefficients. Therefore, three time series regressions were first run, one OLS for each region with a piecewise linear spline function including wine PSR crop. Due to the aggregated nature of the crop data relative to the weather variables, considering all weather variables as right hand side variables could lead to multicollinearity problems. We therefore decided to follow a general to specific approach by performing stepwise estimation with backward selection. Only one weather variable was found to have an effect, namely total rain during the period October–March, and only in the equation for Burgundy. Durbin-Watson d-statistics were calculated in each time series regression. They are equal to 1.76, 1.88 and 2.09, respectively and the adjusted  $R^2$  are .752, .738 and .933. Given these results, we removed all weather variables apart from  $R_{3it}$ .

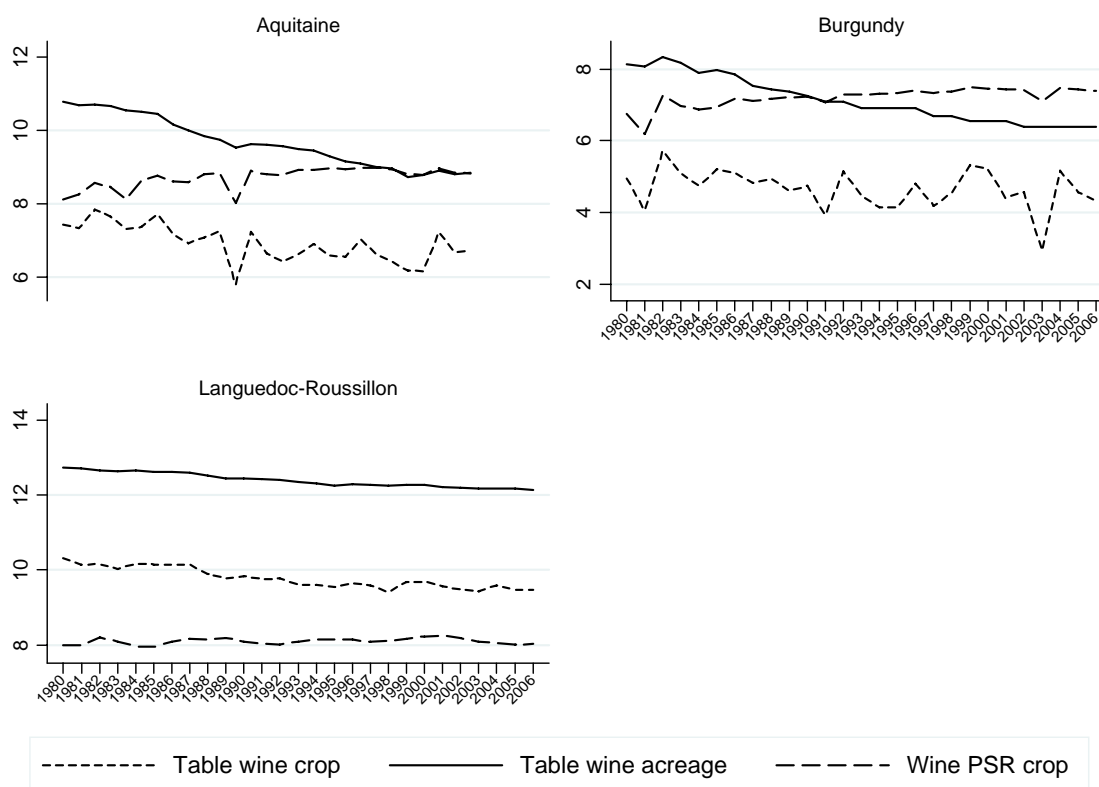
In sum, since the coefficients on some variables vary substantially across regions, we have to address two related issues: whether we should pool the data or not and assume homogeneity of all coefficients or not across equations. Given the heterogeneity between our three regions in terms of share of table wines and distillation quantities, to impose parameter homogeneity when this is not justified could lead to wrong specification and conclusions. Furthermore, as suggested in Baltagi (2005), when there is little variation in some of the variables, this reduces the efficiency gains from considering homogeneity.<sup>20</sup> Our data appears to be a case in point, since the variance of the rain variable is small and there is little variation in some of the remaining variables, particularly in Languedoc-Roussillon (see Figure 9).

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19. We lose one year per region when converting three of our weather variables.

20. To save space, we do not report the results of the homogenous panel with fixed and random effects.

**Figure 9:** Time series of the logarithm of crop volume (table wine and wines PSR) and acreage for table wines



A standard Chow test could be employed for parameter stability across regions, but as this assumes homoscedastic errors, it is important to check for homoscedastic errors before pooling. A White test for the null of homoscedasticity leads us to accept the null: The calculated statistic follows a  $\chi^2$  distribution with 21 degrees of freedom and is equal to 19.75 (the critical value is equal to 32.67).<sup>21</sup> We subsequently tested for homogeneity by using first a simple Chow test with all variables in the three equations. The Chow test's statistics under equal variances is 11.89, which is well above the  $F$  (12,60) tabulated value of 1.91.

21. We ran the test by considering only one weather variable, namely  $R3$ , as it is the only coefficient which is significant in the equation for Burgundy. All other variables are the same as they appear in equation (1).

Considering the above results, we decided to estimate a heterogeneous panel. We estimate a 3-equations model for crop (one equation per region), assuming heteroscedastic errors but no within-region correlation.<sup>22</sup> To save on degrees of freedom, we employ interactions with regional dummy variables. This approach not only allows us to pool our three regions, but permits also to test for specific cross equation restrictions. The test statistics that coefficients are the same for the three models follows an  $F$  distribution with 11 and 62 degrees of freedom.<sup>23</sup> The calculated value of the statistic is equal to 28.71, which is well above the critical value (1.94) at the 5% significance level. This result is confirmed from joint tests for two regions at a time, notably between Aquitaine and Languedoc-Roussillon, and between Burgundy and Languedoc-Roussillon.<sup>24</sup>

The following model specification and diagnostic tests were performed: To check for specification errors, we performed a link test as implemented in STATA (*linktest*), which consists of regressing our dependent variable on the linear predicted value and the linear predicted value squared. Since we find that the linear predicted value squared has no explanatory power, we can conclude that the model is not misspecified (the  $P$ -value is equal to 0.963). Finally, we test for normality of the residuals by employing the D'Agostino, Balanger and D'Agostino (1990) test. We reject normality, which may be due to the presence of serial correlation in the data. A test for the null of no first-order correlation in the residual by using the test suggested by Drukker (2003) leads us not to reject the null hypothesis at the 10% significance level ( $P$ -value = 0.074). Assuming that serial correlation could be a problem, we estimate this model by using the Cochrane-Orcutt transformation, with the autocorrelation based on Durbin-Watson and robust standard errors adjusted for our three regions.

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22. Although we did not find evidence of heteroscedasticity by using the White's test, we nevertheless estimate the model with Stata's robust command.

23. Since  $R3$  is included in only one of the models, the number of constraints is 11 and not 12. More formally, the test is a joint test of the hypothesis that the coefficient on each variable of a given equation is identical to the coefficient of the two remaining equations, and the weather variable's coefficient in the equation for Burgundy is equal to zero.

24. The result of the test for comparing the coefficients of Aquitaine and Burgundy is less conclusive, with a test statistic equal to 8.42 whereas the tabulated  $F(6,62)$  is equal to 2.24. This can be explained by the similarity of those two regions in terms of the relative share of wines PSR they produce compared to the third region, Languedoc Roussillon where the production of table wines is more important.



We do not reject the hypothesis that the error is normally distributed (at the 1% level;  $P$ -value=0.018). Based on skewness alone, we reject the hypothesis that the error is normally distributed at the 5% level, but not at the 1% level ( $P$ -value=0.020). Based on kurtosis alone, our distribution is not significantly different from the kurtosis of a normal distribution at the 5% significance level ( $P$ -value=0.056). We retain this model for presentation (Table 1).

**Table 1: Estimation results from a heterogeneous panel, robust standard errors (1981–2007)**

	<b>Acreage</b> (table wine)	<b>Crop</b> (wine PSR)		<b>Rain</b> (Oct.-March)	<b>Intercept<sup>b</sup></b>
		<b>Pre-reform</b>	<b>Post-reform<sup>a</sup></b>		
<b>Aquitaine</b>	1.073 *** (.068)	1.308 *** (.125)	.452 <sup>c</sup> (.207)		.521 *** (.023)
<b>Burgundy</b>	.890 *** (.049)	1.899 *** (.195)	3.598 *** (0.200)	$-14.24 \times 10^{-4}$ *** ( $2.98 \times 10^{-5}$ )	0.423 *** ( $8.23 \times 10^{-4}$ )
<b>Languedoc.-R.</b>	1.747 *** (.061)	.375 * (.124)	-.414 * (0.143)		.087 *** (0.002)

**Notes:**

“\*\*\*”, “\*\*”, “\*” is significantly different from zero at the 1%, 5% and 10% level, respectively (standard errors are in parentheses); number of observations is equal to 78; the  $R^2$  for the system of equations is equal to 0.986.

<sup>a</sup>. Coefficients in this column represent the change in the slope from the pre-reform. The cutoff point is the year 2000.

<sup>b</sup>. This is the intercept as employed in the spline regression for each region.

<sup>c</sup>. *P*-Value of this coefficient is 0.161.

The larger coefficient estimate on acreages in Languedoc-Roussillon is indicative of the higher share of table wine production and the generally higher yields in that region (Table 1). As expected, there is a positive effect of wine PSR production on the production of table wines, particularly in Aquitaine and Burgundy. As suggested earlier, this is not surprising since quality downgrading used to be a key practice in those regions, which also had a larger share of quality wines PSR, and where there was no distillation scheme in place to absorb surpluses of quality wines PSR (pre-reform). The estimate for wine PSR in Burgundy also suggests that despite the reliance on crisis distillation since the 1999’s CMO reform, downgrading was more significant in this region not only before the reform, but also subsequent to the reform, despite distillation being available to market participants in the post-reform period. On the other

hand, the smaller coefficient estimate for Languedoc-Roussillon likely reflects the lower share of wines PSR in that region and the lower reliance on downgrading. The negative post-reform coefficient in this region is consistent with the observation that producers from Languedoc-Roussillon mainly relied on the various distillation schemes for eliminating table wine surpluses (Figure 6 and 7). The estimation results thus suggest that crisis distillation measures for quality wine PSR are likely to have removed part of the burden on the table wine market in Languedoc-Roussillon (and to a lower extent in Aquitaine; the coefficient on wine PSR crop being not significantly different from zero).

Considering the above estimation results, we conclude that distillation policy-distortions spilled over from quality wine PSR to table wine markets in significant ways, and that quality downgrading was another factor leading to spill-over effects across markets. Therefore, our results suggest that the effectiveness and efficiency of the CMO for wine is likely to have diminished further since the introduction of a ‘crisis’ distillation scheme for quality wines in 1999, with a differential impact across regions.

## **5. Conclusions**

This paper provides evidence that policy distortions have spilled over across wine markets in France. Distillation support measures aimed at addressing supply-demand imbalances have a long history in Europe’s wine market. Forty-five years after a complex and financially increasingly unsustainable Common Market Organization (CMO) for wine was introduced, the European Commission had adopted proposals for a reform of the CMO for wine in 2007, which led to a phase-wise introduction of reform measures as of August 1<sup>st</sup> 2008, and a gradual phasing-out of distillation support measures. In finalizing the implementation of this reform package, the question is whether policymakers have begun to implement a reform that not only recognizes the budgetary consequences, but also the by-product and market distortions of current distillation support measures that are likely to have persisted so far.

The paper addresses this question, focusing on three French key wine producing regions, and both on table wines and quality wines PSR. The analysis provides support for a differential adoption of quality downgrading by producers across regions, a practice whereby producers can sell quality wines PSR as table wines under certain conditions. Our estimation results of a heterogeneous panel (1981-2007) suggest that quality downgrading led to spill-over effects across markets, and that spill-over of distillation policy-distortions from the quality wine PSR to the table wine markets contributed to sustained wine surpluses since wines of lower quality were produced above levels that would have been produced in the absence of these market interventions. Considering that France is an intermediate case between Italy and Germany in terms of its production structure of quality and table wines, we would anticipate that similar spill-over effects of distillation policy distortions can be anticipated, particularly in Germany where quality wines PSR occupy a larger share of the wine sector than in France.

However, a number of caveats remain. Our analysis has been constrained by the limited availability of French data at the regional level. We employed average monthly and average regional temperature data, yet region-specific data on the exact volumes of quality downgrading is missing. Despite the above caveats, we believe that several policy conclusions can be drawn from our analysis. The eligibility of quality wines PSR for crisis distillation since 1999 is likely to have amplified the by then already existing market distortions in France through further spill-over of policy distortions. The significant use of crisis distillation in the markets for table and quality wines PSR suggests that market participants faced constraints with regard to the use of quality downgrading. This was likely an intended policy outcome, since the EU objective of reducing market imbalances in the market for table wines focused on distillation measures since the 1970s, rather than on downgrading. Considering that high levels of allocative inefficiencies are likely to have prevailed for more than a quarter of a century, the gradual reform process that has begun on August 1<sup>st</sup> 2008 and thus the stepwise phasing out of support for by-product distillation, potable alcohol and dual-purpose grape

distillation, as well as for crisis distillation measures by 2012 (European Commission, 2010, 2006c, 2007a, b; Council of the European Union, 2007; Europa, 2009) should be seen in a positive light from an economic perspective.

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