**Bordeaux 2016 Abstract Submission**

**Title**
The narrow path of collective appropriation of biological control methods in viticulture: the case of mating disruption

**I want to submit an abstract for:**
Conference Presentation

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**Keywords**
mating disruption, technological change, adoption drivers, collective dimension

**Research Question**
Reducing pesticide use is strongly encouraged in France but the diffusion of biological control methods is rather low. We explore the individual and collective drivers of the MD in vineyards.

**Methods**
We use some original data coming from a national survey, resulting in 531 wine firms using MD or not. Using MCFA and statistical analysis to test our hypotheses.

**Results**
The collective management of MD is one of the key-point of the diffusion of the method (through neighborhood but also learning process, council and drivers for the starting).

**Abstract**
Despite the rise in yields in viticulture generated by the use of chemical substances to protect the vineyards, alerts on their toxicity launched over the past decades by environmental groups and some scientists have gradually pushed the government to take into account both environmental and health damage. First, through
coercion by the progressive banning of organochlorine substances and their replacement by other ones (organophosphates or carbamates) certainly less persistent in the environment but often characterized by a more acute toxicity. Second, through incentives addressed to scientists to find more environment-friendly solutions that enable winemakers to reduce pesticide use by adopting innovative agronomic practices. So that the winemakers decision on those innovations is circumscribed by a more or less stringent regulation (environmental standards but also incentives), by rather common considerations as firm competitiveness and costs, and also by the demand (trade, retail as well as "organic" wine consumers) (Oltra and Saint-Jean, 2005). Viticulture is usually considered as an upstream dominated sector (Alonso Ugaglia, 2011 ; Possas et al., 1996), and can be described by the following stylized features: the production level depends strongly on climate conditions, which affects the technological trends over time but also in space, very limited sources of cost reduction related to firms’ size and range of products, however they are important components for vineyards management (Pailler, 2004), high variability in size and organizational characteristics of companies and production units, the low level of technology appropriability related to the lack of attractiveness for R&D and other innovation efforts. Consequently, much of the effort in the adoption of innovations is coming from outside and is done with the help of other stakeholders (council organisms for example). Starting from this observation, some biological control methods have been developed, based on “the use of living organisms to prevent or reduce the damage caused by pests” (Ferron, 1999). It is therefore not to resort to synthetic pesticides that are banned in organic agriculture and, where possible, to use living organisms to fight vineyard pathogens. In 1996, BASF brings to market a method of mating disruption (MD), an alternative method to chemical insecticides to fight against grape worms (Eudemis and Cochylinis). In this method, the insects are disturbed during the reproduction phase by a technique based on a natural principle saturating the air with pheromones and making the males unable to recognize the females. The implementation of this control method requires special conditions: a minimum of 10 hectares plots without any discontinuity, 500 dispensers per hectare and low initial insects pressure (BASF, 2014). MD represents currently 4% of French vineyards while it is almost 65% in Germany (BASF). It also appears that the implementation of the method is different according to the French wine region considered. This method of control is also rather expensive compared to insecticide use, approximately 200 to 245€/ha (ATV49, 2012). This setting may be crucial in explaining the poor development of MD in France. Moreover, the strong expansion of the process in Germany can probably be explained by the subsidies set up by the German Länder to support its implementation (Cassagnes, 2012). Last but not least, the minimum size of treatment often requires cooperation with neighbours. Because it limits the use of pesticides, this method is generally considered as a biological control method (even if the pheromones are chemical), in line with environmental concerns. However, the winemakers are feeling like taking risk in having a lower efficiency compared to pesticide use. Another source of concern is about the Flavescence dorée (FD) (incurable disease caused by leafhoppers) vector parasite infesting the vines and causing heavy damage on the vines. The fight against the parasites is based on one to three compulsory chemical treatments decided by government offices (Prefecture). Indeed, the fight against FD is expensive and quite effective against grape worms because these two parasites have fairly similar development periods. It could therefore be a logical substitution treatment against grape worms, especially as the struggle against FD is increasing and therefore there are more and more winemakers concerned. Therefore, the spread of MD offers a particularly interesting study case because mobilizing internal and external drivers to innovation adoption and represents a unique opportunity to test new hypotheses to analyze innovation process. Some previous works (Saint-Gès and Bélis-Bergouignan, 2009 for example) have indeed shown that technical change in this area can be analyzed in highlighting how it is articulated with organizational changes within techno-organizational trajectories, often characterized by path dependency. Given the difficulties for the diffusion of this method, the implementation of MD can be analyzed in terms of breaking the path dependency since the change in practice represents both a technical and organizational change, which therefore requires the adaptation of winemakers’ skills through individual or collective knowledge transfer systems. Initiating technical change requires firstly individual training strategies for new skills (learning by doing). However, it appears that the collective dimension must be taken into account because the social and institutional environment for decision making winemakers’ process is particularly pregnant (learning by interacting).
regions (Bordeaux, Champagne, Val de Loire, Languedoc, Charente, Rhone/Provence valley and Burgundy) with a large panel of 10,000 winegrowers, illustrative of the diversity of their situations. We analyze the results of 531 usable questionnaires obtained at the end of the investigation. In the sample, we have 226 wine firms having implementing MD at least once during the 10 previous years and 282 that have never used it. We articulate a reading of the techno-organizational trajectory of respondents at two levels: individual decision-making and collective dimension as each grower develops its practices in interaction with a changing environment. We focus on the tension between decision exploration of new practices and absorption of new knowledge and collective dimensions of proximity that may prevail. The questionnaire includes 40 questions and three parts (description of the wine firm, MD perception and use including the drivers, perspectives on future use of MD). We used some multiple correspondence factor analysis (MCFA) to characterize the population of firms having been using MD in the last ten years, plus some statistical analysis to explore further the collective dimension and the possible diffusion in the mid-long run. The multivariate analysis allows treating a large number of potentially self-correlated variables and identifying different types of MD adoption. Choosing more specific MCFA is justified by the mixed nature of the data, quantitative and qualitative.

In the results, we first show some stylized facts about wine firms implementing MD. These growers are rather regular in the MD use, meaning few of them have abandoned during the period. They are mainly in appellation systems and located in regions under pressure (Champagne, Bordeaux). They are mainly selling bottles with direct selling. The surface concerned by MD is rather (too) small (5ha), showing that cooperation with neighbours can be difficult even of necessary. But globally speaking, the users are rather satisfied about the method. The MCFA highlights different drivers. We are identifying two different groups of correlated variables: the first one including a collective management of MD use and a process driven by some external organisms opposed to an individual, voluntary origin of MD use coupled with the environmental criteria as the reason why and no collective dimension, and the second one opposing on one side no training, no specific knowledge and on the other side training and council with a good MD knowledge, confirming our assumptions. It highlights the influence of this collective dimension and the different ways it can be expressed: training and support on one side and institutionalization of the process on the other. Then, if we consider the collective effect more specifically according to the neighbourhood, the results show that this is not the first driver in the decision to adopt MD (the first one being the environment). This suggests that if the share of MD management is a necessary condition for the technical success of the implementation of this method, it also raises questions about the ability of winemakers to organize collectively (constraint). Then, a chi-square shows that there is a significant dependence between the non use of MD and the obligation to spread against FD vectors, meaning there is a competition between the regulation and the objective to reduce pesticide use given by the same governmental offices. Finally, about the perspectives of MD development, we show that if they have no problem to say they will use MD in the long term (but without any engagement to do it), it is more complicated in the short run. The main part of refusals being due to the cost, the efficiency and lack of council, that we are interpreting as excuses used by people with lack of knowledge and experience about MD when these arguments are not cited by experienced people. These interesting preliminary results are encouraging to analyze deeper MD diffusion process.

References:
ATV 49, Association Technique Viticole, 18 avril 2012, INFO Viti’bio n°3.


