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Full Research Article

Do japanese citizens move to rural areas seeking a slower life? Differences between rural and urban areas in subjective well-being

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Abstract. For some time, individuals in multiple contexts have been moving from rural to urban areas for economic reasons. In recent years, however, young people in Japan have been increasingly turning to rural areas to embrace a slower, less-hectic lifestyle. Despite this interesting development, researchers have thus far failed to identify determinants of residents' well-being in rural and urban areas in Japan. Moreover, recent empirical work has shown that stated happiness or subjective well-being (SWB) can serve as an empirical proxy for perceived utility. To expand upon this line of research, in this paper, I use SWB to gauge disparities between the Japanese rural and urban environments. In addition, I determine how natural capital and social capital affect SWB for both rural and urban residents. Results show that on average, rural residents report higher SWB than urban residents despite low average income. I also identify multiple factors other than household income that affect SWB; these relationships are particularly pronounced for rural residents. Finally, results demonstrate that residents that migrate from urban to rural areas reported high levels of SWB. Taken together, the results of this study provide new insight into rural values and the attractiveness of rural residency.

Keywords. Happiness, subjective well-being, natural capital and social capital.

JEL codes. I31, D63, Q15.

1. Introduction

Japan is one of the first countries in the world to face problems associated with depopulation. The "Masuda Report" (Masuda, 2014) generated significant interest throughout Japan with its prediction that nearly half of all Japanese municipalities may disappear due to population decline and the inability to maintain administrative functions. Because the municipalities at risk for disappearance are mostly located in rural areas, the need to cope with rural community issues has come to the fore for policy makers.

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Contrary to the findings of the Masuda Report, a recent opinion poll showed that a growing number of young Japanese urbanites wish to settle in rural areas (Cabinet Office of Japan, 2014), indicating a general interest among Japanese citizens to embrace a rural lifestyle. This interest in rural living was not always pervasive. In the 1980s, Tokyo served as the center of the Japanese population, causing overconcentration there. In turn, the concentration of urban functions in Tokyo resulted in substantial income disparity between citizens in urban and rural areas.

Despite the economic benefits of living in an urban area, a growing number of people have begun to leave cities in search of better lives in rural areas (Ministry of Internal Affairs and Communication of Japan, 2017). To illustrate, the aforementioned opinion poll showed that the proportion of Japanese citizens interested in living in rural areas increased from 21% in 2005 to 32% in 2014 (Cabinet Office of Japan, 2014). This trend was particularly pronounced for young people. The return of young citizens to rural areas could revitalize these areas and improve Japanese agriculture on the whole. To date, the Cabinet Office has not performed an econometric analysis to determine which variables affect citizens' motivations for returning to rural areas. Still, the results of the survey suggest that increasing interest in rural residence among young citizens may be a result of shifting perceptions regarding that which makes living conditions attractive and changing values. Internationally, researchers and policymakers have widely accepted that not only that food is the key product of agriculture, but also there are other benefits of agriculture. Taken together, these benefits have come to describe "multifunctionality" of agriculture (Organization of Economic Co-operation and Development [OECD], 2001 and 2003).

Past research by agricultural economists on multifunctionality has largely focused on "visualizing value" in monetary terms through Stated Preference and Revealed Preference methods. These researchers have not sufficiently explored (a) which elements of rural areas contribute to well-being, or (b) how these variables are related. These questions are of utmost importance, given recent emphasis on the use of ecosystem services[1], which relate to the association between ecosystems and well-being (TEEB D0). In short, ecosystem services directly or indirectly support our quality of life.

In the last decade, the economic literature has experienced the emergence of a new research agenda that uses subjective questions to measure individual well-being. Some of this work has provided support for a link between factors related to the regional environment (e.g., air quality, green space) and well-being. Given the emergence of this link, the purpose of this paper is to use subjective measures to compare urban and rural residence in terms of well-being. In doing so, I will show how rural characteristics affect subjective well-being (SWB), which may influence Japanese citizens' motivations for migrating from urban to rural areas. As an empirical indicator of utility, happiness data permit comparison of urban and rural areas to a degree greater than traditional economic indicators (e.g. GDP).

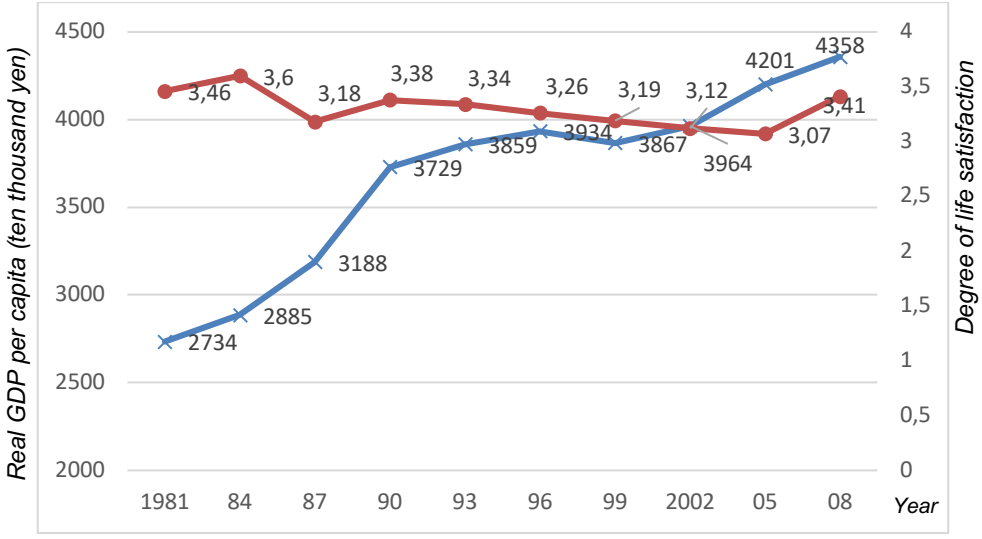
[1] Ecosystem services can be classified into one of four main categories: provisioning services, regulating services, habitat services, and cultural services. Provisioning services relate to products obtained from ecosystems, including food, fresh water, wood, fiber, genetic resources, and medicines. Regulating services are defined as the benefits obtained from the regulation of ecosystem processes. These include climate regulation, natural hazard regulation, water purification and waste management, pollination, and pest control. Habitat services emphasize the importance of ecosystems to provide habitats for migratory species and to maintain the viability of gene pools. Cultural services include non-material benefits that people obtain from ecosystems, including spiritual enrichment, intellectual development, recreation, and aesthetic enjoyment.

To address the issues outlined above, the remainder of the article is organized in a series of interrelated sections. Section 2 features a review of research on SWB, with a particular emphasis on differences between rural and urban areas. In Section 3, I describe the data and empirical model used to test these differences. Following this, I report the results of the econometric analysis in Section 4. Finally, in Section 5 I discuss the limitations of the analysis and offer some concluding remarks.

2. Subjective well-being research: rural vs. Urban areas

The Easterlin paradox is a key concept in happiness economics. Related to the relationship between economic variables and well-being, Easterlin (1974) showed that within developed nations, reported happiness was not significantly associated with per capita GDP. This paradox has recently manifested in Japan, where survey data has shown that happiness levels have not risen in parallel with increases in income (Cabinet Office, 2008: Figure 1). In short, these data show that economic wealth does not necessarily determine the degree to which one is satisfied with his/her life.

Figure 1. Japanese real GDP per capita and the Degree of Life Satisfaction.



Source: Cabinet Office 2008.
(Notes)
1. Compiled from the Cabinet Office "National Survey on Lifestyle Preferences," "Annual Report on National Accounts" (Data before 1993 is compiled from 2002 report and data after 1996 is compiled from 2006 report), and the Ministry of Internal Affairs and Communication "Population Statistics".
2. "Degree of Satisfaction" is calculated as follows: The question, "Are you satisfied with life or not?" was answered using five scales from "Satisfied" to "Unsatisfied." The weighted average of each answer was indexed into "Degree of Satisfaction."
3. The respondents represent both sexes from the age of 15 to 75. (Excludes "do not know" and "no answer").

Happiness research based on self-reports of life satisfaction has made significant contributions to our understanding of how people conceptualize well-being beyond their consumption habits. In addition, the growing literature on SWB has thus far focused on degree and determinants of happiness. This is useful in a variety of fields that inform policy (Bok, 2010).

Despite the growing literature on SWB and happiness, studies that focus on rural areas, agriculture, and their respective relations to SWB are scarce. In one of the rare studies to explore these associations, Baaske *et al.* (2009) surveyed 18,000 citizens in 60 municipalities to show a close relationship between farming performance and perceived quality of life. This finding reiterates that agriculture is one of the most significant predictors of quality of life within a municipality.

In another example, a team of researchers from the University of Évora and Cardiff University have been conducting a survey in rural Portugal to measure SWB. These researchers have surveyed local farmers and other community members using a place-based approach. To evaluate causality between SWB and agriculture, the researchers plan to add specific questions on agriculture to complement general questions about SWB (Surove *et al.*, 2012). In addition, although multiple researchers have measured SWB in the rural areas of developing countries (e.g. Markussen *et al.*, 2014 in Vietnam; Dedehouanou *et al.*, 2011 in Senegal; Guillén *et al.*, 2006 in Thailand), none of these studies have compared rural areas with urban areas in terms of SWB.

In a similar line of research, Tsutsui *et al.* (2009) compared large Japanese cities (the 13 largest in Japan), medium-sized cities (>100,000 residents), and other cities/towns/villages in terms of SWB. Their results show that on average, the size of the city positively corresponded to respondents' reported SWB. This finding is not consistent across all studies, however. For example, Hellevik (2003) found no significant difference between rural and urban residents in Norway with respect to reported SWB.

All studies that have evaluated differences in SWB between rural and urban residents delineated respondents contingent on the province or prefecture in which they lived. Despite the convenience this method offers, classification based on administrative boundaries may not highlight how rural and urban areas differ in terms of how they moderate the relationships between multifunctionality conservation, social capital, and migration on SWB. Given the specificity of the SWB construct, greater nuance with respect to respondents' locations may reveal significant effects on SWB that would otherwise remain hidden. This is especially true in Japan, where capturing one's residential environment is difficult using any standard means due to Japan's geographic diversity.

Given the shortcomings of past research, this paper offers two key contributions to the literature. First, it features a comparison of rural and urban residents' SWB using "subjective" classifications of urban and rural areas. Specifically, respondents are classified as rural or urban based on their own self-reports. Delineation of rural areas from urban areas has always been a controversial endeavor. One criterion for disaggregating urban and rural areas is the presence of Densely Inhabited Districts (DIDs), which have been accounted for since the 1960 Population Census of Japan. This criterion would dictate that areas that have not been classified as a DID are rural in kind. Despite the simplicity of this solution, land use in Japan is complicated; farmland is often scattered across multiple kinds of districts, even in Tokyo. Furthermore, even areas designated as DIDs are often

surrounded by farmland. Therefore, it is not appropriate to distinguish urban and rural areas as a function of their DID-status[2].

Second, this classification protocol will allow for the identification of rural characteristics and individual experiences that affect SWB. The recent movement in Japan for residents to return to rural areas is affected by the multifunctional value of rural land, but no researcher has attempted to identify variables that affect rural and urban residents. The increased understanding that will derive from this analysis can potentially contribute to rural-development policy planning.

3. Empirical application

3.1 Econometric model

Consistent with most extant studies in this domain, in this paper, SWB is operationalized with participants' responses to the following question: "How dissatisfied or satisfied are you with your life overall?" Responses to this question were posed as an 11-point Likert scale ranging from 0 (not at all satisfied) to 10 (completely satisfied).

The first step in this life-satisfaction approach is to estimate a micro-econometric SWB model in which SWB is estimated as a function of socio-economic and demographic variables, factors related to natural and social capital, and other control variables. The model takes the form of an indirect utility function for individual i in location k:

$$SWB_{i,k} = \beta_0 + \beta_1 \, ln(y_{i,k}) + \beta_2 \, x_{i,k} + \beta_3 \, a_{i,k} \qquad i = 1 \ldots I, \, k = 1 \ldots K \tag{1}$$

In this model, $y_{i,k}$ represents household income; x is a vector of a wide range of socio-economic and demographic characteristics other than income, including relative income, age, marital status, employment, health status, and migration experience; and a_{ik} depicts respondents' attitudes towards rural natural capital and social capital (Brereton *et al.*, 2008; Ambrey *et al.*, 2014). For the purposes of this paper, I estimated Eq. (1) as an ordered logit model. As such, SWB is assumed to be a categorical variable, making it impossible to directly observe happiness levels. Instead, I could determine only the range of values in which respondents' happiness levels lie.

3.2 Data

The empirical model used in this study is guided by existing studies on SWB. Data for the model were collected in October of 2014 via an Internet survey in which I asked

[2] According to the Japanese Ministry of Agriculture, Forestry, and Fisheries' (MAFF) "Classification of Agricultural Area," "rural areas" refer to areas that are not "urban areas." The MAFF approach involves using rural areas as a unit of classification. In contrast, the OECD uses the prefecture (of which there are 47 in Japan) as a unit of classification. Both the MAFF and OECD approaches are based on an area's population density (OECD, 2009). Hayashi and Sasaki's (2015) classification is similar to the OECD's; they identified 14 rural prefectures, 21 intermediate prefectures, and 12 urban prefectures. Regardless of how different approaches delineate rural and urban areas, none of them captures the specific elements that affect SWB (Hayashi and Sasaki, 2015).

participants questions related to their perceptions of SWB, demographics, socio-economic factors, and personal attitudes.

The OECD's Guidelines on Measuring Subjective Well-being (OECD, 2013) contend that although economic variables, demographic variables, and quality of life affect SWB, many other issues (e.g., measuring personality traits) are complex. As a result, the OECD did not provide recommendations in relation to these complex issues. Nevertheless, recent research has shown conscientiousness to be the strongest predictor of life satisfaction among the Big Five personality traits (i.e. Tanksale, 2015). Because the Big Five personality traits are important predictors of political and social attitudes, in addition to typical variables that have appeared in past SWB studies, I also added questions to measure respondents' thoughts regarding the conservation of natural capital and expectations for food, agriculture and rural issues in the coming decade.

I administered this survey with the Policy Research Institute in the Ministry of Agriculture, Forestry and Fisheries in Japan through a consumer monitoring company with access to 2.3 million registered subjects. The survey platform randomly selected respondents based on the demographics of each prefecture by ensuring the sex and age ratios of participants reflected those of Japan overall. In total, 1,500 Japanese participants aged 20 to 64 provided data. To collect data concerning SWB, the survey included a question asking individuals "How dissatisfied or satisfied are you with your life overall?" Table 1 provides summary statistics for all explanatory variables used in the estimation. Explanations of all explanatory variables in the empirical model are offered in the following subsections.

3.2.1 Socio-economic characteristics

Socio-economic variables in the model include age, marital status, health status, income, and relative income. I selected these variables based on past research on SWB. The survey also included questions related to participants' places of residence; they were asked to indicate if they lived in a rural area, sub-rural area, suburban area, or urban area.

3.2.2 Awareness and personal thoughts concerning natural capital and social capital

Respondents provided answers to questions meant to capture the respective determinants of SWB for rural and urban residents. These items relate to the conservation of natural capital and the perceptions of their living environment's social capital. The items concerning natural capital test participants' awareness toward natural capital conservation, which is a summation of answer towards degree of awareness for eight types of key elements of Multifunctionality in agriculture[3]. Questions related to social capital measure how much respondents trust their neighbors ("number of trustable person") and how much respondents help others ("degree of norm of reciprocity") in their region of residence. I selected these questions based on a MAFF policy report focusing on social capital in rural areas (Japanese Ministry of Agriculture, Forestry and Fisheries, 2007). While

[3] 1. Conservation of Land, 2. Fostering Water Resources, 3. Preservation of the Natural Environment, 4. Development of Favorable Landscapes, 5. Maintenance of Cultural Heritage, 6. Recreation/Relaxation, 7. Viability of Rural Community, 8. Food Security (MAFF-Japan, http://www.maff.go.jp/e/nousin/tyusan/siharai_seido/s_about/cyusan/tamen/).

Table 1. Definition of variables and descriptive statistics.

Variable	Definition	Mean	Max	Min	Std. Dev	Observations
SWB	Reported current life satisfaction (happiness) by integers from 0 to 10. Based on the following survey question "Overall, how happy are you these days?" The respondent is to choose from a scale of 0 to 10, where 0 is "very unhappy," 5 "neither happy nor unhappy" and 10 is "very happy"	5.823	10	0	2.230	1500
Age	Age of respondents in years	43.147	64	20	12.508	1500
Age squared/100	Age of respondents in years squared/100	20.180	40.96	4	10.843	1500
Unemployed/seeking	Dummy variable = 1 if respondent is currently unemployed and seeking a job	0.066	1	0	0.248	1500
Married	Dummy variable = 1 if respondent is legally married	0.590	1	0	0.492	1500
Very good health	Dummy variable = 1 if respondent's health condition is very good	0.108	1	0	0.310	1500
Good health	Dummy variable = 1 if respondent's health condition is good	0.624	1	0	0.485	1500
Ln(income)	Natural log of household income	6.137	7.65	3.91	0.770	1246
Relative income	Dummy variable = 1 if respondent thinks their income is higher than the average income in the neighborhood	0.341	1	0	0.474	1500
Citizen in urban	Dummy variable = 1 if respondent subjectively believes him/herself to live in an urban area	0.287	1	0	0.452	1500
Citizen in suburban	Dummy variable = 1 if respondent subjectively believes him/herself to live in a suburban area	0.402	1	0	0.490	1500
Citizen in subrural	Dummy variable = 1 if respondent subjectively believes him/herself to live in a subrural area	0.216	1	0	0.412	1500
Citizen in rural	Dummy variable = 1 if respondent subjectively believes him/herself to live in a rural area	0.079	1	0	0.270	1500
I turn	Dummy variable = 1 if respondent experienced urban-to-rural migration	0.033	1	0	0.178	1500
U turn	Dummy variable = 1 if respondent experienced returning to the countryside in home town	0.097	1	0	0.297	1500
J turn	Dummy variable = 1 if respondent experienced returning to the countryside other than home town	0.035	1	0	0.185	1500
MF conservation	Degree to which respondents recognize the importance of agriculture's multifunctionality (Index of eight elements of agricultural multifunctionality)	17.971	24	0	4.527	1500

Variable	Definition	Mean	Max	Min	Std. Dev	Observations
Farmer	Dummy variable = 1 if the respondent is a farmer	0.062	1	0	0.241	1500
Farmland	Dummy variable = 1 if respondent resides in an area that is less than a 15-minute walk to farmland	0.611	1	0	0.488	1500
Food/Agri perspective	Expectations for state of food, agriculture and rural issues in the coming decade (higher values reflect more optimistic expectations)	7.968	21	0	3.618	1500
Neighbor friendliness	Perceptions of friendliness within the neighborhood (Scale = 0–3)	1.239	3	0	0.788	1500
Trust person	Number of trustable persons in the neighborhood (Scale = 0–3)	0.876	3	0	0.739	1500
Norms of reciprocity	Degree of norms of reciprocity	0.269	1	0	0.443	1500
Shock	Frequency with which respondent experienced a shocking event in the previous five years (Scale = 0–4)	1.145	4	0	1.284	1500
Risk aversion	Degree to which respondent wishes to avoid risk (Scale = 0–10)	5.761	10	0	2.298	1500
Satoyama	Satoyama Index (SI) of respondent's resident area (10 km × 10 km).	0.238	0.592	0.003	0.123	1500
Population decrease	Dummy variable = 1 if respondent expects the population of young women (aged 20 to 39) within his/her municipality to decrease by more than half its current level in the next 30 years	0.052	1	0	0.222	1500

Ferre-i-Carbonell and Gowdy (2007) evaluated the relationship between subjective measures of well-being and individual environmental attitudes, the current study also included variables related to social attitudes.

3.2.3 Migration from urban to rural areas

In Japan, a "U turn" refers to the migration of people who return to their hometowns to settle down and earn a living after working or studying in cities. In contrast, the "I-turn" refers to unidirectional movement out of urban areas. One final migration pattern is called the "J-turn," wherein a person leaves the city to move to a rural area other than his/her birthplace. The questionnaire included a question related to the type of migration participants engaged in. This variable was operationalized as a control variable, as migration type may exert an effect on SWB.

3.2.4 Preference parameters

Items related to respondents' aversion to risk were also incorporated into the model as controls. I included these variables because respondents' happiness may relate to these preference parameters (Tsutsui *et al.*, 2009).

3.2.5 Objective indicators

In addition to the subjective data gleaned via the above questions, I also included several objective measures as predictors in the model. First, I included the Satoyama Index (SI) to indicate the 100-sq. km area (10 × 10 km) in which a resident resides. SI was included because it can serve as a proxy designed to capture the richness of different geographic regions; "a high SI value is an indicator of high habitat diversity, which is characteristic of traditional agricultural systems, including Japanese Satoyama landscapes, while a low value indicates a monotonic habitat condition typical of extensive monoculture landscapes" (Kadoya and Washitani, 2011, pp. 20). Second, I included a predictor in the model that reflects the rate at which the population in certain regions decreases due to an outflow of young women. Because aging and decreasing fertility rates are serious problems in Japan, their salience can affect SWB. If the population of young females is in decline, the capacity for the Japanese population to replenish itself declines in parallel (Masuda, 2014).

4. Results

4.1 Estimation results: whole sample

The largest portion of the entire sample indicated that they were neither happy nor unhappy (5 on the Likert scale), followed closely by a slight leaning towards happiness (7 and 8 on the Likert scale; see Figure 2). The result is consistent with previous survey data provided by Japanese citizens (Cabinet Office, 2011). Western European countries differ. Most respondents in Western Europe mark 8 on the Likert scale, indicating slightly happier respondents. Although these differences between Japanese and European data are interesting, comparing SWB across nations should be done with caution and a consideration of cultural factors that may influence responses (Diener and Oishi, 2004).

Following the comparison of the overall sample, I then compared urban and rural respondents based on their reported levels of happiness (see Table 2). Respondents were classified into one of four categories, all of which were based on participants' subjective perceptions. These four categories are citizen in urban areas, citizen in suburban areas, citizens in subrural areas, and citizens in rural areas. Rural residents reported a slightly higher happiness level ($\mu = 6.04$) than their urban counterparts ($\mu = 5.82$), despite the latter having higher household income. However, an analysis of variance (ANOVA) failed to show statistically significant differences between the four categories (p-value = 0.35).

For the sake of simplicity, I combined the samples of urban and suburban citizens into one larger "urban citizen" category. I similarly combined the samples rural citizens and subrural citizens into a larger category of "rural citizens." Following these combinations, I evaluated the relationship between income level and SWB (see Figure 3). Results of the survey reveal a positive relationship between income level and SWB for urban residents, but this correlation is weak for rural residents. These findings suggest that income may be a contributor to SWB for urban residents, but rural residents seek out other factors for their SWB.

Figure 2. Distribution of SWB scores in comparison with urban and rural residents.

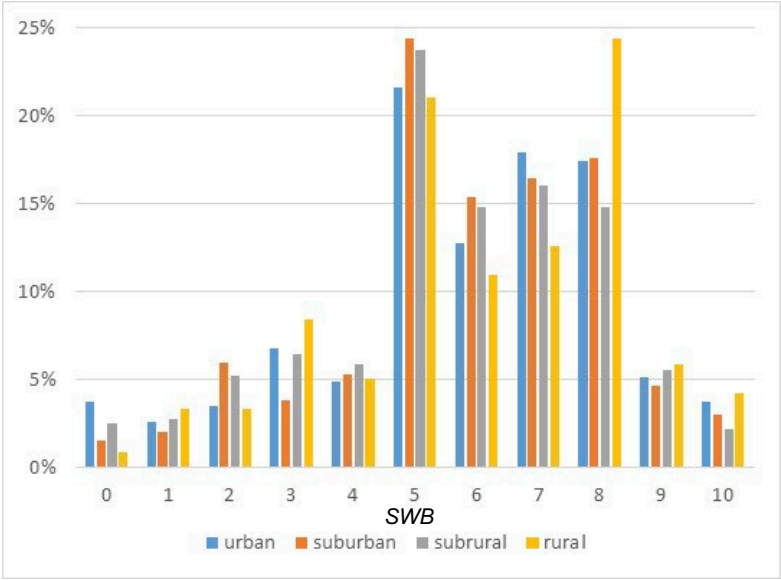


Table 2. Respondents' reported levels of SWB by category.

	Sample	Average	Variance
Urban Citizen	430	5.82	5.47
Suburban Citizen	603	5.88	4.55
Subrural Citizen	324	5.66	4.98
Rural Citizen	119	6.04	5.19
All sample	1500	5.82	4.97

Consistent with past work on SWB, I developed an ordered logit regression model to examine how multiple factors influence SWB. In this model, the main predictor variable was area of residence (i.e., urban vs. rural) and the outcome variable was SWB. Although we were primarily interested in the effect of area of residence on SWB, we also included other predictors in the model. For instance, we tested whether migration from urban to rural areas (i.e., UJI turns) influences SWB. Other important variables relate to individual respondents' relationships with the rural areas in which they reside. In the original iteration of the analysis, I included several additional agriculture related variables such as experience and frequency to participate rural activities, but ultimately removed them to avoid multicollinearity and endogeneity. Although instrumental variables can be included to avoid potential inaccuracy, there exists no consensus on which combination of variables should be used to predict SWB. In addition to the standard logit regression model, I also performed inverse probability of treatment weighting (IPTW) and propensity score (PS)

Figure 3. Distribution of Average SWB score in each income group.

matching to better understand the relationship between residential area and SWB (see Section 4.3).

Table 3 presents the main results produced by the logit regression model. The pseudo-R^2 value of 0.072 is comparable to previous work in this domain (e.g. Ambery and Fleming, 2011), suggesting that the model has an acceptable level of explanatory power.

Results of the logit regression analysis show that an individual's area of residence (i.e., rural = 1, urban, suburban and subrural = 0) has a positive effect on SWB. None of the variables related to citizen migration (i.e., the UJI turns) were statistically significant predictors of SWB across the entire sample, but the following section evaluates rural and urban residents independently. In relation to agriculture related variables, the results suggest that if respondents (a) are aware of the importance of agriculture's multifunctionality and/or (b) envise a bright future for Japanese food and agriculture, they experience higher SWB. With respect to the socioeconomic predictors, age, unemployment, health condition, income, and relative income all exert significant influence on SWB. All social control variables—degree of friendliness with neighbors, number of trusted persons and degree of norms and reciprocity—similarly exert significant, positive effects on SWB.

4.2 Estimation results: Rural and urban residents

After performing the logit regression on the entire sample, I then replicated the analysis independently on the rural and urban resident samples. These analyses respectively yielded pseudo-R^2 values of 0.075 and 0.094, which indicate that both models had satisfactory levels of explanatory (see Table 4).

Table 3. Results of the ordered logit model across all respondents (Dependent variable: SWB).

Variable	Coefficient	p-value	
AGE	-0.058	0.060	*
AGE_SQUARED_100	0.066	0.061	*
UNEMPLOYED_SEEKING	-0.695	0.002	***
MARRIED	0.675	0.000	***
VERY_GOOD_HEALTH	1.241	0.000	***
GOOD_HEALTH	0.693	0.000	***
INCOME	0.000	0.022	**
RELATIVE_INCOME	0.826	0.000	***
I_TURN	0.346	0.226	
U_TURN	-0.098	0.586	
J_TURN	0.110	0.686	
MF_CONSERVATION	0.037	0.004	***
FARMER	-0.246	0.258	
FARMLAND	-0.345	0.002	***
PERSPECTIVE_FA	0.046	0.002	***
NEIGHBOR_FRIENDLY	0.137	0.093	*
NO.__TRUST_PERSON	0.164	0.049	**
NORMS_OF_RECIPROCITY	0.397	0.001	***
SHOCK	-0.141	0.002	***
RISK_AVERSION	0.103	0.000	***
SATOYAMA	-0.686	0.102	
POP_DECREASE	-0.099	0.663	
CITIZEN_IN_RURAL	0.420	0.042	**
Pseudo R-squared	0.0726		
Sample	1498		

Note: ***p < .01, **p < .05, *p < .10.

For some variables, significant differences between urban (urban and suburban) and rural (rural and subrural) residents emerged.

First, among rural residents, there was a significant parabolic (i.e., U-shaped) relationship between age and SWB. This result may be attributable to elderly respondents' desire to move to a more peaceful residence in their final years.

Second, consistent with the correlational results reported in Section 4.1, I found that household income is significantly and positively related to SWB. This result is consistent with many previous studies that have revealed a significant relationship between income and SWB. The analyses presented in this study, however, indicate that this phenomenon applies only to urban residents. Interestingly, there was a positive correlation between *relative* income and SWB for both urban and rural residents.

Third, with respect to respondents' migration experiences, I found that respondents who moved to the rural via an "I-turn" tend to have higher SWB than their "U-turn" and "J-turn" counterparts. People who performed an "I-turn," which refers to unidirectional

movement out of an urban area to a rural area, were mostly between the ages of 20 and 40. These residents may no longer require growth in material wealth, but seek durable human communities and living environments characterized by nature. In this way, the observed I-turn may result from fundamental changes in young people's values within the "de-growth" movement.

Fourth, the analyses also produced several notable findings concerning natural and social capital. Urban residents with strong attitudes concerning conservation of the rural environment reported high levels of SWB. Similarly, urban residents with optimism towards future Japanese agriculture had high SWB, on average. Interestingly, there was no relationship between attitudes towards conservation and SWB among rural citizens. This result may demonstrate that rural residents do not seem to realize the value of natural capital in their own backyards. City residents within 15 minutes walking distance of farmland reported low SWB. In Japan, agricultural land use is common, even in urban areas across the country. This finding may be attributable to difficulties associated with managing farmland in urban areas, including the use of pesticides, noise from agricultural machines, or dust. However, urban residents have recently come to recognize the importance of the social and environmental functions of urban agriculture, and the benefits related to rural farmland (e.g. open space for disaster management, resources for recreation and education) have been promoted nationally. Issues related to social capital also seemed to exert influence on SWB, as some of these factors (i.e. degree of friendliness with people in the neighborhood, number of trustable people) were positively associated with rural residents' SWB.

Fifth, with respect to the preference-based predictors, risk-averse individuals in both rural and urban environments reported high SWB. This result was consistent with past studies (e.g. Tsutusi *et al*., 2009)

Finally, the associations between the objective variables and SWB produced unclear results. For instance, there was no clear relationship between the Satoyama Index and SWB. Decreases in population negatively affect SWB, but only for urban residents. This finding supports the work of Glaeser *et al*. (2016) who found that residents of declining cities appear less happy than residents of other areas (e.g. the American Rust belt).

In addition to identifying factors that influence current SWB, I also estimated an ordered logit regression model to predict *future* SWB. Although there were many similarities to the analysis of factors that affect current SWB, there was one key difference. Rural and urban respondents who were optimistic about future Japanese agriculture also reported high levels of future SWB.

4.3 Using propensity score methods to estimate the effect of rural residence on SWB

Past correlational studies have shown that there are differences between rural and urban residents in their SWB. However, past work has not provided evidence to show that one's area of residence is causally antecedent to SWB. Given this gap in the literature, I supplemented traditional regression methods with inverse probability of treatment weighting (IPTW) using the propensity score to better represent the relationship between an individual's area of residence and his/her SWB.

Propensity score methods compare individuals in different treatment conditions by testing differences in their average scores. Originally developed by Rosenbaum and Rubin

Table 4. Ordered Logit Model results by resident type (Dependent variable: SWB).

Variable	Urban Residents		Rural Residents	
	Coefficient	p-value	Coefficient	p-value
AGE	-0.040	0.292	-0.134	0.022 ***
AGE_SQUARED_100	0.050	0.249	0.138	0.039 ***
UNEMPLOYED_SEEKING	-0.755	0.007 ***	-0.726	0.094 *
MARRIED	0.583	0.000 ***	0.898	0.000 ***
VERY_GOOD_HEALTH	1.415	0.000 ***	1.116	0.002 ***
GOOD_HEALTH	0.755	0.000 ***	0.579	0.011 **
LN_INCOME_	0.211	0.026 **	0.013	0.930
RELATIVE_INCOME	0.857	0.000 ***	0.858	0.000 ***
I_TURN	-0.896	0.032 **	1.300	0.001 ***
U_TURN	-0.262	0.300	-0.098	0.704
J_TURN	-0.041	0.896	0.573	0.327
MF CONSERVATION	0.048	0.004 ***	0.009	0.677
FARMER	0.146	0.685	-0.357	0.195
FARMLAND	-0.405	0.001 ***	0.119	0.778
PERSPECTIVE_FOOD and AG	0.048	0.010 ***	0.029	0.258
NEIGHBOR_FRIENDLY	0.066	0.525	0.298	0.034 **
NO._TRUST_PERSON	0.041	0.697	0.457	0.002 ***
NORMS_OF_RECIPROCITY	0.436	0.003 ***	0.403	0.081 *
SHOCK	-0.113	0.037 **	-0.195	0.019 **
RISK_AVERSION	0.124	0.000 ***	0.102	0.015 **
SATOYAMA	-0.303	0.552	-1.659	0.033 **
POP_DECREASE	-0.651	0.040 **	0.457	0.181
Pseudo R-squared	0.075		0.094	
Sample	850		380	

Note: ***p < .01, **p < .05, *p < .10.

(1983), PS matching has been used in several other fields (Binder and Freytag, 2014; Barra *et al*., 2016) and can be applied to research questions concerning SWB. To identify any causal relationships between rural residence and SWB, we used a matching estimator. To simplify the interpretation of the results, we created a dummy variable that adopts the value of 1 if an individual reports a SWB-value greater than 8, and 0 otherwise. Using this dummy variable, we performed an IPTW analysis with a Cox proportional hazards (PH) model, as well as a logistic regression that relies on IPTW. We then used the logistic regression model to estimate the propensity score for each subject.

Results produced by the IPTW Cox proportional hazards (PH) model indicated an estimated hazard ratio of 0.701 (95% CI: 0.420-1.171, p = 0.148), and a non-significant effect of rural residence on SWB.

In contrast, the IPTW logistic regression model produced an odds ratio of 0.635 (95% CI: 0.372-1.002, p < .10). This result suggests a marginally significant, positive, causal association between rural residence and SWB.

5. Conclusions

In this paper, I used subjective classification standards to compare rural and urban residents in terms of their SWB. Results suggest that on average, rural residents have higher SWB than their urban counterparts, despite higher average income among the latter.

By using an ordered logit estimator, I demonstrated that for rural residents, factors other than household income significantly predict SWB. In addition, urban residents with high awareness of the conservation of natural capital reported high levels of SWB. This finding is consistent with past work showing that beliefs and intrinsic religiosity significantly affect SWB (Barra, 2016). In contrast, for rural residents, some elements of social capital (i.e. friendliness with neighbors, number of trustworthy people) positively affect SWB. Past work has suggested that SWB depends on personal relationships, but the current study demonstrates that this association exists only for rural residents. Rural residents who migrated directly from urban areas reported high SWB. Taken together, these results provide new perspectives that are related to the values of rural residents, making rural areas attractive.

Furthermore, the results of the analysis using propensity score methods revealed that living in a rural area is causally antecedent to SWB. This result suggests that standard regression analyses do not satisfactorily capture these effects.

The results of the analysis provide evidence for the importance of conserving the rural environment for well-being: environmental conditions in respondents' residential areas and respondents' awareness of and attitudes towards conservation influence SWB differently in line with past researches (i.e. Kyoto University, 2013). In the current study, for example, the Satoyama index was not significantly associated with SWB, but positive attitudes towards the conservation of natural capital did exert a positive effect. Taken together, these results suggest that raising awareness of environmental issues is fundamental to maintaining SWB.

Finally, although this paper provides several new findings that can be used to inform policy, one limitation should be acknowledged. This study represents the first attempt to use data from Japanese respondents to compare urban and rural citizens in terms of their SWB. As a result, the results should be interpreted with caution. As argued by Hirschauer *et al*. (2015), the study of SWB in specific domains may help identify conditions that foster well-being, but it will inevitably raise questions as whether and how this research should inform policymaking in all contexts. Besides, the regional classification based on the self-report might severely limit its applicability for policy, even though other measures of regional classification have some limitations as well. Those who regard themselves as the residents of urban or rural are not necessarily those of urban or rural. Proposing the legislation affecting those people that think themselves living in urban or rural area seems meaningless. As such, the results reported here should encourage future applied research in other geographic regions.

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Full Research Article

SAM multipliers and subsystems: structural analysis of the Basilicata's agri-food sector

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Abstract. Local agri-food products are conceived as a form of cultural capital, representing potentially fruitful resources for rural development. Italy and its regions offer a rich and diverse agricultural and food heritage that has led to the creation of numerous quality agri-food systems. Despite their ability to absorb disturbances and maintain their functions, it is important to develop economic models targeted to analyse the relationships among the components of food systems, in order to identify their strengths and weaknesses and drive the implementation of sectoral policies. In view of the new Rural Development Programme (2014-2020), the aim of this work is to analyse the structure of the Basilicata's agri-food system using a multi-sector model based on a two-region SAM, specifically developed for Basilicata, an Italian region characterised by a highly specialised agri-food sector. Results show that the availability of a highly disaggregate multi-sector model of the regional economy may be a valuable supporting tool to design regional policies for innovation and for the development of rural areas, laying the foundation for further analysis.

Keywords. Rural development, agri-food systems, multi-sector model, SAM multipliers, subsystem approach.

JEL codes. E16, R15.

1. Introduction

Agri-food is considered as one of the most crucial sectors for economic growth, as it is the main source of livelihood that makes growth possible (Dethier and Effenberger, 2012; Schultz, 1964). Over the last few years, different studies have emphasised the contribution that agri-food can make for rural development, on the regional scale (Ilbery and Kneafsey, 2000; Kneafsey *et al*., 2001; Marsden *et al*., 2000; Murdoch *et al*., 2000; Parrott et al., 2002; Tregear *et al*., 2007).

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Local agri-food products are conceived as a form of cultural capital; according to the principles of the endogenous development theory (Ray, 1998; Terluin, 2003), they represent potentially fruitful resources for development, as they can incorporate and add value to many local resources with features that are peculiar to a specific area (Brunori and Rossi, 2000; Marsden *et al*., 2000).

This awareness, combined with the growing consumers' demand for healthy and safe food, has induced producers to explore new ways of doing business, through initiatives that take over the idea that localised agri-food systems could provide not only economic but also social and environmental benefits, thereby combining marketing with political, socioeconomic and cultural activities that improve collective well-being (Volpentesta and Ammirato, 2012).

In Basilicata region (southern Italy), agri-food makes a significant contribution to the regional economy in terms of output, employment and exports. The sector contributed €771 million in value added to the Basilicata economy in 2014 (ISTAT, 2016a). While its contribution to the regional economy is small relative to other sectors, the Basilicata agri-food sector is of strategic importance for the sustainable development of rural communities. The spatial distribution of the production activities, as well as the presence of potential food and wine tourism products with geographical designations (Bencivenga *et al*., 2016), provide it with a key role in sustaining remote rural areas through the generation of income and jobs.

Different elements show the presence of a valuable "quality" potential in the regional agri-food sector that may be exploited to increase the competitiveness of the regional economy. In the near future, the new 2014-2020 programming period of Rural Development Programme (RDP) will play a major role in enhancing innovation for agriculture, forestry and food industry providing financial support to business choices directed to improve economic and environmental performances, and promoting the organization of competitive food chains. The design and the implementation of regional policy, however, should be increasingly oriented by relevant knowledge on the structure of economy.

There are different approaches applied in the analysis of agribusiness[1]. Cook and Chadded (2000) describe their evolution linked to the agribusiness, agri-food system and sub-sector (filière) concepts. However, it is important to point out that any strategy of sectoral development should be based on top-down multi-sector approaches, which take into account the dynamics of the agri-food production activities within the wider regional economic system.

By the mid-1950s, Davis and Goldberg (1976) developed the "agribusiness" concept valuating the extent and amount of agricultural and industrial relationships, by the use of the Leonetief input-output (I-O) model. Since Davis and Goldberg's work, the input-

[1] According to David and Goldberg's definition (Davis and Goldberg, 1976), agribusiness includes three components: 1. the farm supplies aggregate including all intermediate consumptions of agriculture (backwards linkages of agriculture); 2. the farming aggregate composed by all operations of crop cultivation and livestock breeding at the farm level; 3. the processing and distribution aggregate composed by all operations of storage, processing and marketing of agricultural products both for food and non food uses. The processing component can be divide into two further components, the fiber processing and the food processing. This further decomposition of agribusiness allows to separate two subsystems: 1. the agri-food block, including a part of the farming aggregate (agricultural products for food production) and the food processing and marketing component ; 2. the agri-industry block composed by the remaining part of the farming aggregate (non food products) and fiber processing and marketing component.

output analysis has largely been used to study the structure of an economy both at the regional and national level. With reference to Italy, among others, Chang Thing Fa (1981) and Chang Ting Fa *et al.* (2013) use a triangulation method of I-O tables to analyse the structural change of the agribusiness at Italian and European level, respectively. Belletti (1992), using an I-O subsystem approach, analyses the agri-food sector in more detail studying the delocalization of the agri-food supply chain in Tuscany region. However, there are some limitations in using Leotief input-output approach. In the Leotief model, *"…the omission of the general equilibrium links relating output to factorial income and final consumption may be of critical relevance both in aggregate terms (lost gross output) and in the rank ordering of sectors (hierarchy shifting)"* (Cardenete and Sancho, 2006: 322).

These limitations can be overcome by extending the conventional I-O methodology in a Social Accounting Matrix (SAM) (Miller and Blair, 2009; Rocchi *et al.*, 2015; Viccaro *et al.*, 2015). In addition to the inter-industry transactions specific to input-output tables, a SAM include balanced accounts for factors, institutions (such as producers, consumers, government) and foreign sectors, closing the cycle of the income distribution and spending.

There are numerous examples of the use of SAM models in the context of agricultural and food analysis. Caskie *et al.* (1999) use a regional SAM to analyse the impact (in term of output, income and employment) of a reduction in the final demand in beef on Northern Ireland's economy. Psaltopoulos *et al.* (2006) evaluate the impact of CAP measures on rural development in Archanes area (Crete, Greece) using an inter-regional SAM. The possibility to decompose through multiregional model the multiplier effects in interregional and intraregional effects is helpful to understand in depth the differences in economy structure among regions, in this case between rural and urban areas. Other examples of SAM-based studies are reported in Rocchi (2009), Vega *et al.* (2014), Cardenete *et al.* (2014) e more recently Campoy-Muñoz *et al.* (2017).

The cited work by Cardenete and colleagues shows the effectiveness of multiplier analysis by using SAM models in order to avoid the "missing linkages" typical of the Leontief models.

Based on that, the objective of this work is to analyse the structure of Basilicata's agri-food sector using a multi-sector linear model based on a two-region SAM, specially developed for Basilicata.

Through the SAM multiplier matrix (Miller and Blair, 2009), we will evaluate the contribution of each production sector in the agri-food sector to the regional economy and after, following the sub-system approach proposed by Momigliano and Siniscalco (1982), we will analyse the shares of the production sectors represented in the model that are directly and indirectly committed to satisfy the final demand towards different categories of food. In the light of results of the analysis, a set of policy implication will be discussed.

In the following section the potential development linked to the "quality" of agri-food production in Basilicata is shortly discussed. Section 3 presents the SAM and describes the model used in the analysis. The main results are provided and discussed in section 4 while some final remarks are proposed to reader in section 5.

2. The "quality" potential of the agri-food sector in Basilicata

Basilicata's agri-food sector plays a major role in the regional economy, due to the significant weight of employment in agriculture and the wide range of typical and quality

agri-food products (eight products with a PDO/PGI), besides the number of farms and research bodies involved in the sector.

The share of the agriculture's contribution to the total value added is definitely the highest in Italy (5.4% against about 2% at the national level) (ISTAT, 2016a). Considering Basilicata's entrepreneurial community, the agriculture has the highest number of firms operating in the region (Table 1), which reflects, however, the small average size of agricultural holdings.

As to the food industry, its contribution to the overall value added is lower compared to agriculture (2.3%) achieving, however, one of the highest levels on the national scale: this is due to the fact that a large part of the sector still focuses on the production and trade of low value added agri-food products. The importance of the food industry within the regional economy can be clearly seen when considering the manufacturing sector only: food industry ranks just after the *automotive* sector, both in terms of value added produced (20% vs. 35%) and number of labour units employed (just over 3,200 against about 4,500) (ISTAT, 2016a); food industry is the first in terms of number of operating firms (Table 2), which are mainly small and medium enterprises.

The analysis of foreign trade enables an outline of the structure and trends of Basilicata's agri-food sector. The most interesting aspect is the reduction in imports recorded just after the economic crisis of 2007 till now, both for the agricultural products (-18%) and for food and beverages (-39%), combined with a significant increase in exports, equal to +24.5% for agriculture and +49% for the food sector (ISTAT, 2016b). Basilicata's food exports in 2015 were above EUR 36 million, mostly represented by bakery products accounting for 55% of exports (about EUR 20 million), followed by vegetable fats and oils, mainly olive oil (14%) and beverages (10%), basically related to wine exports.

Another important factor is the trend of food export observed over the last few years. Compared to the trend of the other manufacturing sectors (Figure 1), food is the only industry that has not been affected by the negative impact of the economic crisis of 2007, but rather continued to grow.

Table 1. Number and % of Basilicata's operating firms by economic sectors (2015).

Sector	n°	%
Agriculture	17,500	34%
Construction	6,161	12%
Other services	11,987	23%
Trade	12,428	24%
Manufacturing	3,818	7%
Total	51,894	100%

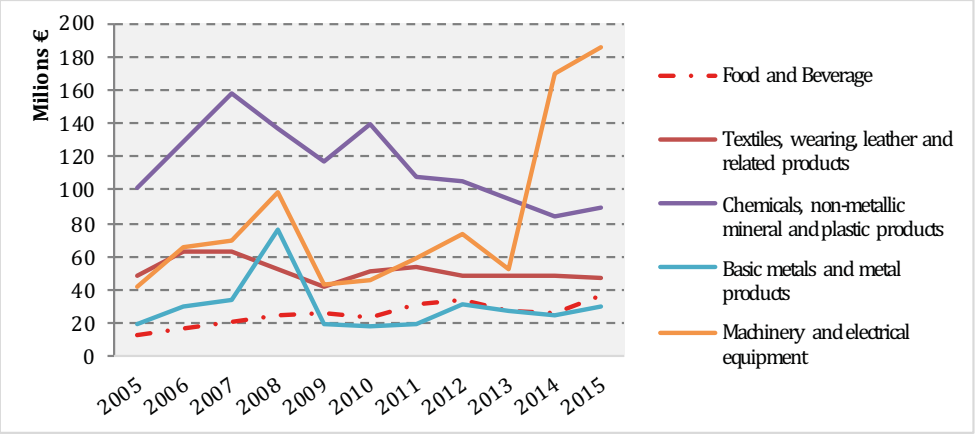
Source: own calculations on ISTAT data (ISTAT, 2016a).

Table 2. Number and % of Basilicata's manufacturing firms (2015).

Sector	n°	%
Food and Beverage	895	23%
Textiles, wearing, leather and related products	300	8%
Wood and of products of wood	553	14%
Chemicals and plastic products	112	3%
Non-metallic mineral products	308	8%
Basic metals and metal products	778	20%
Machinery and electrical equipment	266	7%
Motor vehicles, trailers and semi-trailers	39	1%
Others manufacturing	567	15%
Total	3,818	100%

Source: own calculations on ISTAT data (ISTAT, 2016a).

Figure 1. Trend of export of the main sectors of Basilicata's manufacturing industry[1] (2005-2015)



Source: own calculations on ISTAT data (ISTAT, 2016b).

[1] The graph does not show the automotive sector, due to a purely graphical reason, given the significant amount of exports (over 2.2 billion of euro in 2015). Even this sector, however, shows a drop just after 2007, with a gradual recovery starting only from 2014.

These positive results seem to have been affected by the quality upgrading of exported products and the subsequent strengthening of those factors, such as certified quality, innovation (organic products) and originality, which constitute the established strengths of image abroad.

A recent study on the commercial performance of regional agri-food sectors in Italy between 1991 and 2012 confirms the good performance of Basilicata in foreign trade, mainly related to the level of specialization of its productions (Platania *et al.*, 2015).

Evidence of the main regional specializations, in economic but also cultural and social terms, derives from some experiences of specialized territorial clusters with a broad production base, such as the *Distretto Agroindustriale del Vulture* (6,489 businesses covering 15 municipalities), the *Distretto Agroalimentare di Qualità del Metapontino* (7,430 businesses covering 12 municipalities), which have been operating since 2004, and the most recent rural districts (since 2010), including the *Distretto rurale di Pollino-Lagonegrese* (27 municipalities) and the *Distretto delle Colline e delle Montagne Materane* (19 municipalities).

These clustering systems, involving the largest part of the region, focus on quality specialized productions (wine, olive oil, mineral waters, dairy products, pork meat processing, fresh pasta, bakery products, fruit and vegetables and cereal production, preserved food, honey) and their promotion through tourism activities.

Considering the potential integration that agri-food production activities have with the tourism sector, tourist flows can be an asset in the forthcoming years to promote the development of Basilicata agri-food sector, especially with reference to the opportunities offered by "Matera 2019", event, when the town of "Sassi" will be European Capital of Culture. Based on a direct interview to the agribusiness operators working in Basilicata's agri-food districts, even though the event has not yet generated any impact on the sector, the

shared perception of operators is that it can offer good development opportunities in the forthcoming years.

A further aspect of interest that emerged from the interviews is the great attention the agribusiness operators attach to research, development, training and innovation in the sector. Indeed, based on the analysis conducted by the European Commission on the European regions' innovation capacity in 2014, Basilicata was classified as "Moderate Innovator" (European Commission, 2016).

Investments in innovation in order to improve the competitiveness of the sector (Contò *et al*., 2009) may be supported by the research institutions present in the region that are already operating in that direction. Other notable initiatives include the spin-offs coming out of research, recognized by the University of Basilicata since 2012 in the following areas: environment, new agri-food products (donkey milk) and innovative services.

Finally, the new 2014-2020 programming period of Rural Development Programme (RDP) represents an opportunity to increase the competitiveness of the regional economy, providing financial support to business choices directed to improve economic and environmental performances, and promoting the organization of competitive agri-food supply chains. In this context, the structural analysis of the Basilicata's agri-food sector presented in the following paragraphs will provide a set results with interesting policy implications.

3. Materials and methods

3.1 A two-region SAM model

In the present study, the structure of the regional agri-food sector has been analysed using a two-region SAM model (Basilicata vs. Rest of Italy) with a detailed disaggregation of accounts for agriculture and food industry production activities (see section 3.3 below).

The SAM (Miller and Blair, 2009) is a two-entry matrix recording the flows occurring between all actors of an economic system, in a given place and for a given time period (usually one year). Each row/column pair represents respectively the inflows and the outflows of a given account, so that by definition the matrix is balanced (the row totals must equal the column totals). A SAM may be considered as an expansion or a generalization of a Leontief input-output table. While in the latter, emphasis is laid on the production system, in the SAM the perspective is larger. The simultaneous representation of the accounts for production activities, production factors, institutions (households, firms, and public administration), capital formation and exchanges with the rest of the world makes it possible to follow the formation of value-added and its distribution and redistribution in the form of income to the institutions.

SAMs are crucial databases for many quantitative models (e.g. SAM linear models and Computable General Equilibrium models). Beside their statistical content, SAMs are a useful tool to evaluate policy interventions both at the national and regional level. Through the solution of a linear model (establishing an appropriate "closure rule": Miller and Blair, 2009), it is possible to analyse the structural features of the economy and calculate the impact that exogenous changes on single components have on the whole economic system. In our study, the closure rule considers as exogenous the accounts for national Government, capital formation and the rest of the world' so that the resulting SAM multi-

pliers take thus the value of Leontevian-Keynesian multipliers.

Let us consider the matrix of SAM coefficients of a single region "r" (Miller and Blair, 2009: 515):

$$S^{rr} = \begin{bmatrix} A & 0 & C \\ V & 0 & 0 \\ 0 & Y & H \end{bmatrix} \quad [1]$$

where A is the matrix of inter-industry technical coefficients, C is the matrix of endogenous final expenditure coefficients, V is the matrix of endogenous value-added factors shares, Y is the matrix of endogenous coefficients distributing income to institutions and H is the matrix of endogenous coefficients for income re-distribution among institutions.

The structure of the matrix of SAM direct coefficients of our two-region model, as in any two-region I-O model, is (Miller and Blair, 2009: 77-80):

$$S = \begin{bmatrix} S^{bb} & S^{bi} \\ S^{ib} & S^{ii} \end{bmatrix} \quad [2]$$

where the blocks along the main diagonal account for flows within the two regions (b = Basilicata and i = rest of Italy) while the blocks along the other diagonal represent the (commodity and financial) flows between the two regions.

By solving the linear system $x = Sx + f$ (where x is the vector of totals of endogenous accounts and f is the vector of exogenous account flows) for x, we have:

$$x = (I - S)^{-1}f \quad [3]$$

where $M = (I - S)^{-1}$ is the matrix of SAM multipliers.

Each coefficient quantifies the total increase for each account i deriving from a unit exogenous shock on the account j. Note that since the SAM-based model endogenizes transactions that not included in the input-output interindustry models, the SAM multipliers will generally result larger than the input-output ones.

The advantage of using a two-region disaggregation of accounts lies in the possibility of considering the rest of Italy as being endogenous to the model; this makes it possible to breakdown impacts on Basilicata's economy calculating not only the total but also the intra- and interregional impacts (spillovers and feedbacks). If the calculated matrix of multipliers M enables the estimate of the total impact, the breakdown of the matrix of accounting coefficients S into intraregional $\begin{bmatrix} S^{bb} & 0 \\ 0 & S^{ii} \end{bmatrix}$ and interregional elements $\begin{bmatrix} 0 & S^{bi} \\ S^{ib} & 0 \end{bmatrix}$ enables to calculate the following[2]:

Intraregional effects: $M_{\text{intra}} = (I - \tilde{S})^{-1}$ [4]

[2] For details of the multiplier decomposition for multi-region model see the chapter "Decompositions in an interregional context" (Miller and Blair, 2009: 286-288).

where $\tilde{S} = \begin{bmatrix} S^{bb} & 0 \\ 0 & S^{ii} \end{bmatrix}$;

Interregional spillover effects: $M_{spill} = I + S^{\star}$ [5]

where $S^{*} = \left(I - \tilde{S}\right)^{-1}(S - \tilde{S})$;

Interregional feedback effects: $M_{feed} = [I - (S^{*})^{2}]^{-1}$ [6]

3.2 The sub-system approach

Starting from the concept of *vertically integrated sector* (Pasinetti, 1973), the structural analysis of Basilicata's agri-food sector has been integrated by the sub-system I-O approach that makes it possible to study an individual sector, or group of sectors, that is considered a subsystem which interacts with the rest of the productive system (Belletti, 1992; Llop and Tol, 2013; Momigliano and Siniscalco, 1982; Montresor and Marzetti, 2010). In particular, we use the approach proposed by Momigliano and Siniscalco (1982), extending Belletti's work (Belletti, 1992) in a two-regional model.

The input-output approach is based on the representation of the interdependencies existing between different economic sectors. In fact, the level of activation of different production processes in the sectors of the economy depends not only on the final demand directed to them, but indirectly, via the circular flow of the economy, on the final demand directed towards all sectors. In the subsystem approach the production system is divided into blocks, constituted by the shares of the production sectors represented in the original matrix that are directly and indirectly committed to satisfy the final demand towards different categories of goods.

Let be A the matrix of accounting coefficients representing only the interdependencies existing among production sectors (industries) in the economy. The re-classification of economic quantities from the production sectors to the different "blocks" of the economy working to meet the final demand towards different sectors, may be carried out using the following "**B** operator" (Momigliano and Siniscalco, 1982: 155):

$$B = \hat{x}^{-1}(I - A)^{-1}\hat{f} \quad [7]$$

where the symbol ^ indicates diagonalisation. A generic element b_{ij} of the matrix B is the share of activity of the i sector triggered by the final demand directed to the j sector. Thus the sum of all rows of matrix B is 1, since the level of activation of different production sectors is completely covered by the production required by the final demand towards the whole production system.

Any economic quantity may be reclassified from sectors to "blocks" by multiplication, using the operator B. For instance, if l is the vector of employment in different sectors, the matrix L:

$$L = \hat{l}B \quad [8]$$

subdivides the labour employed in different sectors among different blocks ("subsystems") of the economy. Through matrix *L* it will be possible not only to assess the relative importance of different subsystems in terms of employment but also to characterise the composition of different subsystems in terms of "shares" of the original sectors. The same operation may be carried out using the vector of value added of different sectors.

The reclassification by subsystems is based only on the matrix of coefficients representing the interdependencies existing between different production sectors (the *A* submatrix in the right side of equation 1), implicitly using a Leontevian-type multiplier that does not consider feedbacks through consumption as in the SAM multiplier decomposition proposed in the previous section. However, the application of the sub-system approach to a two-region model, like that used in this study, makes it possible to extend the analysis to the participation of each region's sectors in the fulfilment of the demand addressed to the production sectors of the other region.

3.3 A social accounting matrix for the agri-food system analysis

The SAM used in this study is a two-region (Basilicata *vs*. Rest of Italy) matrix referring to 2011, produced in collaboration with the Regional Institute for Economic Planning of Tuscany (IRPET, Florence) with most recent statistical records available.

The structure of the matrix includes a total of 347 accounts, concerning 51 production activities, 64 goods and 3 production factors (employment and self-employment, and capital), 3 types of institutions (households, businesses, public administration) in the two regions. The household sector is subdivided by income deciles into ten groups, whereas the public administration is distinguished as local and central. There are of course also the accounts entitled to the capital formation and to real and financial flows with the rest of the world.

In order to analyse the structure of Basilicata's agri-food sector, the accounts concerning agriculture and the food industry have been broken down in some detail for both Basilicata and the rest of Italy, using the matrix of inter-industry technical coefficients derived from the national supply-use table produced by the *Dipartimento di Scienze per l'Economia e l'Impresa* of the University of Florence for the year 2009 (Rocchi *et al*., 2016). By combining it with the official statistics made available by ISTAT for the year 2011 (value added, employment, import, export), the accounts concerning the food industry activities have been broken down into ten sub-sectors and relative commodities:

1. Meat
2. Fish
3. Olive oil
4. Vegetable oils, sugar, pasta
5. Vegetables and fruits
6. Dairy products
7. Cereals
8. Animal feed
9. Wine
10. Water and other beverage

The agricultural sector, conversely, has been subdivided using the data of RICA (Rete di Informazione Contabile Agricola) (CREA, 2016) as well as the available data of

FADN (Farm Accountancy Data Network) (European Commission, 2016b). By combining the two databases, the agricultural sector has been initially broken down into 8 groups of businesses by type of farming for the rest of Italy, and into 5 production activities for Basilicata. In order to ensure a greater consistency of the analysis, the Italian agriculture has been subsequently regrouped in the following 5 subsectors:

1. Cereal grains
2. Horticulture
3. Permanent crops
4. Livestock
5. Mixed

Agricultural commodities are grouped under the heading of agricultural products while the final demand is represented by consumption functions (bundle of commodities classified according to the COICOP classification). Discrepancies between row and column totals of accounts after disaggregation were reconciled balancing the table according the Stone-Camperhown-Meade approach (Round, 2003).

4. Results

4.1 The structure of Basilicata's agri-food sector based on the matrix of multipliers

According to the SAM, in 2011 the output value of the fifteen sectors of Basilicata's agri-food system amounted to about EUR 1.2 billion, 7.9% of the regional total value. The agri-food share increases when considering the value added (8.3%) and, above all, employment (16.6%). High values are due, as previously mentioned, to the importance of agriculture, which is a typically a labour intensive sector, within Basilicata's economy.

Table 3 compares the output multipliers of seven macro-sectors making up Basilicata's production system, as it is represented in the SAM.

The first two rows indicate the increase in final output required to satisfy 1 EUR of additional demand addressed to each macro-sector. Since Basilicata is a region framed within a national economy, a significant share of activation is transmitted outside its regional boundaries. For example, a one-million additional demand addressed to Basili-

Table 3. Output multipliers in Basilicata's economy macro-sectors.

	Agriculture	Other primary activities	Food industry	Other manufacturing	Constructions	Trade and services	Public administration
Bas' output	2.813	2.745	3.017	2.922	3.027	2.829	2.803
RoI' output	0.934	0.819	1.243	1.156	1.015	0.931	0.848
RoI/Bas (%)*	*34.0%*	*32.0%*	*38.1%*	*37.5%*	*33.4%*	*33.8%*	*32.2%*
Labour**	64.3	0.8	8.7	5.7	19.3	18.4	26.8

*Bas: Basilicata; RoI: Rest of Italy.
**Labour Unit for millions of euro.

cata's agriculture generates a 2.8 million increase in the output produced by Basilicata's economy (mostly in the agricultural sector but also in all other sectors), and nearly one million Euros in the rest of the Italian economy. As a whole, the share of the output multiplier operating outside regional boundaries is about 30 to 40%. Significantly, agriculture also shows the highest employment multiplier, whereas the food industry shows a multiplier value that is basically in line (although slightly above) the average of the other manufacturing activities.

The analysis of multipliers is detailed in Table 4 that proposes data referred to the fifteen sectors in which agri-food has been broken down. The table shows the results of the regional breakdown of multipliers. The three columns to the right of the total multiplier break down the multiplier effect (that is the output growth generated in addition to the initial stimulus) into three components: the *regional effect*, i.e. the additional output generated by interdependencies (among industries and through final consumption) within the region; the *interregional spillover*, which is the impact transmitted outside the regional boundaries and generating an increase in the activity in different sectors in the rest of Italy; and the *interregional feedback*, i.e. the additional increase in the regional output resulting from the output growth in the rest of Italy.

The share of each subsector within the two components of agri-food system (agriculture and food industry) is shown in the second column. It can be noted that most of the regional agricultural output is produced by the farms "specialised" in arable crops and animal husbandry, and by the farms classified as "mixed". To assess these data we should

Table 4. Regional breakdown of output multipliers in the agri-food sectors.

	Macro-sectors' output (%)	Total multiplier	Regional effects	Interregional spillover	Interregional feedback	RoI/Bas* (%)
Agriculture						
Cereal grains	13.2%	2.814	0.866	0.944	0.004	109.01%
Horticulture	0.0%	2.473	0.705	0.765	0.003	108.51%
Permanent crops	6.5%	3.060	1.048	1.008	0.003	96.18%
Livestock	67.1%	2.641	0.744	0.893	0.004	120.03%
Mixed	13.2%	3.068	0.963	1.101	0.004	114.33%
Food industry						
Meat	6.0%	3.268	1.048	1.214	0.006	115.84%
Fish	0.7%	2.774	0.864	0.907	0.003	104.98%
Olive oil	6.0%	3.438	1.207	1.226	0.006	101.57%
Vegetable oils, sugar, pasta	41.6%	3.154	0.967	1.182	0.005	122.23%
Vegetables and fruits	5.9%	3.268	1.066	1.197	0.006	112.29%
Dairy products	17.4%	3.277	0.987	1.284	0.006	130.09%
Cereals	3.2%	3.331	1.115	1.210	0.006	108.52%
Animal feed	1.1%	3.327	1.018	1.303	0.006	128.00%
Wine	5.7%	3.311	1.038	1.268	0.005	122.16%
Water and other beverage	12.5%	3.481	1.029	1.447	0.005	140.62%

*Bas: Basilicata; RoI: Rest of Italy.

consider that the type of farming (based on which the agricultural sector is broken down) classifies farms (typically multi-product firms) based on the *prevalence* of certain production processes. A farm is classified as "specialised" in a given process if the latter represents at least two thirds of the output value. Hence the output produced in the farms classified as "livestock farms" is not consisting solely of livestock products but includes also a significant share of other products. Similarly the output produced by the other groups of farms consists for its part of a basket of goods.

The output multipliers tend to be higher in the food industry than in the agricultural activities. In the first case the initial impact determined by the final demand addressed towards the sectors generates almost always a three times larger total increase of the output produced: in the case of olive oil and of the beverage industry, the overall growth of output is about three and half times the initial stimulus. This is a quite typical structural difference, because in the agricultural activities a lower ratio between intermediate consumption and output results in a lower impact on the activities supplying inputs.

Considering the regional breakdown of multipliers, since Basilicata is a small regional economy open to the rest of the Italian production system, it is not surprising that the "return" feedback towards Basilicata's production activities is negligible. Conversely, spillovers towards the rest of Italy are significant, thereby certifying how Basilicata's production activities depend on imports from the rest of Italy. Spillovers tend to be higher for industrial activities. The last column of the table sums up these results showing the percentage ratio between the share of the multiplier effect remaining in the region (regional effect plus feedback) and the spillover component. Only in the case of farms specialised in permanent crops, the additional growth of the output that remains within Basilicata is higher than that "transmitted" to the rest of the Italian economy. The industrial activities most open to the rest of Italy are the dairy and the beverage industries. These are two important sectors within Basilicata's food industry, accounting for about 30% of the output value: especially in the case of dairy industry, this figure could suggest interesting spaces for an additional integration with the regional agriculture. On the other hand, the olive oil industry shows a higher integration with the regional production system, with an internal multiplier effect that is equal to the produced spillovers: although this is a minor sector in terms of output value, it proves that the commitment to quality can have positive impacts on the rest of the regional economy.

4.2 Sub-system analysis

The structural analysis of Basilicata's agri-food system can be enhanced through in-depth studies using the results of the subsystem-analysis. Figures 2 and 3 show the contribution of each subsector of Basilicata's agri-food sector to four different subsystems of the Italian economy (Basilicata and Rest of Italy) satisfying certain "blocks" of final demand. Since the four blocks represent the total final demand in the SAM, the total of the per cent values of each row is always 100.

Comparing the data classified as "sector" in the two figures, it is possible to see how industrial activities tend to meet the sector-specific demand more than agricultural activities (with the only exception of those of the farms specialised in horticulture that represent, however, a negligible component of Basilicata's agriculture). The participation in the subsystems associated with the demand of the other sectors of Basilicata's agri-food

Figure 2. Share of Basilicata's agricultural sectors to the various "blocks" of the production area.

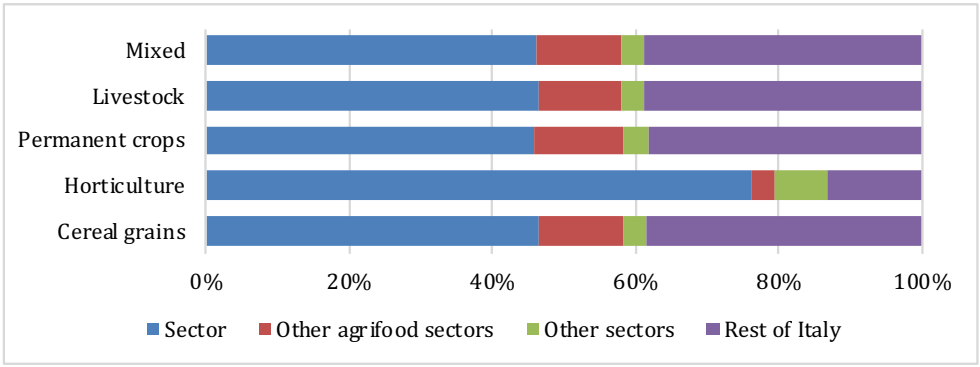
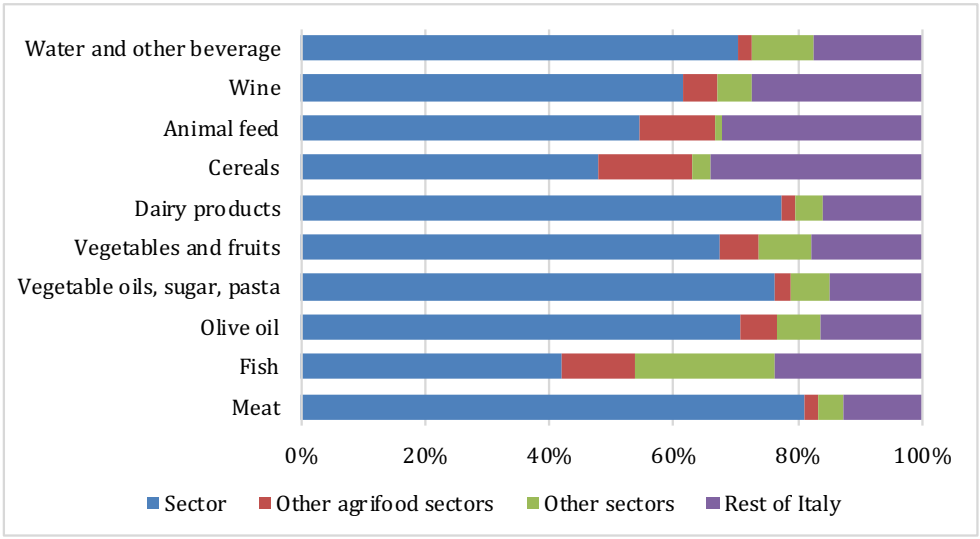


Figure 3. Share of Basilicata's food sectors to the various "blocks" of the production area.



industry is quite variable in the case of the regional food industry, ranging from 15% of the activity of grains and starch products to 2.2% of the meat-processing industry. The value is more homogeneous in the case of agricultural sectors, which commit, on average, around 11% of their activity to the participation in other subsystems. The datum shows the degree of integration among the components of the agri-food system and could be an interesting indicator of possible areas for innovation to promote its competitiveness.

Considering the participation in subsystems oriented to the final demand of the other regions (Rest of Italy), the higher percentage in agricultural subsectors may be assessed as

an interesting opportunity for the economy in so far as it expresses the capacity of "attracting" (either directly or indirectly) a higher share of final demand towards the regional production system. However, since Basilicata is a small economy open to the rest of the national economy, it would be important to assess the stability of this participation to the subsystems of the rest of the Italian economy. Much depends on the upgrading of agricultural products directed towards the rest of the national production system: in the case of *commodities* without a specific quality differentiation (as may be the case of cereal production), they would suffer pressures from regional (or international) potential competitors.

Tables 5 and 6 show the composition of the subsystems satisfying the final regional demand (broken down into macro-sectors of activity). The composition is expressed both in terms of employment and value added produced. The analysis of composition is repeated using two different breakdowns of the final demand, in order to fully exploit both sectoral and regional breakdown of the model.

Interdependencies between agriculture and food industry obviously appear especially in the subsystem concerning the food industry, which includes Basilicata's agricultural activities accounting for 26.9% of employment and 11.6% of the value added produced. To satisfy the demand of food industry products, however, the relevant subsystem also activates the agriculture of the other regions (12.5% of subsystem employment and 9% of the value added), in addition to a far more important component in services' activities. This is again an indicator of interesting areas of integration that might be boosted up in the regional system. The participation of other sectors of Basilicata's economy in the food industry subsystem could probably be increased, resulting lower than that in other subsystems of regional manufacturing.

The same analysis of Tables 5 and 6 is proposed again in Table 7, except that subsystems are referred to the final demand oriented towards the single sectors of Basilicata's

Table 5. Composition of subsystems in terms of employment: macro-sectors.

Subsystems	Final regional demand				
	Agriculture	Food industry	Other manufacturing and constructions	Trade and services	Public administration
Regional agriculture	92.3%	26.9%	0.4%	1.1%	0.2%
Regional food industry	0.2%	30.6%	0.1%	0.4%	0.1%
Rest of Italy' agriculture	1.8%	12.5%	0.9%	1.1%	0.2%
Other manufacturing and constructions	2.1%	7.2%	67.9%	5.1%	4.7%
Trade and services	3.2%	21.3%	28.9%	90.9%	9.8%
Public administration	0.4%	1.5%	2.0%	1.4%	85.1%
Regional agri-food sector	92.5%	57.5%	0.4%	1.5%	0.2%
Rest of regional economy	2.7%	13.9%	71.3%	85.4%	94.0%
Rest of Italian economy	4.8%	28.6%	28.3%	13.1%	5.8%
Labour (LU x 1,000)	15.2	10.7	56.6	55.1	67.1

Table 6. Composition of subsystems in terms of value-added: macro-sectors.

Subsystems	Final regional demand				
	Agriculture	Food industry	Other manufacturing and constructions	Trade and services	Public administration
Regional agriculture	79.6%	11.6%	0.1%	0.3%	0.1%
Regional food industry	0.5%	36.5%	0.1%	0.3%	0.1%
Rest of Italy' agriculture	3.3%	9.0%	6.0%	1.6%	0.9%
Other manufacturing and constructions	6.4%	11.6%	63.6%	5.3%	5.6%
Trade and services	9.7%	30.0%	29.0%	91.6%	12.1%
Public administration	0.5%	1.3%	1.2%	0.8%	81.3%
Regional agri-food sector	80.1%	48.0%	0.2%	0.6%	0.1%
Rest of regional economy	7.4%	18.0%	67.1%	84.3%	91.3%
Rest of Italian economy	12.5%	34.0%	32.7%	15.1%	8.6%
Value-added (M€)	320	456	3 347	3 450	3 334

Table 7. Subsystem composition: sectors of Basilicata's agri-food system.

Regional subsystems	Employment			Value-added		
	Regional agri-food sector	Rest of regional economy	Rest of Italian economy	Regional agri-food sector	Rest of regional economy	Rest of Italian economy
Cereal grains	97.0%	1.1%	1.9%	73.2%	9.9%	16.9%
Horticulture	100.0%	0.0%	0.0%	96.2%	0.9%	2.9%
Woody	96.4%	2.3%	1.3%	57.5%	24.5%	18.0%
Livestock	83.5%	4.9%	11.6%	85.2%	4.8%	10.0%
Mixed	82.2%	6.4%	11.4%	68.1%	11.6%	20.2%
Meat	62.7%	10.2%	27.1%	51.6%	14.9%	33.5%
Fish	54.9%	17.9%	27.2%	48.4%	18.6%	33.0%
Olive oil	56.2%	15.7%	28.1%	32.3%	26.9%	40.8%
Vegetable oils, sugar, pasta	58.6%	15.3%	26.1%	52.1%	18.1%	29.9%
Vegetables and fruits	61.6%	11.0%	27.4%	48.9%	16.5%	34.6%
Dairy products	60.6%	9.2%	30.2%	52.4%	12.1%	35.5%
Cereals	64.3%	8.8%	26.8%	50.5%	14.5%	34.9%
Animal feed	55.0%	12.1%	32.9%	44.6%	16.1%	39.2%
Wine	53.7%	16.8%	29.5%	39.3%	22.6%	38.1%
Water and other beverage	42.2%	20.7%	37.1%	34.3%	23.7%	42.0%

agri-food production activities. For the sake of convenience, the presentation of data has been transposed, with the subsystem components into columns (totals of rows equal to 100). Table 7 shows the subsystem composition in terms of regional location of activities.

Table 8. Final demand composition of the restaurant and accommodation services.

Subsystems	Employment		Value-added	
	Basilicata	Rest of Italy	Basilicata	Rest of Italy
Regional agriculture	3.0%	7.3%	1.4%	3.7%
Regional food industry	1.7%	2.8%	2.3%	3.4%
Other primary activities	3.8%	0.3%	3.7%	0.4%
Other manufacturing and constructions	4.4%	3.3%	8.2%	5.2%
Trade and services	86.3%	85.6%	83.5%	86.4%
Public administration	0.8%	0.7%	0.8%	0.9%

Except for the case of the few farms classified as specialized in horticultural production and showing a sub-system virtually "self-contained" at the regional level (notably in terms of employment generated both directly and indirectly), activities involving animal husbandry (both specialized and mixed) are, among the agricultural ones, those with the highest participation of non-regional components to the satisfaction of final demand. In the case of food industry products, the level of participation in the subsystems by non-regional production activities is quite homogenous, especially in terms of employment.

The comparison of the "parallel" subsystems referred to the final demand in the two regions (Basilicata and Rest of Italy) can provide relevant additional indications. Table 8 shows the case of the two regional subsystems devoted to fulfill the final demand for accommodation and food services. These are production activities that might benefit from a regionally-based integration with the agri-food sector, in particular with a view to qualitative differentiation and promotion of typical regional products.

The level of participation of both regional agriculture and food industry is lower in the case of the Basilicata's subsystem as compared with "the average" of the rest of Italy. This means that the final demand towards Basilicata's activities supplying restaurant and accommodation services is less able to activate production and employment within the regional borders than those operating in the rest of Italy. Such results suggest the existence of an unexploited space for the integration of tourism activities with the local agri-food system.

5. Conclusions

This study has proposed a structural analysis of Basilicata's agri-food system, based on a two-region SAM model, appropriately broken down. The objective of the analysis was to make available helpful information for defining sectoral regional policies, associated with the implementation of the new programming period of Rural Development policies. The 2014-2020 Rural Development Programme actually offers a major opportunity to increase the regional system competitiveness, by providing public funds equal to EUR 680 million.

Agri-food is an important component of Basilicata's economy, not only in terms of value produced and employment created, but especially for its quality production and local production systems in which all steps of supply chains (agricultural, industrial, and

marketing steps) find their coordination. The structural analysis of interdependencies between the various components of the agri-food system, via the two-region model, has highlighted important areas of further integration that could drive innovation processes.

To enhance the positive impact of agri-food production activities on the regional economic development, two basic strategies may be followed. The first consists in attracting increasing shares of non-regional demand towards Basilicata's products. In this respect, the growth of exports in challenging times, like the recent ones, indicates that first steps in that direction have been made. But the scope for improvement and strengthening in this broad area is still large, encompassing the trade with the other Italian regions. Basilicata's agri-food system (in particular its agricultural component) invests a relevant part of its activities for the direct or indirect fulfillment of the final agri-food demand of the other regions. This is a segment of activity requiring a specific strategy to consolidate the comparative advantages to base them mostly on unique features of the regional system, including the quality of the environment, the specificities of the varieties produced, and the knowledge of the context related to production traditions. If the participation in the market of agricultural *commodities* (like in the case of cereals for the pasta industry) is an important business segment in Basilicata's agri-food system, it can and must be made stable by innovation processes aimed at increasing product qualitative differentiation.

The second strategy could be described as the strengthening of interdependencies within the regional production system aimed at increasing the share of the multiplier effect remaining within the regional economic system. The subsystem analysis has demonstrated that there are large areas for increasing integration within regional food chains, in particular between agricultural production and industrial processing. In this sense, rural development policies, especially the measures aimed to promote coordinated actions at the district scale, may be a good basis for creating local supply chains and tighter links among regional production activities. This process, however, should again be driven by qualitative differentiation. If, on the one hand, "shorter" food chains can increase the regional multiplier effect through an enhanced integration between agriculture and food industry, they could also represent an important factor to upgrade (and hence add value to) production, with the possibility of increasing "downstream" integration with other regional sectors. The analysis has shown that in Basilicata the integration with food and restaurant and accommodation services is lower than in other Italian regions. But there also is much room for intensifying the interdependencies of the regional agri-food system with elements of the public administration (such as, for instance, public providing activities in school canteens or in hospitals). These market opportunities would be useful to improve final consumers' awareness of regional production peculiarities and might have long-term additional effects on the growth of demand addressed towards the regional production system.

Results show that the availability of a highly disaggregate multi-sector model of the regional economy is a valuable tool in supporting the design of regional policies for innovation and for the development of rural areas. The structural analysis described in this paper could be further extended at the level of each single chain, with the characterization of the main *forward* and *backward* linkages and the interaction with the rest of the national economy.

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Full Research Article

Measuring the complexity of complying with phytosanitary standard: the case of French and Chilean fresh apples

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Abstract. Nowadays, complying with technical, sanitary and phytosanitary (SPS) regulations and standards is becoming more and more demanding due to their proliferation and increasing complexity. Consequently, increasing requirements in plant health protection and food safety can lead to a loss of competitiveness in countries that are major exporters of fresh products, causing a redistribution of the market shares in certain sectors. Exporters complying with regulatory standards benefit from better market access and avoid boarder rejection or product downgrading but incur additional costs due to additional procedures and paperwork. This is the case for French apples producers which are losing competitiveness compared to the Chilean ones on foreign markets. This situation can be partially explained by the difficulties of French exporters to comply with international SPS requirements. The aim of this article is first to make a compilation of phytosanitary requirements facing French and Chilean exporters of fresh apples, then to propose a score (hereafter phytosanitary score) which allows to assess the degree of complexity of these SPS requirements. This score is interesting as it synthesizes qualitative information in a metric which can be easily used in quantitative analysis. The results show that even if France and Chile are rather close in terms of SPS requirements, Chilean apples exporters are more capable to comply with foreign SPS requisites than the French ones.

Keywords. Cost of compliance, scoring, apples, sanitary and phytosanitary regulations.

JEL codes. C51, I18, Q18.

1. Introduction

The literature on sanitary and technical regulations has shown that if regulations and standards are market facilitators by decreasing asymmetries, they also hamper trade (Swinnen and Vandemoortele, 2011; Marette and Beghin, 2010). The effects that SPS regu-

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lations have on the economy depend on how they impact consumers, domestic producers and foreign competitors (Swinnen and Vandemoortele, 2009). The cost of production and marketing will increase with the increasing complexity of the regulations abroad. *In the importing country, compliance with a regulation involves a cost to foreign suppliers, which acts like a trade tax, resulting in a deadweight loss as well as transfers from consumers to producers* (Beghin and Bureau, 2002). On a specific market, foreign producers are impacted by the SPS requirements depending on their relative differences in the marginal cost of the regulation, thus on their relative efficiency to comply with importers' standards. This may affect countries that were major exporters, causing a redistribution of the market shares in certain sectors. It is the case for French apples exporters who compete now with newcomers as China which were not even producers 10 years ago.

International trade of apples (and more generally of fruits and vegetables), requires that products intended for marketing come with a Phytosanitary Certificate (PC) which certifies that they are properly inspected, pest-free, and comply with national and international phytosanitary regulations. However, regulatory constraints and requirements in the importing countries may differ substantially from those in the country of departure. This asymmetry directly impacts the phytosanitary risk management and therefore the costs of compliance. Usually, to deliver the PC for fresh apples, countries require either a cold treatment and/or fumigation with methyl bromide (APHIS USDA, 2014 Calvin and Krissof, 1998). The former, even if simple to apply, can become quite complicated because the required temperature for cold treatment may vary from one destination to another. Moreover, if the majority of countries agree on a pre-shipment cold treatment, others require it during transportation or even at the port of arrival complicating the procedure. But the cold treatment is one among many requirements and paperwork an apple exporter faces before selling its products abroad.

Even if a producer is able to comply with all these measures, a possible refusal of the apples still remains if at the port of arrival, a further inspection proves that something went wrong during the transportation or if the regulations have changed meanwhile. Rejections of apples occurred between the US and Japan in 2002, the US and Taiwan, Australia and New Zealand in 2007 (WTO, 2010) also between France and Vietnam in 2012 (France Agrimer, 2015).

These examples illustrate that quantifying costs of compliance is not an easy task due to the proliferation of technical and sanitary regulations and standards and to their increasing complexity. Moreover, whereas models for policy analysis often require quantitative data, these regulations are often not quantitative. *For qualitative standards, like labelling, no numerical values can be directly used. Further, these qualitative policies affect different components of costs of production and marketing and cannot be easily aggregated into a single price equivalent. Evaluating the protectionist component of these numerous qualitative policies into a protectionist score is likely to remain a challenge* (Li and Beghin, 2014). Several authors worked on the issue of introducing qualitative policy instruments in quantitative analysis by producing different synthetic indicators. Among others we can quote works on technological positions (Jaffe, 1986), regulations on Genetically Modified Organisms (Vigani *et al*., 2011) or varieties of grapes and wines (Anderson, 2010). More recently, Ferro *et al*. (2015), Li and Beghin (2014), Winchester *et al*. (2012) or Drogué and Demaria (2012) also built synthetic metrics to compare bilateral regulations on maximum residual level of food contaminants.

In this article we build a phytosanitary score that allows approximating the relative complexity of phytosanitary requirements in the marketing of fresh apples. We compiled the sanitary and phytosanitary regulations French and Chilean apples exporters must comply with on their main markets of destination. These two countries have been chosen for two main reasons. First, at international level, in comparison with Chile, French producers are losing market share, which could be explained by their difficulties to comply with international phytosanitary regulations. The second reason lies in the characteristics of the countries themselves. France is a traditional provider of apples with a long history of production and consumption, while Chile is a more recent producer export-oriented, and, being located in the Southern Hemisphere; apples in Chile are produced off-season.

The indicator presented henceforth can be seen as a proxy for higher compliance cost born by exporting countries when shipping their apples abroad. This kind of indicator can be used in econometric models to evaluate the impact of non-tariff barriers on trade. At the same time, supply chain operators can also use it as synthetic information on the complexity of phytosanitary requirements in importing countries.

In order to compute our indicator, we first identified all the components of apples phytosanitary requirements Chile and France must comply with by destination (number of inspections, number of treatments and location of treatment, signature of an agreement between countries, etc.). Then, each component is graded with an increasing value according to its degree of complexity; finally we sum them up in a normalized score.

Results show that the scores for France and Chile are rather close, but suggest that overall France suffers from more stringent foreign regulations and Chile is able to reach more easily any destination markets thanks to a better geographical position and phytosanitary situation.

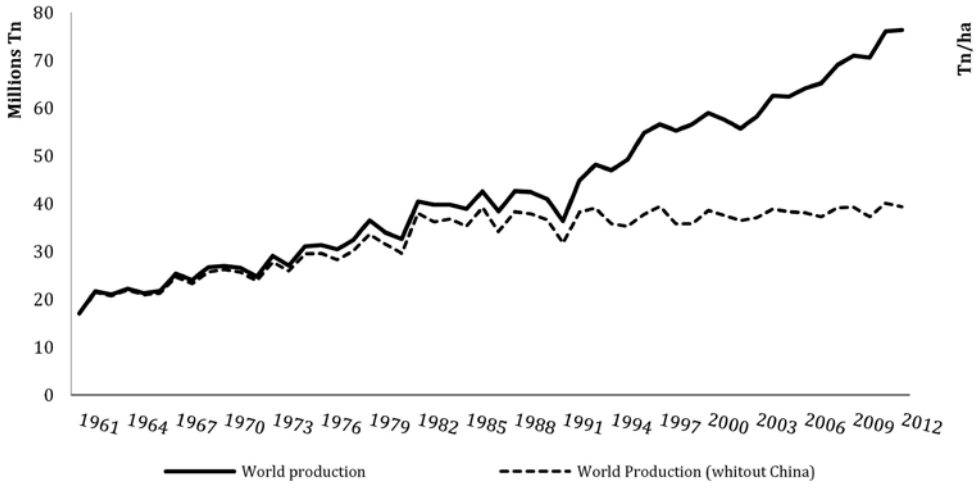
The originality of this work is a deeper understanding on sanitary and phytosanitary requirements that French and Chilean apples producers necessarily face if they decide to gain foreign markets' share, and more particularly the design of a tool that allows to grade and to translate regulatory data into a single score useful for quantitative analysis.

The paper is organized as follows: section 2 is an overview of the international market of apples and the recent redistribution of market shares between countries in this sector. Section 3 is devoted to the presentation of the data on phytosanitary requirements. Section 4 presents the building of the score. Section 5 is devoted to the sample and the numerical results. Section 6 concludes.

2. The international market of apples

Compared with other markets of agricultural commodities, such as sugar, coffee or bananas, the apple world market can be broadly considered as residual: in 1961, only 9.5% of the world fresh production was traded on international markets and reached 11% fifty years later (2012). The main reason is that, historically, traditional producing countries (essentially Western countries) were also the main consumers. From the 90s, an evolution took place in the global geography of production and consumption, leading to evolving trade flows. The description of these changes is therefore important to understand the main opportunities and obstacles encountered by the major exporting countries (like France or Chile).

Figure 1. World apple market: production (with and without China).



Source: Faostat.

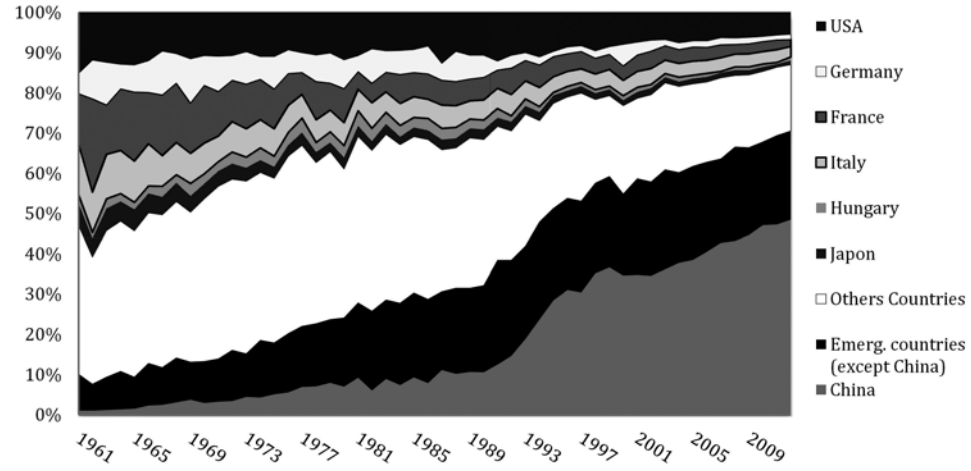
According to the FAOSTAT database, apples are nowadays the second most produced and consumed fruit in the world after bananas and before oranges and grapes. Its production evolved greatly during the last 50 years, from 17 million tons in 1961 to more than 76 million tons in 2012 (+300%). This apparently linear development, hides some recent and deep changes in the geography of production. First and foremost, there is the spectacular increase, from the beginning of the 90s, of the Chinese production (Figure 1). From just 1% of the world production in 1961, it represents today half the global output in the world (48% in 2012)[1]. In general, during this same period there is a globalisation of apple production and traditional producers (as France or Italy) have lost market shares in relative and absolute value, to the benefit of China and emerging countries (Figure 2).

On the demand side, we observe the same evolution: in countries of traditional consumption, with high incomes, saturated food demand, and with stronger health and environmental concerns, apples suffer the competition of other fruits, including exotic ones (Figure 3). In contrast, population growth recorded in emerging economies, combined with higher average incomes and the dissemination of national and international education policies promoting fruit consumption[2] explain the increase of their respective demand for fruits, especially apple, one of the easiest to store (Figure 3).

Finally, if the geographical area of apple production and consumption has greatly expanded in the last 20 years, the new consumer countries are not necessarily the producing ones. Therefore, and except for China, which is largely able to meet its own domestic

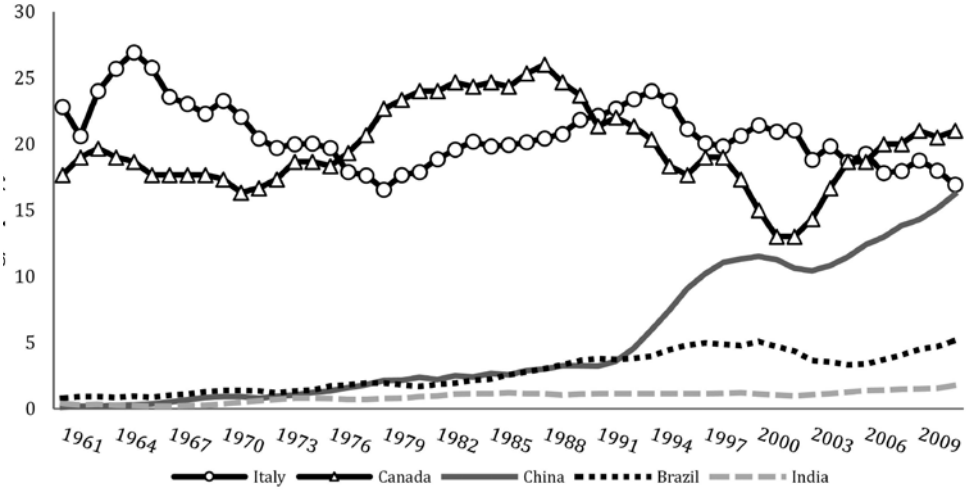
[1] What explains this phenomenon is the liberalization process of the Chinese market implemented by Deng Xiaoping (Murphy *et al.*, 1992). His reforms have allowed the Chinese farmers to sell their excess production on the free market, leaving the market price system drive the allocation of productive investments.
[2] WHO: http://www.who.int/mediacentre/news/releases/2003/pr1/en/.

Figure 2. World apple market: production shares - selected countries.



Source: Faostat.

Figure 3. World apple market: per-capita apple consumption – selected countries.



Source: Faostat.

demand, the increasing consumption of apples in developing countries (like India, Indonesia or Brazil for example) represents a new opportunity for all exporters.

Among the major producing and exporting countries in 2012, Table 1 differentiates those for which the domestic market remains a priority (such as China) from those for which external demand represents a major challenge. In the latter category, Chile, France

Table 1. World apple market: production and export shares – selected countries.

Country	National production on world production (%)	National net exports on world exports (%)	National net exports on national production (%)
Italy	3.2	11.3	38.9
Chile	2.1	9.6	50.4
China	47.3	9.1	2.1
USA	5.6	8.2	16.0
France	2.4	7.1	31.7
Iran	2.4	1.3	5.7
Turkey	3.5	1.0	3.0
India	3.8	-1.8	-7.0

Source: Faostat, 2012.

and Italy[3], represent about 30% of apple's worldwide exports.

If in the following study, we limit the comparative analysis to France and Chile, thus excluding Italy, several reasons justify our choice. First, to avoid duplication effect: France and Italy have similar characteristics in terms of seasonality, produced varieties, production conditions and supplied export markets. Second, the lack of data, especially regulatory data (bilateral phytosanitary agreements), for Italy, does not allow us to add this country to the comparative analysis.

Therefore, we focus on the comparison between France and Chile. These two countries differ not only in terms of geographical location, seasonality, climate characteristics or supplied markets[4]. They also face contrasting trends in exports. French apples exports are falling in the last 20 years, while they are increasing in Chile (Figure 4). These trends can partly be explained by the differences in importers' SPS requirements.

3. Data description of phytosanitary requirements in the apple sector

Diseases and pest invasions vary greatly with place and time affecting the risk management and the protection of trees. The main pests damaging apples and apples orchards are: insects (codling moth, fire blight, sawfly insects, tortricid, aphids, and fruit tree spider mites), fungal diseases (apple scab - *Venturia inaequalis* and powdery mildew - *Podosphaera leucotricha*) and viral diseases.

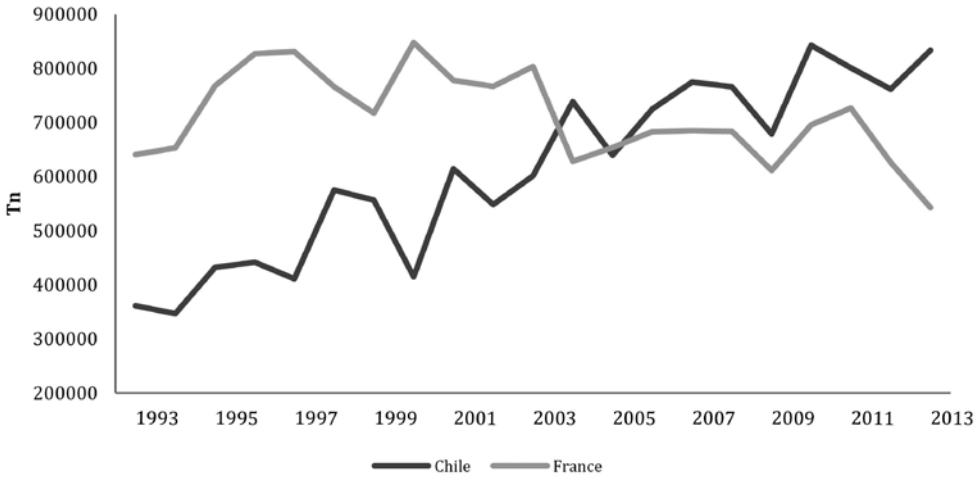
Viral diseases have been less damaging since plants carried a certificate which guarantees against the presence of the Mycoplasma-like Organism (MLO) disease, the apple mosaic or the bitter pit disease (affecting the fruit).

In order to mitigate the phytosanitary risk, regulators impose that crop products intended for marketing are accompanied by a Phytosanitary Certificate, defined above.

[3] We could add to this short list, New Zealand, a strongly export-oriented country. However, it does not represent a sufficient volume of exportations to be mentioned among the major players of the apple world market.

[4] According to the detailed trade matrices published by Faostat, France exports about 75% to EU countries and 11% to Asian countries (in particular middle east). Contrariwise, Chilean exports are more diversified: half of its exports concern the Americas (especially Canada and USA), 23% come to Asia and 23% to Europe.

Figure 4. France and Chile apple exports (1993-2013).



Source: Faostat.

These regulatory constraints and associated additional treatment operations impact the SPS risk management and increase, the costs of production and marketing. However, even if a producer is able to comply with all these measures, some possible rejection/refusal of products may still happen if at the port of arrival further inspection prove the presence of a pest. Rejections of apples occurred between the USA and Japan in 2002, the USA and Taiwan, Australia and New Zealand in 2007 (WTO, 2010) and in 2012 Vietnam stopped apples coming from France and re-negotiated a bilateral SPS agreement (France Agrimer, 2015). To illustrate the complex nature of pest risk management in the framework of international apple trade, let's take the example of cold treatment. Cold treatment is a common practice to fight main apple pests (especially *Ceratitis capitata*), which in some cases, must be associated to fumigation (APHIS USDA, 2014). The cold treatment requires that fruits must be stored at a constant temperature between 0° and 4° for a period of 14 to 21 days to prevent contamination of products by harmful organisms. Even if simple to implement, the cold treatment may become quite complicated because in case of a random interruption, the procedure must start again from the very beginning. An interruption is more likely to occur during shipment because temperature sensors cannot be verified easily and the common practice is that of cold treatment in transit[5].

Moreover, doubts about the presence of pests or harmful organism in a given area may rise the alert level with consequent tightening of controls. This happened, with Vietnam, which denied market access to its trading partners between 2013 and 2015 in order to modify the phytosanitary regulations.

In this context analysing SPS regulations imposes a case by case analysis. Therefore, for the countries under scrutiny (France and Chile) we retrieved information from vari-

[5] Source: EPPO, URL: https://www.eppo.int/QUARANTINE/data_sheets/insects/CERTCA_ds.pdf

ous sources. The first and main sources of information are the websites of the national food safety authorities managed by the respective Ministries of Agriculture (Exp@don for France and the Servicio Agricola y Ganadero (SAG) / Department of agriculture and livestock for Chile). However, in some cases information was missing, thus we also consulted the World Integrated Trade Solution (WITS) maintained by the World Bank, the World Trade Organisation (WTO) dataset and finally the International Plant Protection Convention (IPPC). All this information was crossed-checked with experts from the SRAL (Service Regional de l'Alimentation / French Food Regional Service). The analysis of all the information at our disposal allowed us to identify an exhaustive list of the many requirements apples exporters face[6]. These requirements are of two types: (i) operational as the cold treatment or fumigation: in this case the requirements from the Animal and Plant Health Inspection Service of the United States Department of Agriculture (APHIS/USDA) are the leading reference in many countries; (ii) administrative, taking the form of inspections or of declarations and can vary a lot according to bilateral agreements between the countries of origin and destination. We identify 9 requirements, called "dimensions" and described in the Box A2 in appendix.

To each dimension of the phytosanitary regulation we assigned a grade increasing with the complexity of implementation. The lowest grade is 0 (no constraints). Then, 1 when the regulation requires a form of monitoring easy to apply; a value equal to 2 or 3 when fulfilling the requirements is complex and finally the maximum value in case of a ban. For instance, the grade for the cold treatment ranges between 0 and 3. It takes a value equal to 0 if any cold treatment is required; a value equal to 1 if the cold treatment is applied in transit, a value of 2 when the regulation requires a cold treatment at the port of arrival and a value of 3 for ban. We assume that any kind of activity is more difficult or more expensive to implement in the country of destination than during the shipment or pre-shipment. Indeed (i) the absence of national operators in the foreign countries, (ii) the difficulties related to the use of different languages or different standards or (iii) the potential higher cost of the cold treatment activities in the foreign countries makes the procedure more difficult.

The ban is not difficult to implement but it prevents all imports from the banned country; this is the reason why we consider the ban equivalent to assigning the highest grade to each dimension. Table 2 displays the grades by dimension. As we can see from table 2, the number and the values of each restriction vary from country to country depending on the underlying domestic regulation. Each phytosanitary requirement is controlled and certified by the representative safety authority: the SRAL in France, the SAG in Chile. They perform the required inspections and deliver the phytosanitary certificates.

Once this evaluation has been made, in the next section we synthesize all the components into one metric which gives the relative "phytosanitary distance" between the exporter (*i.e.* France or Chile) and their importers.

4. Building a Phytosanitary Score

In order to assess the complexity of the overall SPS regulations imposed to French and Chilean apple exporters we built a Phytosanitary Score (hereafter *PS*). Follow-

[6] The analysis was carried out between 2014 and 2016. During this period, no major changes took place in trade relations, except for the negotiation of a new bilateral protocol between France and Vietnam.

Table 2. Dimensions and grades of the Phytosanitary Requirements and underlying regulations.

Dimension	Values	Underlying Regulations
Territorial Restriction / QO Restriction	0 (No restriction) 1 (Yes restriction) 2 (Ban)	**Bilateral agreements:** - between France and China, Indonesia, Sri Lanka, Taiwan, Thailand, Vietnam, USA - between Chile and China, India, Taiwan, Thailand, USA, Mexico. **In the other cases**, the information comes from: - Exp@don database (for France) - SAG database (for Chile) - Wits database (by World Bank) - Food Safety Authority of importing countries (Website)
Agreement	0 (No agreement needed) 1 (Agreement on pre-listing) 2 (Agreement on yearly check) 3 (Ban)	
Import Permission	0 (No IP needed) 1 (The IP has been negotiated) 2 (The IP has not been negotiated) 3 (Ban)	
Phytosanitary Certificate	0 (No PC) 1 (The PC has been negotiated) 2 (The PC is under negotiation) 3 (The PC is non official) 4 (Ban)	
Pre-inspection	0 (No Pre-inspection) 1 (Pre-inspection is required) 2 (Ban)	
Pre-clearance	0 (No Pre-clearance) 1 (Pre-clearance is required) 2 (Ban)	
Pre-cold treatment/fumigation	0 (No treatment needed) 1 (Treatment needed) 2 (Ban)	
Cold Treatment	0 (No cold treatment) 1 (In transit cold treatment) 2 (At arrival cold treatment) 3 (Ban)	
Inspection at arrival	0 (No inspection at arrival) 1 (Inspection at arrival) 2 (Ban)	
Total Requirements	24 (maximum requirements)	

ing Ferro *et al.* (2015), *PS* is designed as the sum of the grade obtained by each phytosanitary constraint (dimension) imposed by the importing country to the exporting one. We then normalized it in order to obtain a value ranging between 0 and 1 and further imposed convexity as in Li and Beghin (2014). In our analysis we consider that *PS* measures the relative severity of the phytosanitary constraints imposed by the importing country.

$$PS_{ij} = \frac{1}{N}\left[\sum_{t=1}^{N} \exp\left(\frac{Phyto_{ijN} - minPhyto_N}{maxPhyto_N - minPhyto_N}\right)\right]$$

Subscript i denotes the exporting country and j importing country (here i is equal to France or Chile), $Phyto_{ijN}$ is the grade of the requirement imposed by country j to country i in the dimension N; $maxPhyto_N$ is the highest grade in the dimension N; $minPhyto_N$ is the lowest grade in the dimension N. The PS indicator ranges between 1 (in the absence of any specific requirements) and $e \approx 2.72$ which corresponds to the case of a ban, the greater the score the more difficult to comply with all the dimensions of the country of destination's SPS regulation.

The advantage of introducing the convexity in the standard is that it imposes more weight on more demanding requirements suggesting that it is more difficult to reach higher standards and thus that the marginal cost of compliance is increasing. We are particularly interested in verifying the relationships between trade and PS that is to say between trade and the phytosanitary requirement (*Phyto*). Our intuition being that the two variables are negatively correlated.

5. Sample and results

Crossing data on French and Chilean apple exports during the period 1986-2013 with the sanitary regulations, we have been able to select a sample of 82 countries (over 146 destinations in 2013) for France, and a sample of 51 countries (over more than 100 destinations in 2013) for Chile (see the complete list of countries in table A1 in appendix). For the selected countries there is a positive flow of apples from France and Chile over the period and information on phytosanitary regulations is available. We exclude from our samples, countries with zero trade flows except when those countries imposed a ban on French or Chilean apples. The countries in the sample represent, for both exporters and for the entire period, 99% of their exports of apples on average.

Our sample can be disaggregated in 3 sub-groups. The first one gathers European countries which apply similar phytosanitary regulations (Directive 2000/29 CE, European Commission, 2000). In this common phytosanitary area, French apples move freely without control or particular certificates, while Chilean apples need a simple inspection at arrival. The second sub-group gathers 52 extra-European destinations for which French and Chilean apples must be accompanied by a PC or by a specific phytosanitary document or both. The third group is constituted by countries which banned imports of apples from France or Chile (Indonesia, Japan, South Africa, South Korea and Tunisia).

Table A1 in appendix reports the values of the scores for all countries importing French or/and Chilean apples. It shows in the first column the selected countries importing apples from France; in the second column the values of PS; and in the third column the average trade in volume. Columns 4 to 7 display the same information for Chile.

This score is able to capture the degree of complexity of the regulation. In order to test the relationship between trade and the score we proceed by simple correlation analysis.

In Figure 5 and 6, we can appreciate the position of both exporting countries in comparison to their own trading partners. It is interesting to note that the distribution of the phytosanitary score (PS) seem comparable in the two graphs: the group of European countries is always on the left of the distribution, while the group essentially composed by Asian countries is, in both cases, on the right. This illustrates that European countries apply relatively looser regulatory restrictions compared to Asian countries, regardless

Figure 5. *PS* Country Mapping (France).

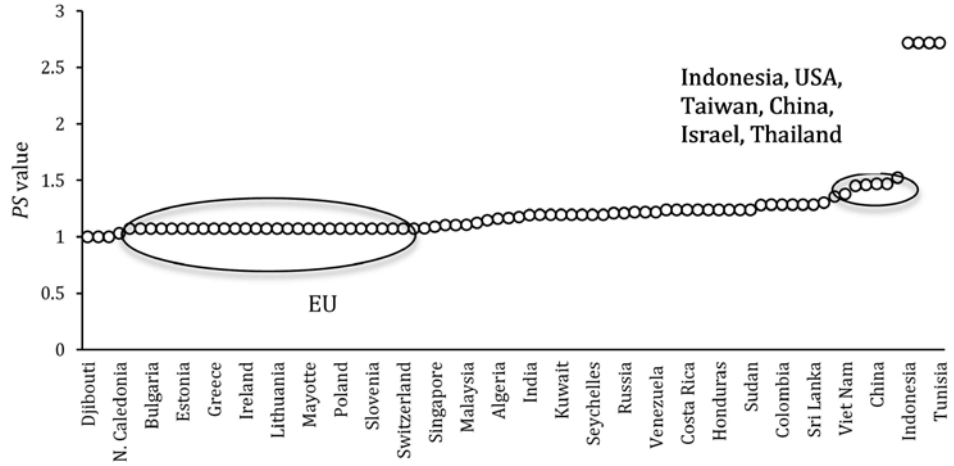
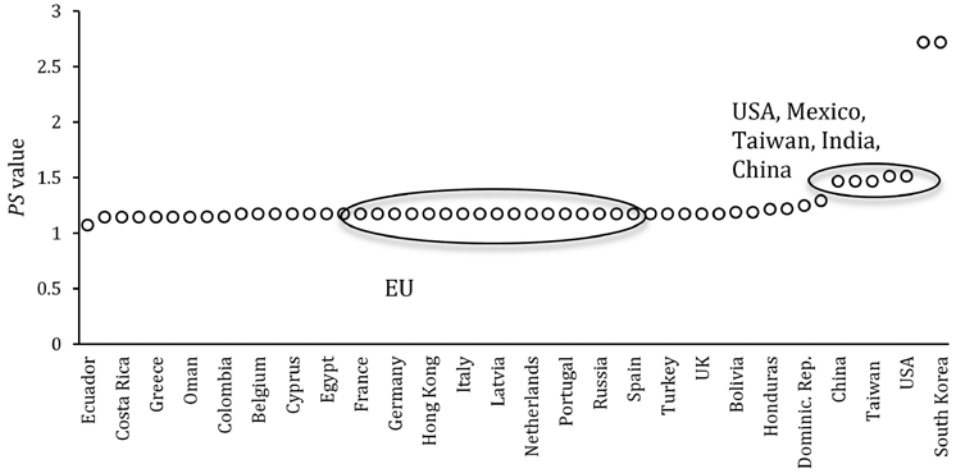


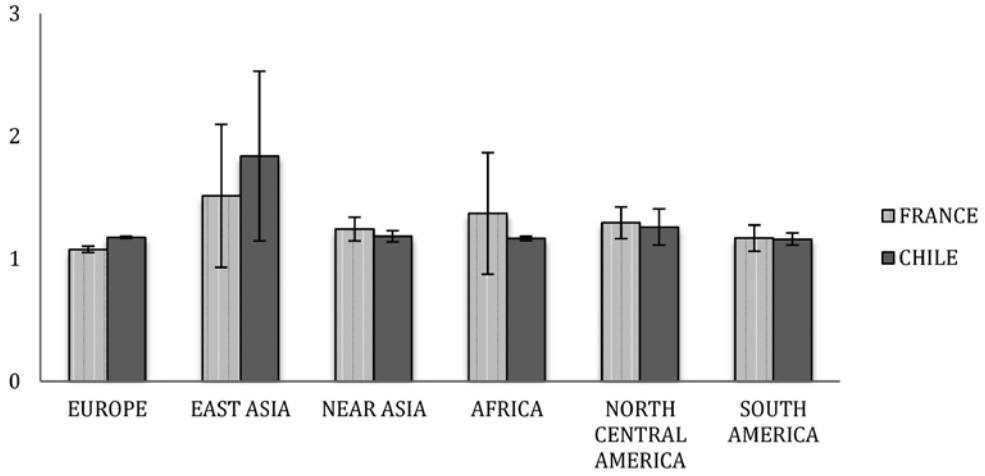
Figure 6. *PS* Country Mapping (Chile).



of the source of exports. However, while it is obvious that France belongs to the group of European countries (as importer, Figure 6), it is also important to note that Chile as importer, belongs to the group of countries applying more complex regulations (as China, Indonesia, Taiwan, Thailand, or the USA).

The box plot in Figure 7 shows the distribution of *PS* by region. In this figure the higher the boxes the more demanding the phytosanitary requirements between France or Chile and their clients. First, we can observe that both exporters face similar average level of complexity by region. However, France is almost always facing a higher degree of variability accord-

Figure 7. *PS* distribution by region (average and standard deviation).



ing to the destination. This variability is at its maximum within the Asian countries. More generally, the variability increases with the level of complexity. It is also interesting to underline the results obtained for African destinations: while the phytosanitary requirements are strongly homogeneous *vis à vis* Chile, they are very heterogeneous for France.

The next Figures from 8 to 11 present the relationship between the importers' complexity of phytosanitary constraints and exports. In order to reduce the high trade variability, we aggregate trade volumes by countries sharing similar or identical phytosanitary scores. In the case of France, we are able to distinguish 6 ranges. Conversely, for Chile we only have 5 ranges, because of the strong requirements' homogeneity.

Figure 8 suggests that for France, the level of trade is, as expected, inversely related to the level of complexity in the sanitary requirements of its partner, and reaches zero in the case of a ban (maximum restriction). Figure 9 shows that this result is globally confirmed, even when we eliminate extreme values, such as EU (no restriction) and bans (full restriction).

However, results are quite different for Chile. As Figure 6 shows, the phytosanitary constraints imposed to Chile by its trade partners are particularly homogenous (except for a few countries on the right side of the distribution). This strong homogeneity of the score does not allow us to discriminate between several ranges and therefore correctly test the correlation between trade flow and score value. Therefore, although figures 10 and 11 show a negative and clear correlation between trade and the complexity in phytosanitary regulations (as for France), the results seem more difficult to interpret.

In order to support our argument, we try to provide further analytical details about this topic. If we look at the trade between Chile and North-American countries, we can see that, while the volume of apples from Chile to the USA is important (103,000 tons on average between 2008 and 2013), this is not the case for Mexico (8,000 tons on the same period). The reason has to be found in the stronger demand of Mexican regulations. Yet, although the USA and Chile are located in the same continent (and thus closer in distance), Chile exports more with the EU (347,000 tons in average between 2008 and 2013)

Figure 8. *PS* value by range and volume of French apple export (2007-2013).

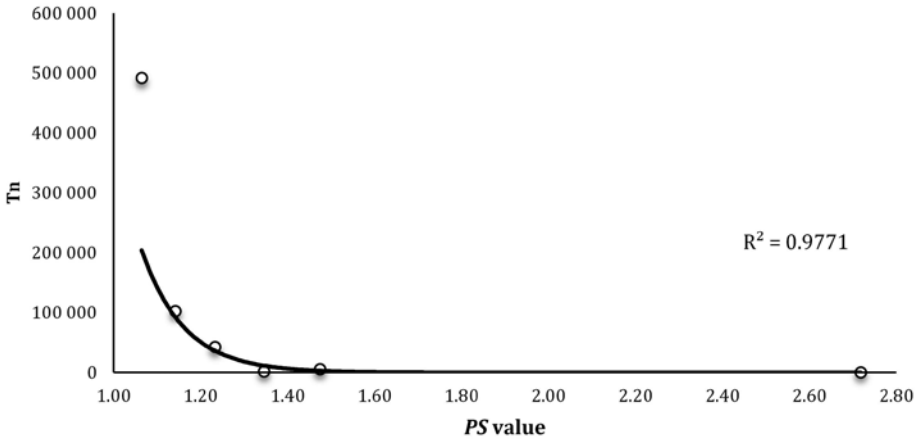
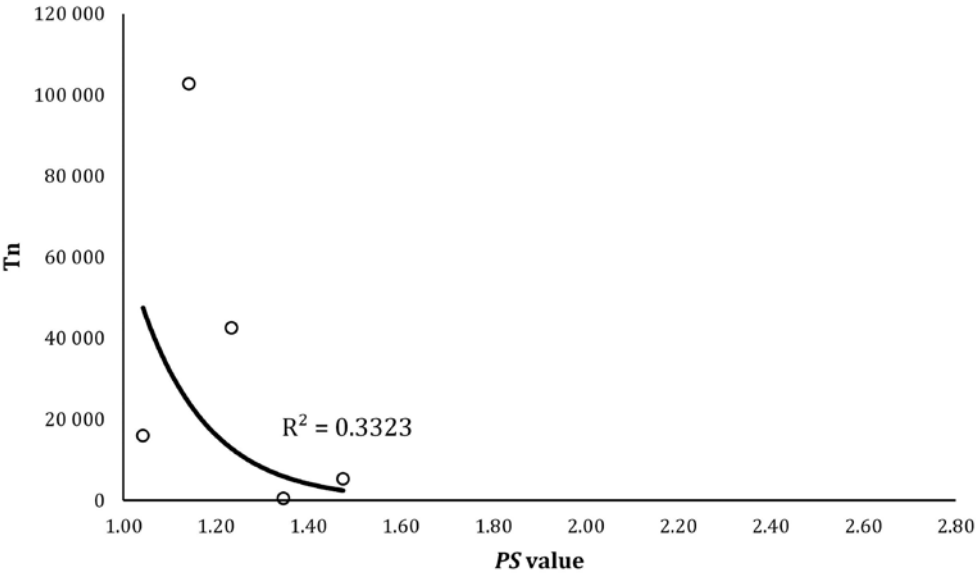


Figure 9. *PS* value by range and volume of French apple export (2007-2013) without EU countries.



than with the USA. We suggest that the cause can also be attributed to the stringency of the US regulations in comparison with those of the EU.

Another explanation could be found in the existence of a trade agreement between the two countries under scrutiny and their trade partners. Table A1 in appendix shows the existence or absence of a trade agreement. The information suggests that for France the geographical proximity and the existence of a trade agreement often overlap and the link

Figure 10. *PS* value by range and average volume of Chile apple export (2007-2013).

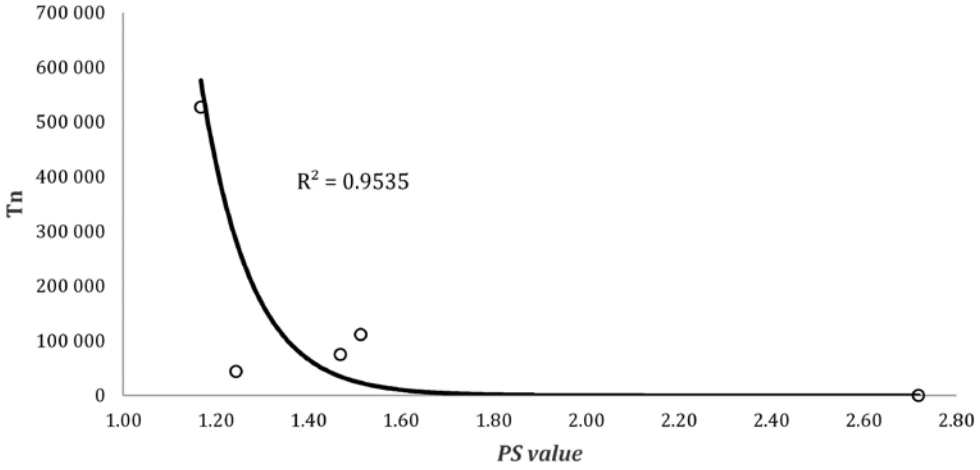
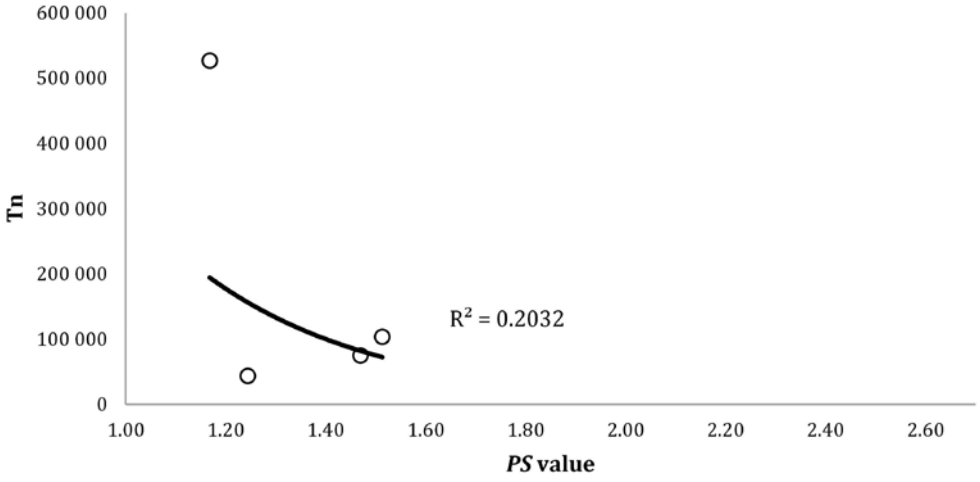


Figure 11. *PS* value by range and average volume of Chile apples export (2007-2013) without USA.



between the existence of the agreement and the level of trade cannot be clearly traced. Moreover, even if the EU (and therefore France) has signed a trade agreement with South Africa, South Korea and Tunisia, French apples are still banned from these countries for phytosanitary reasons.

For Chile, it is slightly different. There is no particular overlapping between the existence of a trade agreement and proximity. But there is also no clear link between the absence of a trade agreement and the absence of trade. Chile exports more apples to Colombia, Ecuador or Peru where no agreement has been signed compared to Brazil with

which an agreement has been signed. The same is true when the importer is farer: Chile is able to export high volumes even without the existence of a trade agreement; it is the case with India, Russia, Saudi Arabia, Taiwan or the Arab Emirates (see table A1).

6. Conclusion

For a long time, France has taken the world leadership in the apple international markets. But the French competitiveness is short of breath. French exporters point at the increasing complexity of the phytosanitary rules governing fresh fruits trade, especially in Asia and the USA.

On the other side, Chile, a growing stakeholder in the apple sector has seen its exports increase regardless of the destination. Even if Chile benefit from its off-season supply with respect to its main destinations (USA, Europe, China), it seems generally less sensitive to the phytosanitary restrictions.

Using a synthetic measure, we studied the link between the level of French and Chilean apples exports and the complexity of the phytosanitary requirements imposed by importing countries. Analysing the regulations for more than 130 destinations (84 importing countries for France and 51 for Chile), we were able to draw several conclusions.

First, we observe that no significant difference between phytosanitary restrictions imposed to France and Chile by destinations exists; therefore, the distributions of *PS* in Figures 5 and 6 are rather similar for both exporting countries.

Second, there is no clear link between the existence or absence of a trade agreement between the two countries and their trade partners and their capacity to penetrate a specific market.

Third, we have yet underlined that the French and Chilean positions inside the *PS* distributions is not the same. France belongs to the EU which is less demanding in terms of phytosanitary regulations, while Chile belongs to the group of countries applying more complex phytosanitary regulations (as China, Indonesia, Taiwan, Thailand or the USA). Therefore, this difference in the relative phytosanitary positions of France and Chile with respect to phytosanitary restrictions abroad, allows us to better explain why Chile resists better to more demanding destinations in terms of phytosanitary regulations than France (see Figures 7 to 11).

French exporters suffer higher costs in complying with phytosanitary rules, especially when they are imposed by the most dynamic importing countries (as Asian countries). For instance, French producers must make a greater effort in pest risk management in comparison to the Chilean producers, when they want to export apples free from the Mediterranean fly to China or Taiwan.

As emerging economies increase their consumption of fruits, with the increase in their per capita income, a new demand appears, especially in Asian countries, opening opportunities for apple growers and exporters.

However even if Chile and France face regulations from Asian countries (especially China, Taiwan or India), its geographical location, the off-season nature of its production and its natural phytosanitary conditions (Mediterranean fly free area) give the former an advantage in terms of capacity of compliance. In the Chilean case, as their phytosanitary restrictions are very close to those imposed by Asian countries or USA, it acts as a "common regulatory language". It reduces asymmetries in pest risk management and facilitates

trade. Thus, it is possible to understand why Chilean exports to Taiwan or USA coexist with high score value: once the constraints overcome, due to a learning effect or similarities in natural phytosanitary conditions, trade can unlock its potential.

In the French case, phytosanitary restrictions imposed by Asian countries or USA are the translation of really different natural and phytosanitary conditions. Then the regulations imposed to France by third countries act as real barriers with high costs of compliance (and learning).

These results, despite apparently opposed for France and Chile, are both consistent with the economic literature on international trade and non-tariff barriers, and suggest once more that sanitary and technical regulations can facilitate as well as hamper trade causing redistribution in the market shares.

Aknowledgments

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Appendix

Table A1. PS by country of 20 selected destinations of France and Chile apples.

France				Chile			
Country	PS Value	Trade Average 2007-2013	Existence of a trade agreement	Country	PS VALUE	Trade Average 2007-2013	Existence of a FTA
Algeria	1.16	63,437	Yes	Algeria	1.18	601	No
Angola	1.24	46	No	Bahrain	1.14	1,307	No
Australia	1.22	14	No	Belgium	1.18	5,756	yes
Austria	1.07	614	Yes	Bolivia	1.18	14,974	No
Bahrain	1.24	365	No	Brazil	1.15	13,400	Yes
Bangladesh	1.28	261	No	Canada	1.18	15,548	Yes
Belgium	1.07	37,748	Yes	China	1.47	12,467	Yes
Brazil	1.21	2,049	No	Colombia	1.15	68,894	No
Bulgaria	1.07	16	Yes	Costa Rica	1.14	7,810	Yes
Canada	1.15	422	No	Cyprus	1.18	535	Yes
China	1.47	638	No	Denmark	1.18	1,952	Yes
Colombia	1.28	965	No	Domin. Republic	1.25	1,705	No
Costa Rica	1.24	93	No	Ecuador	1.07	44,748	No
Cote d'Ivoire	1.24	727	No	Egypt	1.18	5,378	No
Czech Republic	1.07	449	No	El Salvador	1.14	4,841	Yes
Denmark	1.07	12,580	Yes	Finland	1.18	1,162	Yes
Djibouti	1.00	24	No	France	1.18	9,452	Yes
Ecuador	1.20	57	No	Georgia	1.18	327	No
Egypt	1.08	1,619	Yes	Germany	1.18	12,456	Yes

France				Chile			
Country	PS Value	Trade Average 2007-2013	Existence of a trade agreement	Country	PS VALUE	Trade Average 2007-2013	Existence of a FTA
Equat. Guinea	1.30	31	No	Greece	1.14	5,028	Yes
Estonia	1.07	318	Yes	Guatemala	1.18	5,403	Yes
Ethiopia	1.24	0.1	No	Honduras	1.22	3,243	No
Finland	1.07	11,745	Yes	Hong Kong	1.18	8,716	No
Germany	1.07	56,902	Yes	India	1.47	20,605	No
Greece	1.07	96	Yes	Ireland	1.18	2,530	Yes
Guinea	1.20	254	No	Italy	1.18	10,135	Yes
Honduras	1.24	0.1	No	Japan	2.72	0	No
Hong Kong	1.00	1,968	No	Jordan	1.30	797	No
Hungary	1.07	54	Yes	Kuwait	1.18	3,740	No
Iceland	1.07	65	Yes	Latvia	1.18	360	Yes
India	1.19	339	No	Libya	1.14	2,568	No
Indonesia	2.72	1,126	No	Malta	1.18	495	Yes
Iran	1.24	1,576	No	Mexico	1.51	8,053	Yes
Ireland	1.07	20,274	Yes	Netherlands	1.18	63,406	Yes
Israel	1.46	1,021	Yes	Norway	1.18	3,990	Yes
Italy	1.07	3,952	Yes	Oman	1.14	1,814	No
Jordan	1.28	213	Yes	Panama	1.19	1991	No
Kazakhstan	1.18	103	Yes	Peru	1.22	38,402	No
Kenya	1.28	199	No	Portugal	1.18	2,978	Yes
Kuwait	1.20	2,226	No	Qatar	1.18	1,193	No
Latvia	1.07	72	Yes	Russia	1.18	38,062	No
Libya	1.20	2,992	No	Saudi Arabia	1.18	49,620	No
Lithuania	1.07	718	Yes	South Korea	2.72	0	Yes
Luxembourg	1.07	1,092	Yes	Spain	1.18	21,593	Yes
Malaysia	1.11	4,885	No	Sweden	1.18	5,573	Yes
Maldives	1.00	276	No	Taiwan	1.47	41,995	No
Malta	1.07	7	Yes	Turkey	1.18	2,266	Yes
Mauritania	1.20	657	No	UAE	1.18	26,322	No
Mayotte	1.07	438	Yes	United Kingdom	1.18	31,919	Yes
Morocco	1.10	914	Yes	USA	1.51	103,697	Yes
N. Caledonia	1.03	163	Yes	Venezuela	1.18	28,416	No
Netherlands	1.07	66,287	Yes				
Nigeria	1.36	3	No				
Norway	1.07	2,279	Yes				
Oman	1.24	2,631	No				
Poland	1.07	644	Yes				
Portugal	1.07	25,520	Yes				
Romania	1.07	78	Yes				
Russia	1.21	26,118	Yes				
Saudi Arabia	1.12	16,631	No				

France			
Country	PS Value	Trade Average 2007-2013	Existence of a trade agreement
Seychelles	1.20	56	No
Singapore	1.09	3,770	No
Slovenia	1.07	36	Yes
South Africa	2.72	40	Yes
South Korea	2.72	0	Yes
Spain	1.07	101,845	Yes
Sri Lanka	1.28	49	No
Sudan	1.24	479	No
Sweden	1.07	9,104	Yes
Switzerland	1.07	643	Yes
Taiwan	1.47	287	No
Thailand	1.45	3,375	No
Togo	1.20	200	No
Tunisia	2.72	18	Yes
Turkey	1.28	204	Yes
United Arab Emirates	1.10	16,033	No
Uganda	1.17	14	No
United Kingdom	1.07	132,141	Yes
Uruguay	1.22	24	No
USA	1.52	25	No
Venezuela	1.22	200	No
VietNam	1.38	120	No

Box A1. SPS requirements description.

1. Ban and Territorial restriction. The ban forbids all exports of a product towards a third country. The ban may be justified either because of the presence of a quarantine organism in the country of origin but in the country of destination, as it is the case in Tunisia or in South Africa for French apples. Furthermore, countries of destination can temporary refuse imports as in the case of the apples from USA in Japan and from France in Vietnam (see above). Territorial restriction/Quarantine organism restriction: the importing country can impose to its providers that goods crossing its borders originate only from specific parts of the country of origin where quarantine organisms are absent or under control. For instance, France has negotiated a protocol with Indonesia which makes sure that only apples from the region «Pays de la Loire» can be exported. China and Taiwan impose similar restrictions to Chile. Area restriction is then an actual trade restriction.
2. Accreditation: is a more advanced form of territorial restriction. For instance, China or Taiwan establishes a precise list of orchards, of storage and packing facilities, of exporters with the domestic sanitary authorities. The list of accredited organisms can be defined in different ways. In the simplest case it is the local authority (in France the SRAL) which compiles the list of producers complying with phytosanitary requisites and the importer only needs to approve or not the list. Or, the importing country may decide to approve the list after the inspection of the producing units by its own inspectors. The frequency of inspections may vary according to what has been agreed upon by both parties.
3. The import permit (IP): this document is required by few countries imposing additional/reinforced inspections of goods. For instance, Israel phytosanitary authorities require that 2% of the total French exports are examined by local authorities (SRAL). Similar requests are addressed to Chile by countries like Honduras or Bolivia. In both cases, it is a more demanding control compared to the one usually performed by national sanitary authorities to deliver the PC. It is for this reason that the results of IP's inspections are quoted in the PC in the box "additional documents".
4. The Phytosanitary Certificate (PC): in the simplest case (as it is the case for France vs. Norway), the PC is obtained after a visual inspection by the SRAL of apples to be exported. Thus, issuing the PC is equivalent to an inspection. In more complex cases, the PC must mention also all the additional inspections required by the importing country and certified by the SRAL (origin of the products, agreement, import permit, cold treatment etc.)
5. Pre-inspection (or internal inspection): is an additional inspection required by a few countries among which USA and Taiwan. It is also qualified as double internal inspection because it must be implemented by the storage/packing employees before and during the packing operations. This double checking must be validated by the national Safety Authority.
6. Pre-clearance is an additional pre-shipment inspection required by the USA. The pre-clearance procedure must be performed by the APHIS/USDA inspectors and APHIS/USDA trained domestic inspectors (from the SRAL). Moreover, the volumes of the sample intended for inspection are defined by the APHIS/USDA regulation and are larger than those usually required by the SRAL (it is the reason why the presence of the SRAL is necessary during the samples' inspection). However, though we have to consider here the pre-clearance as a simple additional inspection, negotiations between USA and Italy or New Zealand show that pre-clearance is a heavier system of export control (2 or 3 inspections) which can coincide in the French case with a mix of pre-inspections and cold treatment.
7. The pre-cooling/fumigation: in case of the presence of the Mediterranean fly in the producing country, some importers require that the exporter prove that before the loading of apples in the refrigerated container, the merchandise has already reached the temperature recommended by the regulation (pre-cold treatment) or has been subjected to fumigation (with Methyl bromide). In this case the exporter requests the national Safety Authority to certify the apples have been subject to fumigation or pre-cooling during the storage and they have reached the temperature needed to start the cold treatment.
8. The cold treatment requires that fruits must be stored at a constant temperature between 0° and 4° for a period of 14 to 21 days to prevent contamination of products by harmful organisms. For all destinations requiring the cold treatment during the transit, the SRAL is requested to inspect and certify all the stages of loading in the refrigerated containers and the position of the sensors. The SRAL certifies the first stage of the process.
9. Inspection at arrival: it is a final and additional (or unique) inspection performed by representatives of the local phytosanitary authority, which sets the volumes of the samples to be inspected.

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Full Research Article

The italian microbrewing experience: features and perspectives

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Abstract. The so-called Italian *craft beer revolution* is a new phenomenon characterised by a rapidly growing number of microbreweries and popularity of their products. The evolution of the Italian craft beer sector has interesting potentialities in terms of local/rural development. The analysis is based on available statistics as well as on a survey carried out in May 2014 which discloses features, motivations and expectations of the craft beer producers. Together with the risk of overproduction due to the high number of recent entries, the creation of local supply chains (from barley cultivation to its transformation into malt) is emerging as a possible evolution of the sector, thanks to the advent of a new typology of microbrewery, the agricultural brewery.

Keywords. Microbreweries, agricultural beer, barley-to-beer supply chain.

JEL codes. L11, L66, Q13.

1. Introduction

In Italy, craft beer production is a recent and original phenomenon which is not only growing at a fast pace and being appreciated by consumers, but is also outperforming many other sectors of the domestic food and beverage industry, right in the middle of an adverse economic scenario. The rise of this phenomenon has been strongly influenced by the so-called US *craft beer revolution*, which was the grass-roots answer to a highly concentrated beer industry run by few 'giant brewers', as well as to the standardisation and homogenisation of the product (Tremblay and Tremblay, 2005). Started in California in the early 1970s, this "revolution" has led to the rediscovery of old, tastier and more flavourful beers, as well as to a great increase in the number of US producers. In the last decades, this "revolution" has crossed the US borders, spread across Europe (Cabras and

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Bamforth, 2016; Danson *et al.*, 2015; Esposti *et al.*, 2017) and, partly, also in Australia (Argent, 2018), Asia (Tsang and Li, 2016) and Latin America (Toro-Gonzales, 2015).

Eventually, the *craft beer revolution* reached Italy in the mid-nineties and its growth has become very intense in the last ten years. The Italian experience is peculiar for two reasons. First of all, Italy is a traditionally wine-producing and consuming country with an almost complete lack of beer culture and tradition (except in a few areas of the former Lombardo-Venetian Kingdom). Despite this, both craft brewers' number and popularity have been growing steadily, thus making it interesting to investigate what factors may have influenced their diffusion and success, privileging small-scale producers and generating new modes of consumption. Secondly, in the Italian experience, a further innovation has occurred in the last few years, which consists in the advent of a new and somehow unique typology of production units, the agricultural breweries. This new typology has emerged as a major part of the intense recent growth, opening new perspectives in terms of economic, social and environmental sustainability – mostly due to the creation of local supply chains, also in peripheral territories that normally have fewer development prospects.

While there is a wide literature referring to the wine sector (in which Italy has always stood out for its high-quality productions and widespread consumption), studies covering the Italian brewing sector are mainly descriptive or focusing on specific aspects[1], showing that more thorough analyses are needed in order to understand the astonishing development of craft beer productions and the adoption of new brewing business models.

In this context, the aim of this paper is to investigate the main features of the Italian craft brewing experience and the increasing role of agricultural breweries especially with regards to longer-term sustainability. Paragraph 2 provides a theoretical framework in order to understand how this phenomenon has become so popular in Italy while, in paragraph 3, economic data concerning the evolution of the beer (and craft beer) industry are discussed for the US, Europe, and Italy. Paragraph 4 presents an empirical investigation on the sector dynamics and, in particular, a survey focused on the specific features and role of agricultural breweries. Paragraph 5 draws some concluding remarks.

2. Conceptual framework

Although the Italian craft brewing sector is still considered a small economic niche, it can be legitimately regarded as an example of broader transformations within food production and consumption spheres. Favourable dynamics of the market[2], particular local/territorial features as well as the State's intervention may have contributed to its success. Simultaneously, as has already happened for other mature industries[3], the beer industry has been experiencing a significant restructuring process: although the beer market

[1] See Cannatelli and Pedrini (2012), Fastigi (2015), Fastigi *et al.* (2015), Garavaglia (2015), Ravelli and Pedrini (2015), Francioni (2016) and Menghini (2016).

[2] Such as, i.e., the diffusion of new lifestyles, more politically and ecologically oriented, which have been fostering increasing attention towards locally grown food and artisanal forms of production (Brunori, 2007; Cavanaugh, 2007; Goodman *et al.*, 2012; Grasseni, 2013; Paxson, 2013).

[3] As in the case of newspapers (Carroll, 1985), wine production (Swaminathan, 1995; 2001), investment banks (Park and Podolny, 2000), etc.

is notoriously oligopolistic, in the past few years a considerable number of new artisanal beer producers have made their appearance.

A few theoretical backgrounds may be helpful to understand the reasons behind the emergence and development of craft breweries. Within the social sciences, the transformations of production/consumption systems have been analysed in different disciplinary contexts and with different theoretical and methodological approaches. A first reading is provided by the Italian economic and sociological literature and its interpretation of local development and industrial districts, such as the idea that the Italian industrialisation process, particularly in the so-called Third Italy, was based on localised systems of small and medium enterprises in semi-peripheral areas (Becattini, 1979; Bagnasco, 1988; Blim, 1990; Trigilia, 2005). The "local", seen as a socio-cultural and institutional *milieu*, can condition economic agents' behaviour, either creating new opportunities or imposing restrictions upon the extension of the market (Granovetter, 1985 and 2005; Magatti and Borghi, 2002). Therefore, a particular *milieu* can either turn into localised advantages (*i.e.*, in terms of relatively lower costs, as in the case of large availability of a critical production factor, or higher productivity, due to better knowledge and skills) or, conversely, into localised disadvantages, which often take the form of congestion effects (such as an higher density of economic activities operating in the same area and in the same market, which intensify the competition for getting the best local production factors or the highest share of local consumers) (Esposti *et al.,* 2017). This concept is deeply linked to a central theoretical interpretation of local development, namely the idea that economic actions are embedded in social relations which, in turn, condition economic behaviours and impose restrictions upon the extension of the market.

More in general, though, the changes that have occurred over the last decades are coherent with the postmodern society, characterised by a transition from the Fordist large-scale production to an outsourced/service-based economy, with a more flexible way of production and the co-existence of more differentiated goods in order to meet the rapidly changing and increasingly heterogeneous consumers' tastes (Antonelli *et al.*, 2015). Also, in the agri-food sector different production and distribution systems have progressively emerged with a focus on quality in food practices (Goodman, 2003). This phenomenon has led to several experiences, i.e. those proposed by the Slow Food association, that have spread rapidly from Italy to Europe and then to the rest of the world[4] (Antonelli and Viganò, 2017). What is more, on the fringe of global/industrial supply chains, the so-called *Alternative Food Networks* (AFNs) are creating a more direct relationship between farmers and consumers and offering, at the same time, ideas for local development that is socially, environmentally and economically sustainable (Marsden *et al.*, 2000; Goodman, 2002; Norberg-Hodge *et al.*, 2002; Sonnino and Marsden, 2006; Brunori *et al.*, 2012; Goodman *et al.*, 2012; Torquati *et al.*, 2016). The AFNs can determine several positive effects, including an interaction between urban and rural areas, the preservation of local knowledge, traditions and local food products, as well as reducing the negative impact of transport, storing and packaging. Furthermore, AFNs allow farmers and small food producers to differentiate their products, giving the possibility to define new development

[4] In particular, to secure distinctive foods – in terms of 'taste quality' and linkage to a specific territory – facing extinction (Ark of Taste project), or aimed at protecting biodiversity, such as the Slow Food Presidia (Slow Food Foundation for Biodiversity).

strategies for small and medium-sized farms and increasing their survival probability (van der Ploeg *et al.*, 2000; Watts *et al.*, 2005; Winter, 2003; Coley *et al.*, 2009; Cleveland *et al.*, 2015). The AFNs vary widely in terms of organisational procedures[5], motivations, targets, development strategies and especially in how the relationships between producers and consumers are established. Undoubtedly, a crucial and original aspect of these networks is the consumer's behaviour, which is increasingly pro-active: an increasing number of consumers, in fact, has been questioning the unsustainability of the conventional/industrial agri-food system and its process of de-localisation, supporting (or actively participating in) the process of re-localisation. Consumption, in fact, is not only aimed at satisfying functional needs, but it is increasingly being used to strengthen social relationships as well as to exhibit political and ethical beliefs. Food has a strong link-value, so the focus on 'quality' shows a strong tendency to re-embed food in social networks as well as a counteraction to the McDonaldization of society (Ritzer, 1993) therefore favouring the "food from somewhere" instead of the "food from nowhere" (McMichael, 2009).

The consumers' increasing interest for quality and craftsmanship results in different emerging behavioural styles. For example, an interesting profile of the postmodern consumer is the one known as the "craft consumer" (Campbell, 2005), who exhibits a propensity to participate in the production process – a tendency that is gradually becoming more widespread in developed societies. The roots of this trend can be found in the "anti-system" and "anti-alienation" components including a form of consumer opposition to marketing pressure (Rullani and Fabris, 2007). However, this explanation has become less relevant as it has been replaced by a form of consumption that is more similar to a creative act. The value of manual labour has risen dramatically (Weiss, 2012; Paxson, 2013; Cavanaugh and Shankar, 2014) as more and more people, find in food and in its preparation both the possibility to learn certain artisanal and manual skills – which are often alien to modern forms of work – and a way of creating and strengthening social relationships. Indeed, all this opens new market spaces to small firms aiming at the quality of their output, as well as to new forms of entrepreneurship, such as those that transform a passion (*i.e.* homebrewing) into a remunerative and job-creating economic activity (De Solier, 2013).

In general, it seems that cultural transformations, together with the use of consumption as a means of social distinction (Bourdieu, 1984), are generating new economic opportunities and offer new choices for satisfying desires and – increasingly educated – tastes of many consumers (Scarpellini, 2011). Not surprisingly, some craft beer lovers seem to show a sense of elitism which is translated into preferences for beers that are neither highly publicised nor sold too far from their production site[6] (Schnell and Reese, 2003). As a matter of fact, demand can increasingly be seen as a way to express one's identity and personal lifestyle more than just the satisfaction of one's needs (Blaiech *et al.*,

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[5] According to different types of producer-consumer relations and/or to the degree of "connectedness" to the act of food production, AFNs can be classified in four sub-groups: producers as consumers, producer-consumer partnerships and direct sell initiatives (short supply chain), specialist retails (Venn *et al.*, 2006).

[6] For the craft beers, it should be noted that several studies have shown consumers' preferences to be greatly influenced by their values, over and above their objective taste propensity; in some blind taste tests, many of these discerning consumers were unable to recognise their favorite products or the possible presence of contaminants in beer (see Garavaglia, 2010).

2013). Modern consumers are less snobbish and more culturally multifaceted than in the past, where the status rank relied on a few highbrow genres of culture, while nowadays "high status is signalled by selectively drawing on multiple cultural forms from across the cultural hierarchy" (Johnston and Baumann, 2010: p. 35). In fact, consumers' increasing interest for food quality and craft productions, other than showing a certain level of cultural capital, makes them decisive in the success of the craft beer sector and in creating new patterns of production, exchange and consumption.

These theoretical considerations and the social and economic transformations they aim at interpreting are relevant for a proper understanding of the Italian craft beer revolution: however, there are other sectoral and specific aspects that actually matter and that have to be carefully considered as well.

3. The international beer market scenario

3.1 Global trends

Beer is, without any doubt, the most popular alcoholic drink internationally: both in terms of volume and value, world beer consumption is higher than any other alcoholic drink, such as wine and spirits (Colen and Swinnen, 2011). Despite a slight decrease in 2014 and in 2015, the world's beer production had increased for three decades (Kirin Beer University Report, 2015; 2016), with the threshold of 2 billion hectolitres close to being surpassed for the first time in history.

Asia and Latin America count together around 50% of the global beer market now, and China has been the world's largest beer-producing country since 2002 (The Barth Report, 2004) (Table 1). In 2015, the first four world's largest brewing companies (Anheuser-Busch InBev, SABMiller, Heineken and Carlsberg) were all headquartered in Western Europe (Belgium, the UK, the Netherlands and Denmark respectively), despite the fact that the centre of the beer market has been shifting consistently from Europe towards other geographical areas. The share of world beer production of these four major brewing companies rose from 39.7% in 2004 to 47% in 2015 (The Barth Report, 2005; 2016). To name just a few examples, the Belgian InBev[7] purchased the American brewing company Anheuser-Busch for $52 billion in 2008 to form the industrial giant Belgium-based AB InBev (Howard, 2014) which, in turn, completed in late 2015 the acquisition of its closest rival, SABMiller, for over $100 billion, creating the first "truly global brewer" (Bray, 2015).

Despite mega-brewers attempts to enter the craft beer market (see below), AB InBev's strategy might also be interpreted as a way to compensate losses in traditional markets (like the United States) with the penetration into (relatively) new markets (such as China) with huge growth potential and where craft beers are not yet popular (Shadbolt, 2015). In fact, it is worth noticing that the *craft beer revolution* is mainly occurring in those traditional beer-drinking geographical areas (Europe and North America) whose level of beer production and/or share of beer consumption over total alcohol consumption has significantly decreased in the past years. The US is the country where, in the 1970s, the craft

[7] Resulting from the merger, in 2004, between the Belgian Interbrew with the Brazilian AmBev, for $11.5 billion (Howard, 2014).

Table 1. Beer production by country (1,000 hl; 1961, 2000, 2015).

	1961	2000	2015	Ranking
China	500	220,000	471,572	1
USA	111,505	232,500	223,513	2
Brazil	8,000	82,600	138,575	3
Germany	76,266	110,429	95,623	4
USSR/Russia	26,000*	54,900	78,200	5
Mexico	8,303	57,812	74,500	6
Japan	12,431	70,998	53,800	7
Vietnam	n.a.	7,430	46,700	8
United Kingdom	45,374	55,279	44,054	9
Poland	7,064	24,000	39,800	10
France	18,154	18,926	20,520	17
Belgium	13,850	14,733	18,250	22
Italy	3,081	12,575	15,397	28

* 1961 production refers to the whole former Soviet Union; 2000 and 2015 data refer to the Russian Federation.
Source: Elaboration on The Barth Report (1962; 2002; 2016).

beer movement started (Tremblay and Tremblay, 2005) and where the craft beer sector still registers by far the best performance in the world. According to the Brewers Association[8] (2016a; 2016b), in 2016 the US craft beer share was 12.3% of the US beer market. It is a remarkable result, also considering that the craft beer sales volume grew by 6.2% in the same year while the overall beer market remained stable. In 2016, the number of craft breweries in the US was 5,234 (on a total number of 5,301). This is a substantial number if considered that only a few dozen breweries were operating in 1983 when the smallest number was reached in 150 years (Ronnenberg, 1998; Watson, 2015).

Beside the US pioneering experience, however, it must be acknowledged that an international convergence in alcohol consumption patterns is gradually happening. In emerging countries with lower income per capita (such as, i.e., China and Russia) the share of beer consumption has been growing steadily. On the contrary, in traditional European "beer-drinking" countries (such as Austria, Belgium, Czech Republic, Germany, Ireland and the UK) per-capita beer consumption has decreased in favour of wine and/or spirits, while the opposite has occurred in "wine-drinking" (such as Italy, Spain, France) and "spirit-drinking" countries (such as Poland). In the past 5 years solely (between 2010 and 2015), in the 28 European member States the number of active breweries went from 4,035 to 7,397 (The Brewers of Europe, 2016) and, as the former President of the Brewers of Europe (Demetrio Carceller) acknowledged, "«almost 100 per cent» of the new entrants are microbreweries producing speciality beers and mirroring the craft trend that has shaken up the US beer industry", with the result that the artisanal brewers are taking market share off industrial ones (Daneshkhu, 2014).

[8] The Brewers Association is the US craft industry body, promoting and protecting American craft brewers.

Following the craft beers success, many big brewing companies have started either to produce premium beers as well (Carroll and Swaminathan, 1992; 2000; Swaminathan, 1998; Carroll *et al.*, 2002; Hannan, 2005; Garavaglia, 2010) or to directly purchase craft breweries. Anheuser-Busch (wholly owned subsidiary of the Belgian AB-InBev) dominates the US. beer market with a 45% market share, even though this share has continuously declined over the past years (Trefis Team, 2017). From developing their in-house craft beer brand Shock Top to acquiring American craft brands, Anheuser-Busch has looked to penetrating the craft beer market. Despite the "threat of loss of customers due to the tie-up of their favourite local craft beer brand with a corporate giant" being real, on the other hand the increased reach and distribution channels could add new customers (Trefis Team, 2015).

But this phenomenon has not been confined to the United States (Allyn, 2016): in 2015, two very important London-based craft breweries, such as Meantime and Camden Town, were bought by SabMiller and AB InBev respectively (Turco, 2016a). And the same trend is now also concerning Italy: in fact, the first case of an industrial brewing company – AB InBev – buying an Italian craft beer producer – Birra del Borgo, one of the most popular and innovative Italian craft breweries – dates back to 2016 (Montagnoli, 2016; Turco, 2016b).

A final consideration is needed regarding the malting barley supply chain. In 2015, the European malting capacity was around 42% of the global malting capacity (Euromalt, 2017a), and the barley suitable for producing malt (which must be of high quality and able to germinate evenly and rapidly) was mainly produced in France (12.5 million tons), Germany (11.6 million tons), UK (7.3 million tons), and Spain (6.4 million tons)[9] (Euromalt, 2017b).

3.2 The Italian beer landscape

It is worth emphasising that a universally recognised definition for craft beer in Italy did not exist until 2016. In Italy, the craft beer movement started in the mid-1990s, mostly in the Central and Northern regions. This growth was fostered by some legislative and institutional innovations. In particular, in 1995 the Legislative Decree No. 504 introduced some simplifications and innovations into the complex bureaucratic procedures concerning beer production, and this explains why 1996 is usually considered the initial year of the Italian craft brewing sector. The new legal definition of artisanal beer (*Disegno di Legge* S 1328-B, article 35), approved by the Italian Parliament in 2016, defines it as beer produced by small, independent breweries that does not undergo pasteurisation or microfiltration during its production. A small independent brewery is defined as one that is legally and economically independent of any other brewery, that uses equipment physically distinct from any other brewery[10], that does not operate under an operating license

[9] The total EU production of malting barley, in 2015, was 61.11 million tons (Euromalt, 2017b).

[10] The requirement that an artisanal brewery use only its own equipment seems to exclude contract brewing from this definition, although its application has yet to hit the ground. While it may lead to a decline in brewing in this manner, it may also lead to more simple changes in marketing, as those who practice it may choose to dispense with the use of "artisanal" in their labels and other promotional materials. As beer firms are the most popular type of microbrewery adopted by new craft brewers, it will be interesting to see how and if this legal definition shapes the Italian craft brewing landscape (Fastigi and Cavanaugh, 2017).

of any other company, and whose production does not exceed 200,000 hectolitres per year. At the moment, very few Italian craft breweries produce more than 10,000 hectolitres per year while all the industrial ones (except for Hausbrandt group and Menabrea) have a much larger brewing capacity, from 616,000 hectolitres of Birra Forst to 5.2 million hectolitres of Heineken Italia (Assobirra, 2016; data refers to the year 2015)[11].

The first Italian microbreweries had a very small productive capacity and their beers distinguished from industrial ones because they were neither pasteurised nor filtered. Compared to other European countries, in Italy the lack of tradition left room to creativity and experimentalism: this creativity, combined with the Italian artisan ability, soon made Italian craft beers more and more respected and popular among beer experts, both in Italy and abroad and many of them are now recognised worldwide especially for their original tastes and styles. This increasing credibility of the Italian craft beer players is also reflected in the takeover, in 2012, of the Thomas Hardy's Ale – a famed historic British beer brand – by Brew Invest, a subsidiary of the Vecchiato brothers' Interbrau, one of the most important specialty beers distributors in Italy as well as owner of the agricultural craft brewery Birra Antoniana.

The evolution of the Italian craft brewing sector is impressive and its extraordinary growth has been concentrated largely in the last 10 years. In 2015, the Italian craft beer sector produced 390,000 hectolitres (with a growth of 22% with respect to 2014) and made up 2.1% of the national beer production[12]. Despite the lack of beer tradition in Italy, craft beers are now much more than a marginal component of the national beer offer. It is, rather, a very dynamic portion of the industry which is successfully capturing the evolution of consumers' tastes and behaviours, that tend to penalise industrial and homogenised productions in favour of more differentiated and creative beers. On the other hand, however, this rapid growth also raises serious questions about the long-term sustainability of this sector in Italy: in fact, this intense growth will likely slow down in the future, not only reducing the number of new entries but also negatively affecting the performance of the incumbents – eventually pushing some of them out of the market. Furthermore, a dip in craft beers prices could be expected as approaching its maturity phase.

Finally, the lack of beer-tradition in Italy has obliged the vast majority of national small producers to import raw materials from abroad (from regions with a longer and stronger beer tradition), with the consequence that local food supply chains are still often not involved in the creation of added value.

According to the current regulation, Italian microbreweries can be divided into four categories: 1) *craft brewery*, the most common type, which owns a production facility and sells its beer mainly off-site; 2) *brew pub*, which has a production facility as well but distributes its beer mainly on-site (*i.e.*, in its pub/restaurant); 3) *beer firm*, a firm that rents beer brewing equipment and space from other breweries to brew their own beer. The

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[11] Paying attention solely to the production capacity, in the US the Brewers Association stated that a craft brewery can produce up to 6 million barrels of beer per year (little more than 7 million hectolitres) whereas, in Italy, the association Unionbirrai (cultural association which promotes craft beer culture in Italy) as well as other authors (Cannatelli and Pedrini, 2012; Ravelli and Pedrini, 2015) – before the introduction of the legal definition of artisanal beer – used not to consider breweries as microbreweries if their production exceeded 10,000 hectolitres per year.

[12] Elaboration on Assobirra (2016).

fourth category, *agricultural brewery*, was included in 2010 following the approval of the Ministerial Decree No. 212. This typology is, to all intents and purposes, an agricultural firm which can therefore benefit from certain advantages with respect to other non-agricultural brewers, such as a more advantageous tax treatment and the possibility to benefit from European funds for rural development. To keep this status, *agro-brewers* must produce at least 51% of the raw materials used in their brewing process, as well as become members of a consortium, which malts the grains conferred by the members[13].

This latter typology represents a major novelty within the Italian craft brewing movement. On the one hand, according to the farmer's perspectives, it offers an important opportunity of production diversification for the agricultural firm. On the other hand, and more importantly, agricultural brewing may be the key link to local supply chains, opening the possibility of growing and malting barley locally as more than 80% of barley cultivation in Italy is currently used for feeding livestock (Fontana *et al*., 2005). This shows an unexploited space for barley cultivation intended for beer production, largely insufficient at the moment. Apart from the recent opening of the "Consorzio Italiano di Produttori dell'Orzo e della Birra" (called COBI), a micro malt house in the Marches region that malts barley conferred by its members, the production of malting barley has always been localised in the southern part of Italy where, in fact, the only two industrial malt houses are based. However, following the boom of the Italian craft brewing sector in the last decade, the creation of regional supply chains, as COBI did, will add value both to final products and to raw materials (Fastigi *et al.,* 2015).

Of major interest here is the emergence of agricultural breweries as the most dynamic and promising typology, representing also a hope for the long-term sustainability of the sector, on multiple levels (Fastigi, 2015). In economic terms, agricultural breweries are much more market- and business-oriented than the majority of very small, family-based and often amateur traditional microbreweries. From the social and environmental points of view, instead, they are expected to be more sustainable because, by Italian regulations, the bulk of the raw materials (in particular the production of barley and its transformation into malt) must come from the agricultural brewery itself thus implying a much shorter (local) supply chain and positive spillovers for the territory in terms of creation of knowledge and new satellite economic activities.

4. Empirical analysis

The main objective of the present paper is to provide some empirical evidence on the evolution of Italian craft brewing sector with particular attention to issues concerning its long-term sustainability and the role of agricultural breweries in this respect. Such empirical analysis is here pursued through a twofold approach. First of all, a descriptive but detailed analysis of the firms' dynamics within the sector is carried out in order to identify the emergence in the last few years of some tendencies that may indicate risks and opportunities in terms of long-term sustainability. On the one hand, the increase of turnover may signal some initial problems while, on the other hand, the emergence of agricultural breweries can be interpreted as a positive evolution. The geographical characterisation of

[13] This is the usual case, but there are also very few brewers that malt their cereals by themselves.

these processes may be relevant, and are also investigated, as it may indicate a stronger local dimension of these native activities.

Such descriptive analysis, however, does not take into account many relevant aspects concerning the recent evolution of the sector and its perspectives in terms of socio-economic sustainability. Motivations and expectations as well as specific characteristics of these firms and producers are of major relevance to detect the real entrepreneurial dimension of the phenomenon, its business and market orientation as well as its strategic choices. In particular, it is of primary interest here, given the hypotheses put forward above concerning the possible role of agricultural breweries in order to investigate the peculiarities of these firms and whether their emergence may represent a significant step of the whole sector towards a higher economic sustainability. This kind of investigation is herein performed though an online survey administered to all the microbreweries which were active by the end of May 2014 (Fastigi, 2015). Finally, an Ordered Logit model is estimated in order to empirically assess the determinants of the different expectations about the future evolution of the sector and, in particular, the role of agricultural breweries in this respect.

The data for these elaborations were collected from the web portal Microbirrifici.org, the most accurate (online) database with regards to microbreweries in Italy.

4.1 A descriptive analysis of the recent Italian craft brewing dynamics

The emergence of the craft brewing sector within the Italian beer industry is analysed in the present paper through a descriptive analysis of market dynamics[14]. Table 2 shows the striking upward trend in the Italian craft beer sector, with a large number of new small craft producers entering the market in the last two decades. In 2015, there were 920 active craft breweries in Italy. This is the result of 1,077 firms entering the market in the 1996-2015 period while 157 left it over the same period. Therefore, the number of Italian microbreweries has been increasing year after year demonstrating a rising growth rate but some new phenomena have also emerged in recent years. First of all, together with an intense entry rate, the last 4 years have also been characterised by a significant number of exits signalling that a kind of turnover process has also begun. Secondly, the sector has recently experienced an increasing heterogeneity with regards to brewery typologies (see Table 2).

Beer firms and agricultural breweries somehow represent two antithetical directions of the same kind of evolution. As the Italian craft brewing sector is now exiting from the period of pioneers, amateurs, and home-brewers and entering that of market and business orientation, such evolution apparently may take two opposite forms. On the one hand, larger size microbreweries may decide to enter the market by only taking care of the final part of the supply chain, that of commercial valorisation and differentiation of the prod-

[14] The determinants and the time-dependence of these dynamics can be more formally investigated with survival models. This kind of econometric investigation is beyond the scope of the present paper especially as it is not particularly informative concerning the specific features of major interest agricultural breweries while it still assures limited robustness in inferential analysis due to the quite recent emergence of the phenomenon and, thus, the limited number of observations (just 5 years). Nonetheless, an example of this econometric investigation on market dynamics can be found in Esposti *et al*. (2017).

Table 2. Active microbreweries in Italy by typology (1996 – 2015). Variations (Δ %) refer to the previous year.

Year	Craft Breweries		Brew Pubs		Beer Firms		Agricultural Breweries		Total	
	No.	Δ %	No.	Δ %	No.	Δ %	No.	Δ %	No.	Δ %
1996	8	33	8	167	0	-	0	-	16	78
1997	9	13	13	63	0	-	0	-	22	38
1998	8	-11	23	77	0	-	0	-	31	41
1999	12	50	32	39	0	-	0	-	44	42
2000	18	50	40	25	0	-	0	-	58	32
2001	21	17	49	23	0	-	0	-	70	21
2002	23	10	59	20	0	-	0	-	82	17
2003	34	48	61	3	0	-	0	-	95	16
2004	42	24	64	5	0	-	0	-	106	12
2005	55	31	70	9	0	-	0	-	125	18
2006	72	31	80	14	0	-	0	-	152	22
2007	91	26	92	15	3	-	0	-	186	22
2008	127	40	101	10	6	100	0	-	234	26
2009	155	22	106	5	9	50	0	-	270	15
2010	174	12	106	0	17	89	32	-	329	22
2011	201	16	115	8	30	76	38	19	384	17
2012	248	23	122	6	58	93	50	32	478	24
2013	309	25	125	2	117	102	68	36	619	29
2014	386	25	133	6	199	70	89	31	807	30
2015	434	12	136	2	246	24	104	17	920	14

Source: Elaboration on Microbirrifici.org.

ucts. This is what most beer firms do and this form would definitely allow big producers, and also large industrial brands, to enter this growing and promising market segment with its own new products. In this case, craft brewing does not guarantee any kind of local dimension in terms of agricultural production, competences, and skills. The entry of these bigger players might thus have major implications for the future of craft brewing in Italy. This looks like a pattern of conventionalisation (that is, craft products more like industrial ones) that may guarantee economic sustainability in terms of market and business orientation, thus of long-term profitability, but, in fact, might also reveal a negative outcome concerning the sustainability of localised supply chains and social and environmental feedbacks.

At the same time, the advent of agricultural breweries may represent the opposite attempt to transform this experience into a profitable activity while still maintaining a real craft dimension, high product heterogeneity and specificity as well as a stronger linkage with the local dimension and environment. While beer firms tend to prefer imported raw materials, it can be stated that where agricultural breweries are present this gives opportunities for local cereal, malt and, maybe, hop production and, therefore, opportunities

for the already mentioned, though still developing, regional supply chains (Fastigi *et al.*, 2015). A further convenience, in this respect, is represented by the fact that such initiatives, given their agricultural and rural relevance, may encounter the interest of regional policies. In particular, the regional Rural Development Plans (RDP) in Italy definitely played a role in supporting these initiatives and will be relevant, as well, also in the current programming period (2014-2020).

Table 2 supports this interpretation of a recent twofold evolution of the sector. In the last five years,[15] after the introduction of the "agricultural brewery" within the Italian regulation, the two most significantly growing typologies are the beer firms and the agricultural breweries. Therefore, though both processes are present, the question is whether we are experiencing an inversion in the re-orientation to market and business of the sectors: more focused on local (and, maybe, sustainable) agricultural production and transformation and less convergent towards the conventional industrial production mode?

Before trying to provide an answer to this question in the following sections, it is worth noticing here a final descriptive piece of evidence about the last years of evolution. It concerns the regional distribution of different microbrewery typologies and the emergence of a degree of geographical/local specialisation in this respect. Figure 1a shows the regional concentration of active microbreweries in Italy, highlighting Lombardy (16,6%), Piedmont (10,4%), Tuscany (8,8%) and Veneto (8,5%) as the four regions with the highest number of production units. This evidence may seem somehow obvious due to the size effect: these are among the largest (in geographical and demographic terms) Italian regions. Nonetheless, as shown in Figure 1a, these regions still form a continuous area in the North-Western part of the country while other large regions in the South (for instance Apulia and Sicily) do not belong to this leading group.

Again focusing attention on the specific segment of agricultural breweries, however, the picture is a little different (Figure 1b). Among the four regions with the highest number of production units we still find Tuscany and Lombardy but also Emilia-Romagna and, above all, Marche. Marche is a relatively small region but still presents the highest number of agricultural breweries among Italian regions with 16 production units. This is not so surprising, as it is the region where the already mentioned COBI consortium was created and is operating. This demonstrates how agricultural breweries are strongly related to the presence of a local supply chain. Also the concentration of production units in the four leading regions is higher in the agricultural brewery case compared to other typologies, at 49% and 43%, respectively.

To get rid of the regional size effect in order to have better representation of the geographical characterisation of the Italian craft brewing experience, it is helpful to express the presence of production units in relative terms. Figure 1c shows the four Italian regions with the highest number of production units per 100.000 inhabitants. It is now clear that the area with the highest presence of microbreweries is not the North-Western part of Italian but the Central-Eastern part. Also expressing the presence of agricultural production units in relative terms provides a different picture. Figures 1d and 1e reports the number of agricultural breweries per 100.000 inhabitants and the share of agricultural

[15] In 2010, the first year when agricultural breweries were added in the Italian regulation of the sector, there were 28 units.

Figure 1. Top four Italian regions for: (a) number of craft breweries, (b) number of agricultural breweries, (c) craft breweries per 100000 inhabitants (Italy = 1.5), (d) agricultural craft breweries per 100000 inhabitants (Italy = 0.17), (e) share of agricultural breweries on total microbreweries (Italy=11%).

Source: Elaboration on Microbirrifici.org. Data refers to the year 2015.

units on total microbreweries, respectively. The four regions with the highest values are the same for both indicators: Marche is by far the first (more than 35% of microbreweries are agricultural units) then followed by two contiguous central regions (Umbria and Toscana) and by a North-Eastern one (Friuli-Venezia-Giulia).

These maps actually reveal that the Italian craft brewing experience has a relevant geographical characterisation. Southern regions are still less active in this respect while the most dynamic areas correspond to that part of the country (the Central and North-Eastern part) with a marked, and widely emphasised, historical experience based on an industrialisation process driven by small and medium enterprises and a strong specialisation in traditional sectors.

There is an overall agreement that the advent of agricultural breweries represents a relevant and positive improvement within the Italian context. From an agricultural perspective, this has become a real alternative for farms' looking for profitable diversification strategies and new market opportunities. In pursuing such strategies, as mentioned, they may have access to the public support delivered by the regional RDPs that

is absent, or much more difficult to obtain, for non-agricultural breweries. Moreover, the local impact of these breweries is higher than non-agricultural ones especially in relation to jobs creation and revitalisation of rural areas and economies. A final, but still relevant advantage of agricultural breweries, would consist in the fiscal advantages acknowledged to this typology by the recent Italian regulation as it is treated as agricultural production and can thus benefit from the special agricultural tax regime. The latter advantages may also be problematic as it might encourage non-agricultural breweries to convert to the agricultural typology or major industrial producers to enter this segment by matching the minimum requisites designated by the current regulation. In fact, the advent of this typology is too recent to already assess whether this risk is real and its possible extent.

From a production point of view, however, an agricultural brewery can take different forms. As mentioned above, the basic requisite for a microbrewery to be considered agricultural is that at least 51% of the cereals used in its beer production must come from the brewery's own cultivation. In practice, there is no other limitation concerning the transformation stage, the plant size and ownership. Gradually, two opposite typologies have emerged. Agricultural breweries that are in fact originally conventional craft breweries that rent land to crop the large enough amount of product to meet the requirements to be considered an agricultural brewery and take advantage of the resulting benefits. On the other hand, there are the farms with conventional cereal production that decide to orient their production towards malt and beer transformation by renting a plant or by delivering its barley to an independent, often collective, production plant (technically, a type of agricultural beer firm). This second typology corresponds more closely to the idea of the local supply chain and to reinforce this link with the local production, collective plants or producer organisations voluntarily reinforce the requirements implied by the regulation. For instance, for a farm to be part of the previously mentioned COBI consortium and to benefit from COBI's trademark "Birragricola" (namely, "agricultural beer"), agricultural breweries must use at least 70% of their own grains.

Therefore, the advent of the agricultural brewery within the original and somehow unexpected Italian craft brewing experience has been hailed as a positive evolution. However, its characters are still largely unknown and its perspective has to be fully understood.

4.2 The survey

Can we ultimately state that the even more recent "agricultural brewery revolution" is taking place within the recent "Italian craft brewing revolution"? And, if the answer to this first question is positive, what actually characterises this revolution? In other words, what are the differences with respect to non-agricultural craft breweries and to what extent do they open new and more sustainable perspectives in the sector? As anticipated, statistical information is largely lacking regarding this specific phenomenon and it would not in any case capture the deeper aspects such as the motivations and expectations of the new agricultural beer producers. Therefore, to shed light on these aspects, an online survey was launched in 2014, through electronic questionnaires sent to all the active craft beer producers. The aim was to obtain information about their background, their motivations to undertake such a particular activity, their expectations as well as detailed production

information including the origin of the feedstock used in the beer production and preferred distribution channels[16].

The questionnaire was designed to gather first-hand information on craft brewers work history, time spent homebrewing as a hobby before starting their own private brewery, business strategy and expectations about the future of the sector. Last but not least, special attention is paid to the potential of this phenomenon in terms of generating local development which is also economically, socially and environmentally sustainable. The questionnaire was sent to the 604 microbrewers registered as active by May 2014 (in the web portal Microbirrifici.org) and was completed by 325 units, with a response rate of 53.81%. These 325 producers can be considered a representative sample of the whole population of Italian craft beer producers. The distribution across the four different typologies (Table 3) and across regions within the sample is very close to the same proportion within the population. As expression of the most recent growth of the sector, only 11.4% of the sampled breweries were founded before 2005. Of the other 88.6%, 23.4% were founded between 2005 and 2009, 65.2% between 2010 and the end of 2013.

By distinguishing the respondents by the year of foundation some significant differences emerge in terms of the origin of their choices to enter this market, *i.e.* their motivations and expectations. Table 4 compares the two groups of respondents (founded before and after 2010) with regards to some survey questions[17]. It emerges that "new" breweries are more business oriented as their entry choices is less dependent on previous homebrewing amateur experience and resulting more from a strategic choice concerning their activity. Also the context is new as these new entrants expect a more intense growth in production, thus more competition and lower prices. Nonetheless, differences among the two groups are not so large and do not apparently express a real change within the sector or post-2010 "revolution".

In fact, if a post-2010 "revolution" within the Italian craft brewing sector really occurred, this should be attributed to the advent of agricultural breweries. Therefore, to

Table 3. Composition of the sample (breweries that responded to the survey) compared to the population by typologies.

	Sample (respondents)		Population	
	No.	%	No.	%
Craft breweries	171	52.6	297	49.2
Brew Pubs	58	17.9	125	20.7
Beer Firms	67	20.6	118	19.5
Agricultural breweries	29	8.9	64	10.6
Total	325	100.0	604	100.0

[16] For more details on the sample see also (Fastigi, 2015; Fastigi *et al.*, 2015). The complete survey results are available upon request.

[17] Those with more significant differences between the two groups are reported. The whole comparison is available upon request.

Table 4. Comparison of survey responses between breweries founded before and after 2010 (%).

	<2010	2010-2013
What are the main reasons that made you want to become a craft brewer?		
Passion	44.3	41.5
Search for quality	18.4	20.3
Willingness to experiment	17.9	18.5
Strategic choice (business opportunity or production diversification)	13.0	15.3
Others	6.5	4.4
What do you expect as far as the production and number of breweries, in Italy, in the next five years?		
> production and breweries	53.9	65.7
> only production	24.4	21.9
Other	21.7	12.4
What are the expectations of the average price of craft beers in Italy in the next five years?		
Increase	25.2	26.0
Stable	30.6	30.3
Decrease	38.7	40.4
I don't know	5.4	3.4

assess whether these new entrants eventually determined a significant change in behaviours, motivations and expectations, the relevant comparison of the answers to the survey has to be made between agricultural and non-agricultural production units. In particular, here we want to assess, in sequence, whether differences have emerged regarding structural characteristics, motivations and expectations and, consequently, production and marketing choices.

Table 5 highlights some of the main differences emerging from the survey among the two groups. While the owner's age is the same (about 40 years), their experience in the sector is different. Agricultural breweries' owners more frequently than others (34.3% and 23.7% respectively) come from a former experience in the beer sector or in somewhat similar activities, like wine or spirits production. This could suggest that agricultural breweries are often strategic choices in terms of activity diversification and business reorientation of already existing professional activities. This would find further confirmation in the higher presence of previous amateur and home-brewing experience among the non-agricultural commercial breweries compared to agricultural ones (77.4% and 55.2% respectively). Nonetheless, these characteristics highly vary within the two groups and when a mean-comparison test (t-test) is performed, the results indicate a not statistically significant difference between agricultural and non-agricultural microbreweries.

With regard to production and economic size, however, the difference between the two groups emerges more clearly. Among non-agricultural breweries we find on average activities with a lower number of employees, production and revenue compared to agricultural ones. The latter, in particular, show an average production level in 2013 which is more than double the average production levels of non-agricultural breweries. The mean-

Table 5. Structural characteristics: comparison between survey responses of agricultural and non-agricultural breweries (% of responses).

	Agricultural breweries	Non-agricultural breweries
Owner's age	39.8	39.6
Two-group mean-comparison test (t test)	-.047	
Former working experience of the owner in the beer, wine, spirits' sector		
Yes	34.5	23.7
No	65.5	76.3
Two-group mean-comparison test (t test) a	-1.151	
Did the owner homebrew before starting the commercial craft brewery?		
Yes	55.2	77.4
No	44.8	22.6
Two-group mean-comparison test (t test)a		.628
Number of employees		
None	41.4	54.7
1-3	37.9	27.3
4-5	6.9	8.3
>5	13.8	9.7
Two-group mean-comparison test (t test)b	.104	
Beer production – 2013 (hl)	1.357	564,6
Two-group mean-comparison test (t test)	2.173*	
Revenue – 2013 avg. (€)		
<50.000	27.3	42.7
50.000-100.000	22.7	15.5
100.000-250.000	18.2	20.5
>250.000	31.8	21.3
Two-group mean-comparison test (t test)c	1.267	

[a] The test is computed on the dichotomous variable: Yes = 1; No = 2.
[b] The test is computed on the polytomous ordered variable: 1 = None; 2 = 1-3; 3 = 4-5; 4 => 5.
[c] The test is computed on the polytomous ordered variable: 1 =< 50.000 €; 2 = 50.000-100.000 €; 3 = 100.000-250.000 €; 4 => 250.000 €.
* Statistically significant at 0.1 level.

comparison test concludes that, at least in terms of production volumes, agricultural microbreweries are statistically bigger than non-agricultural ones.

A further evidence on the difference between agricultural and non-agricultural breweries has emerged within the Italian brewing sector in the last few years and concerns the differentiated production and marketing choices. This evidently depends on the already mentioned restrictions agricultural producers must meet in order to be considered agricultural breweries. But again, differences go beyond this and they are linked to a stronger business orientation of agricultural breweries. Table 6 compares some responses concerning the production and marketing choices. Their larger size and stronger business orienta-

Table 6. Production and marketing choices: comparison between survey responses of agricultural and non-agricultural breweries (% of responses).

	Agricultural breweries	Non-agricultural breweries
% of sales within the region?	67.5	70.2
Two-group mean-comparison test (t test)	-.397	
% of sales in different channels?		
Direct selling	23.1	38.0
Specialised retailers	69.4	58.0
Large-scale retailers	5.2	1.9
Web	2.3	2.1
Two-group mean-comparison test (t test)a	-2.169*	
How do you evaluate the quality of Italian malts		
Good	88.9	31.3
Medium	7.4	22.6
Poor	3.7	46.2
Two-group mean-comparison test (t test)b	-3.290*	
Do the conditions to produce barley for beer in Italy exist?		
Yes	96.4	79.3
No	0.0	7.6
I don't know	3.6	13.1
Two-group mean-comparison test (t test)c	-1.917*	

[a] The test is computed on the % of sales in specialised retailers.
[b] The test is computed on the polytomous ordered variable: Good = 1; Medium = 2; Poor = 3.
[c] The test is computed on the dichotomous variable: Yes = 1; No = 2.
* Statistically significant at 0.1 level.

tion justifies why agricultural breweries sell a slightly larger proportion outside the local (regional) market and tends to exploit more retail channels (both specialised and large-scale retailers) rather than rely on direct selling. In particular, this latter aspect is statistically different (mean-comparison test) between the two groups.

Beside market orientation, however, the main difference between the two typologies implied by the regulation concerns the feedstock, that is, cereal production, its provision and perception about quality. Considering the lack of a beer tradition in Italy (in most of the country), it is not surprising that Italian beers are mainly produced with imported malted cereals, from countries such as Germany or the United Kingdom, which, thanks to their tradition, have an undeniable competitive edge in terms of quality and price. The results of the questionnaire confirm this, showing that Italian non-agricultural microbrewers buy a very high percentage of their raw materials abroad (more than 90%) while this is evidently not possible for agricultural breweries where feedstock supply coming from abroad is just around 11%. This generates a major difference regarding the creation of a good quality local supply chain: most agricultural brewers are convinced that in Italy there are conditions for a national and local provision of cereals and malt to produce good

quality beer. This confidence is significantly lower among non-agricultural producers as confirmed by the mean-comparison tests.

On the one hand, this "agricultural side" of the craft beer revolution offers a great opportunity to increase the share of cereals cultivated within national borders (and the variety of supply), as well as to reduce the environmental impact of international transport of cereals from abroad. In this context, the exploitation of Italian barley would represent an interesting opportunity to add value to beers that are the result of skills, creativity and passion, thus responding to differentiated consumption behaviours, interested in local productions and cultures. On the other hand, the creation of a local supply chain linked to agricultural breweries does not limit their market penetration.

4.3 A quantitative assessment of expectations formation

Of major interest here is to assess whether these differences between the two typologies with regards to structure, size and marketing choices might lead to substantial differences also in terms of motivations and expectations concerning the craft brewing business. Table 7 compares some survey answers and supports this argument. Passion remains the most considerable factor in deciding to launch a craft beer business in both cases: 43.5% owners of non-agricultural microbreweries and 32.1% of agricultural ones responded that they started producing craft beer because they wanted to transform a passion into a job opportunity. The search for quality and desire to experiment different beer styles are significant factors as well, but less for agricultural producers. For the latter, on the contrary, a very relevant motivation (25% of the respondents) is the search for business opportunities and making a consequent strategic choice to re-orient the farming activity.

In addition to motivations, expectations also seem to differ. Most respondents declare optimistic expectations for the future concerning the enhancement of the cultivated area dedicated to feedstock for beer production, higher number of producers and overall volume of production. Agricultural breweries, however, show less optimistic, or more realistic, expectations: both feedstock and beer production is going to increase but the number of breweries will not. As a result most agricultural producers expect a price decrease, whereas non-agricultural microbreweries still trust in a price increase.

The apparently different motivations and expectations emerging from Table 7, however, provide just a qualitative evidence that can be hardly interpreted as an indisputable difference between agricultural and non-agricultural microbreweries. In order to more formally assess this different attitude, the answers provided on the expectations about the evolution of the sector have been used to construct an ordered categorical variable. Three questions have been considered: expectation about production volumes; expectation about prices; expectation about the quality of Italian barley and malt production. For the generic i-th microbrewery the ordered variable EX_i takes the following values: $EX_i = 0$ when the expectation is negative for all the three questions (no production increase, no price increase, no quality improvement); $EX_i = 1$, 2 or 3 when the expectation is positive for 1, 2 or all 3 aspects, respectively. As the microbreweries taking value $EX_i = 3$ are very few (just 2 units), values 2 and 3 have been collapsed into a unique value. Thus, the adopted ordered variable takes the following values: $EX_i = 0, 1, 2$.

Table 7. Motivations and expectations: comparison between survey responses of agricultural and non-agricultural breweries (% of responses).

	Agricultural breweries	Non-agricultural breweries
What are the main reasons that made you want to become a craft brewer?		
Passion	32.1	43.5
Search for quality	14.3	20.2
Willingness to experiment	12.5	18.9
Strategic choice (business opportunity or production diversification)	25.0	0.0
Others	16.1	17.5
In Italy in the next five years, will the quantity of cultivated barley for craft beer production increase?		
Yes	67.9	65.2
Not much	32.1	33.8
I don't know	0.0	1.1
What do you expect concerning the production and number of breweries in Italy in the next five years?		
> production and breweries	60.7	63.9
> only production	32.1	23.4
Other	7.1	12.7
What are the expectations of the average price of craft beers in Italy in the next five years?		
Increase	10.7	27.2
Stable	21.4	31.3
Decrease	67.9	37.1
I don't know	0.0	4.5

This categorical variable is then entered into a ordered logistic regression model (Ordered Logit) whose determinants (i.e., the independent variables) are selected characteristics of microbreweries presented and discussed in previous sections: the geographical location of the microbrewery expressed by a geographical gradient (an increasing variable moving from Northern to Southern provinces; Torino province takes the lowest value, Siracusa province takes the highest value); the age of the entrepreneur; the age of the microbrewery; the typology (a dummy taking value 0 for non-agricultural breweries and 1 for agricultural ones); the production level (hl/year); the % of sales within the region; the % sales in specialised shops.

Table 8 reports the Maximum Likelihood (ML) estimation of this Ordered Logit model (Cameron and Trivedi, 2005). Rather than reporting the estimated coefficients, the table reports the respective marginal effects as they can be directly interpreted as the increase of the probability to be associated to a given option induced by a unit increase of the inde-

Table 8. Ordered Logit estimation: conditional marginal effects for the 3 options (estimated standard errors in parenthesis).

	option 0 (N=36)	option 1 (N=205)	option 2 (N=84)
Geographical gradient N-S	-.0059* (.0030)	-.0058* (.0029)	.0116* (.0060)
Age - Entrepreneur	.0014* (.0008)	.0014* (.0010)	-.0028* (.0016)
Age - Brewery	.0032 (.0044)	.0030 (.0044)	-.0062 (.0088)
Agricultural microbrewery (dummy)	.0122 (.0231)	.0121 (.0232)	-.0243 (.0461)
Production (hl/year)	.0001 (.0001)	.0000 (.0001)	-.0001 (.0001)
% sales within the region	-.0037 (.0033)	-.0036 (.0030)	.0073 (.0065)
% sales in specialised shops	-.0058* (.0023)	-.0055* (.0020)	.0113* (.0052)

* Statistically significant at 0.1 level.

pendent variable.[18] Extreme options (highly pessimistic and highly optimistic breweries) collect a lower number of observations compared to the intermediate one. Nonetheless, in all options numerosity is enough to identify some statistical significant determinant.

The estimation results emerging from Table 8 suggest that expectations formation is significantly affected by three major factors: the geographical location; the age of the entrepreneur; the selected supply chain with the consequent marketing strategy. More positive expectations are found moving from Northern to Southern provinces and in young producers. Moreover, expectations are also higher for microbreweries with a higher share of sales to specialised shops so, arguably, with a stronger attention to the quality and specificity of their products.

On the contrary, the microbrewery typology does not seem to have a significant impact; in other words, expectations do not significantly differ between agricultural and non-agricultural breweries. The size and the age of the microbrewery do not significantly affect expectations, too. In fact, for all these variables the sign of the marginal effects would rather suggest that less optimistic expectations can be found in older and bigger agricultural microbreweries. It is worth noticing that these results differ from what emerged in previous studies about the main determinants of craft brewing dynamics in Italy (Esposti *et al.*, 2017). While agricultural breweries definitely represented a major engine in the recent boon of the sector in Italy and this rapid growth did not show a major geographical characterisation, the expectations about the future evolution of the sector are more affected by the location rather than by the typology.

5. Conclusions

This article aims at investigating the evolution of the new and strongly increasing phenomenon of production and consumption of craft beers in Italy. Although microbreweries are often seen as a niche sector within a market ruled by industrial mass producers,

[18] Coefficient estimates are available upon request. An Ordered Probit estimation has also been performed. Results are qualitatively very similar but with lower statistical quality. These further estimation results are available upon request.

the so-called craft brewing "revolution" is triggering interesting transformations in several contexts with possibly significant reverberations in terms of sustainable local development. Regarding this latter aspect, the Italian case shows an interesting peculiarity. It consists in the emergence, in the last five years, of a highly dynamic and particular segment, that of agricultural breweries.

The empirical analysis confirms that the advent of this new typology is significantly affecting the evolutionary trajectories of a still infant sector in Italy. Above all, it changes its long-term perspectives in terms of economic and socio-environmental sustainability. As a matter of fact, since the mid-nineties the Italian craft brewing "revolution" has been strongly dependent on amateur and home-brewing forms (the so-called "knowledge productive leisure" – De Solier, 2013), that then moved into commercial production. This origin explains the enthusiasm and the creativity that characterises the Italian experience but it may also reveal unsustainable aspects in the long term. The small microbreweries' size, their "naivety" as well as their dependence on imported feedstock and competences, may jeopardise their competitiveness in both domestic and foreign markets. The survey carried out and discussed, however, demonstrates that agricultural breweries are themselves "revolutionising" the sector with regard to these aspects. Their larger size, business orientation, creation of local supply chains, but also their more realistic attitude towards the real evolutionary potential of the sector may represent a real opportunity for the longer-term success of the Italian craft brewing industry.

The role of policies is also critical in this respect. On the one hand, it has been crucial for the birth of the Italian craft beer sector (Legislative Decree No. 504, 1995) and, in particular, of agricultural craft breweries (Ministerial Decree No. 212, 2010).[19] On the other hand, however, a further selective support is now expected for this latter typology, especially because of their potential in helping developing rural territories and their long-term sustainability. In particular, the creation of local supply chains, from the cultivation of barley to its transformation into malt, seems a major target for agricultural and rural policies. This seems of strategic relevance not only to reduce dependence on foreign imports (and, consequently, limiting the environmental impact of transport activities) but also to create economic opportunities for micro malt houses which, in turn, might even differentiate and innovate their malt production and trigger the research and development of new dedicated varieties of Italian malting barley (Anderson, 2013). On these opportunities and on the role of policy and regulation in this respect deeper investigations and further research are expected in the future.

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[19] The new legal definition of artisanal beer (Disegno di Legge S 1328-B, article 35), approved by the Italian Parliament 20 years after the birth of the sector, is the evidence of the greater and greater regard that this phenomenon has generated among the public.

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Short Communications

Sanitary and phytosanitary measures in the context of the CPTPP agreement

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Abstract. The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) is a notorious example of the proliferation of so-called mega trade agreements. The countries constituting its signatory parties include five hundred million inhabitants and almost fifteen percent of the global Gross Domestic Product. The objective of this paper is to analyze the role of sanitary and phytosanitary (SPS) provisions within the CPTPP regarding international food trade. Three sections are presented: (i) food production, imports and exports among CPTPP countries, (ii) the content of the SPS CPTPP chapter regarding the text of the WTO-SPS Agreement and (iii) concluding remarks. It stands out among the results that there are significant differences in agricultural production capabilities between CPTPP parties, which should be addressed in order to achieve the desired integration.

Keywords. Mega trade agreements, agricultural trade, food safety, sanitary and phytosanitary measures, Trans Pacific Partnership.

JEL codes. F13, F15, Q17.

1. Introduction

The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) is a notorious example of the proliferation of so-called mega trade agreements. It was signed as Trans Pacific Partnership Agreement (TPP) initially on February 2016 by 12 Pacific basin countries: Australia, Brunei Darussalam, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, United States and Vietnam, which altogether comprise almost eight hundred million inhabitants and 40% of the global GDP. TPP partners had two years after signing to ratify the agreement. In January 2017, the president of the United States, Donald Trump, withdrew the country from the agreement on his first day in office. After a few months of impasse, the rest of the TPP members decided to go ahead without the United States, signing the new version of the agreement in March 2018. The

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CPTPP will come into effect 60 days after at least six of the signatory countries have ratified it.

One of the chapters in the new CPTPP that did not change at all from the TPP version is the chapter on Sanitary and Phytosanitary Measures (SPS). These technical, non-tariff measures, which aim to protect food safety as well as animal and plant health, have been characterized in recent decades by their increased visibility, with various effects on agricultural trade flows. The objective of this paper is to analyze the SPS provisions within the CPTPP, considering the already existing regulatory framework under the Agreement on Sanitary and Phytosanitary Measures of the World Trade Organization (WTO) and the agricultural sector profile of signatory countries. Our research represents a relevant contribution to the discussion on the possible implications of CPTPP for the agricultural sector, as the literature on the Trans Pacific Partnership has been focused so far on its repercussions in general terms (UNCTAD, 2016).

2. Agricultural production and trade among CPTPP members

The CPTPP partners are quite diverse regarding size, contribution to GDP and productivity of their agricultural sector. Some countries, such as Mexico, Peru and Vietnam, have labor intensive agriculture with low productivity per worker. Australia, Canada and Japan, on the other hand, have low participation in agriculture in terms of total employment but remarkable productivity. These differences are mainly due to technological development and the ability to add value to the products. In fact, in Peru and Vietnam, small-scale family farming and even subsistence agriculture are still common, but the fast economic growth of both economies and the lack of profitability of family farming are

Table 1. CPTPP partners' general data on agricultural production (2014).

	Australia	Brunei	Canada	Chile	Japan	Malaysia	Mexico	New Zealand	Peru	Vietnam
Total population (millions)	23.6	0.4	35.5	17.8	127	30.2	123.8	4.6	30.8	92.5
Rural population (millions)	2.4	0.1	6.8	1.8	8.8	7.6	26	0.6	6.7	62
Area harvested (millions ha)	36	0	66	4	12	100	61	1	11	49
Area equipped for irrigation (1000 ha)	2,550	1	870	1,110	2,469	380	6,500	722	2,580	4,600
Employment in agriculture (%)	3.3	-	2.4	10.3	3.7	12.6	13.4	6.6	25.8	47.4
Agricultural value added per worker (constant US$)	52,701	83,868	-	6,638	50,720	10,127	4,416	28,677	1,949	489
Food production value (2004-06 millions US$)	25,035	50	27,181	8,424	17,730	14,311	35,142	10,334	9,145	27,498
Agriculture, value added (% GDP)	3	1	2	3	1	9	3	7	7	18

Source: Prepared by the author based on FAO (2015).

motivating land abandonment. In Vietnam, 56% of rural youth express a desire to migrate to big cities for work (The Ahn and Minh Chanh, 2015).

The contribution of agricultural products to total trade also differs considerably among CPTPP partners. In some Asian economies such as Brunei, Japan and Singapore, the participation of the agricultural sector in exports is negligible (less than 2%). For New Zealand, however, it represents more than half of total exports. For most CPTPP partners, such as Australia, Chile, Malaysia, Peru and Vietnam, the contribution of agriculture to exports is ten to fifteen percent. Vietnam, in spite of the low agricultural productivity, is now the world's leading coffee exporter.

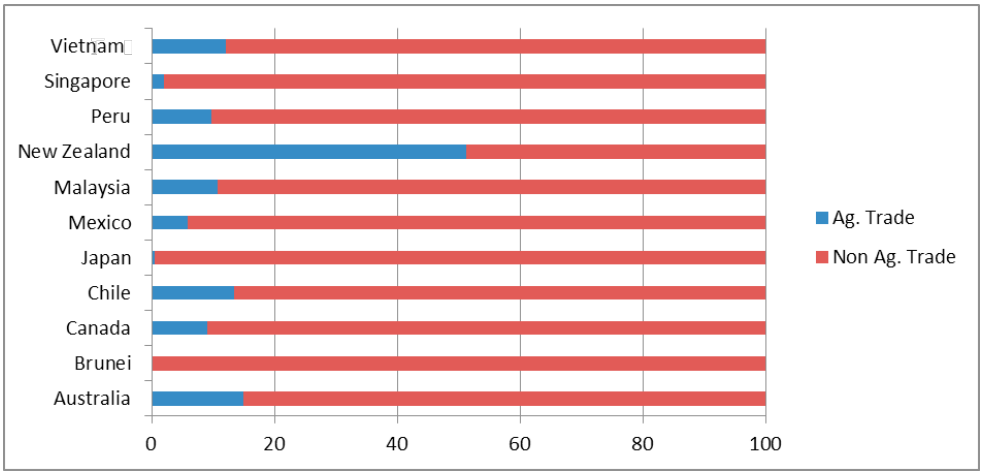
With respect to agricultural products as a percentage of total imports, the differences are not as significant among countries, with only a 10% gap between the minimum and the maximum. If we consider the size of each market, however, the situation changes. Global imports of agricultural products to Japan, Canada and Mexico alone constitute 58% of total CPTPP agricultural imports.

With regard to intra CPTPP agricultural trade, the situation is even more dramatic. Canada, Japan and Mexico concentrate 72% of imports of agricultural products from CPTPP countries.

3. Analysis of the CPTPP SPS Chapter considering the WTO SPS Agreement

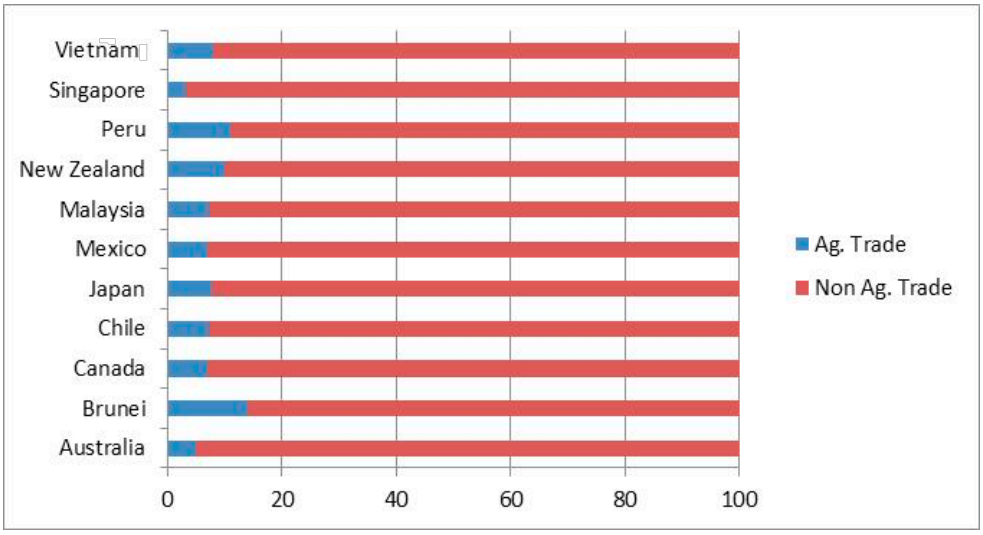
The CPTPP Agreement declares that one of its objectives is to *reinforce and build on the SPS Agreement* (art. 7.2.b). From its overture, however, it shows some substantial differences with the WTO-SPS Agreement with regards to its approach to SPS issues. The CPTPP Agreement stresses the importance of preserving compatibility between SPS measures and trade. In fact, it establishes within its objectives the protection of human, animal

Figure 1. Contribution of agricultural and non-agricultural products to total exports (%, 2005-2015).



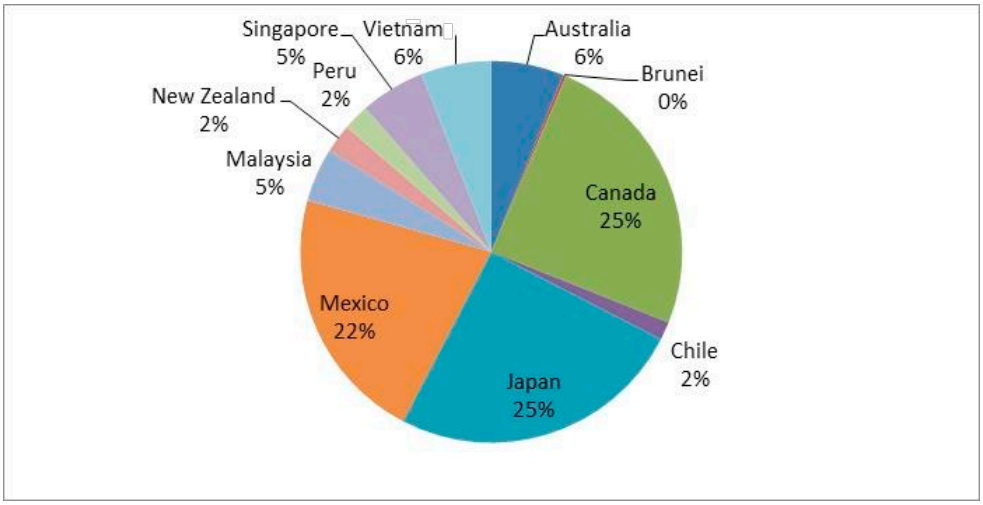
Source: Prepared by the author based on WITS.

Figure 2. Contribution of agricultural and non-agricultural products to total imports (%, 2005-2015).



Source: Prepared by the author based on WITS.

Figure 3. Destination markets of intra CPTPP agricultural exports (2014).



Source: Prepared by the author based on WITS.

and plant life or health, as the SPS Agreement does, but *while facilitating and expanding trade* (art. 7.2.a). The WTO-SPS Agreement merely states that SPS measures must not constitute a *disguised restriction on international trade*.

One of the strategies posed in the CPTPP Agreement to reduce the potential impacts of SPS in trade is to *strengthen communication, consultation and cooperation between the Parties* (art. 7.2.c). For this, as well as for the general supervision of the Parties' implementation of the provisions in the Chapter, the CPTPP Agreement establishes its own Committee for SPS Measures. The main functions of this Committee are to: i) act as a forum for the Parties on SPS matters, ii) identify and develop cooperation projects on SPS within the Parties and iii) share issues and positions for the meetings at the WTO Committee on SPS Measures and at the three international standard-setting organizations recognized by the WTO-SPS Agreement, including Codex Alimentarius Commission, the World Organization for Animal Health and the International Plant Protection Convention. With regards to the third function, Suppan (2015) suggests that, despite these consultations being voluntary, it would be difficult for the related authorities to ignore them if the country's representatives want to give the impression that they are enhancing cooperation.

Increased communication between CPTPP Parties also relies on transparency provisions. A particularity of the CPTPP Agreement is that it highlights the importance not only of sharing information between the Parties, but also with "interested persons", giving both the *opportunity to comment on their proposed sanitary and phytosanitary measures* (art. 7.13.1). This suggests that the CPTPP Agreement seeks to facilitate the inclusion of Parties' private sectors in the conception of SPS measures; which would be consistent with the large amount of interest and support that food industry representatives gave to TPP SPS Chapter negotiations in the US (Johnson, 2014). In fact, in the US, a high level of participation already exists among companies, public opinion and interest groups in the development of the country's SPS measures (USTR, n.d.).

Furthering the goal of a discussion of SPS measures beyond the institutional level, another addition to the provisions of the WTO-SPS Agreement is that CPTPP Parties *shall make available to the public, by electronic means in an official journal or on a website, the proposed sanitary or phytosanitary measure* (…) *the legal basis for the measure, and the written comments or a summary of the written comments that the Party has received* (art. 7.13.5). Electronic publication is also mandatory for the final version of the SPS. These requirements are also recommended by the WTO. In the 2008 document "Recommended procedures for implementing the transparency obligations of the SPS Agreement" (G/SPS/7/Rev.3) the WTO encourages the submission of an electronic version of the draft regulation along with the traditional notification format. The CPTPP goes further, making electronic communication mandatory and expanding its scope.

Another particular provision of the transparency within the CPTPP SPS Chapter is that it enhances the communication between Parties beyond the notification of SPS measures, through their competent authorities and contact points. The information that Parties exchange is related to: i) detected SPS risks of exports from the other Party's territory, ii) relevant changes in the sanitary or phytosanitary situation in all or part of the exporting Party which may affect the existing trade, iii) research progress possibly impacting SPS regulation and iv) significant changes in the Party's food safety and pest and disease management policies, as well as related practices that have the potential to affect trade. The WTO SPS Agreement also enhances members' communication through national Enquiry Points. However, the CPTPP focuses this communication on the triggers for the generation of SPS measures, seeming to push for the CPTPP Parties to anticipate complex, pos-

sible, forthcoming scenarios related to SPS regulation and procedures of the other Parties in order to adapt and avoid negative impacts on trade flows.

In fact, the CPTPP Agreement gives relevance not only to the process through which measures are communicated, but also to their conception. Like the WTO-SPS Agreement, preference is given to adherence to international standards. However, when a Party decides to develop its own SPS measures, different from the international ones, the CPTPP Agreement establishes that they must be based on *documented and objective scientific evidence* (art. 7.9.2). The use of the adjectives "documented and objective" instead of "available", as in the WTO-SPS Agreement, means that the precautionary principle (e.g., as in SPS Art. 5.7), by which the existence of a possible risk has to be considered, is undermined (Labonté *et al*., 2016).

Another particularity in the CPTPP Agreement on the topic of transparency is that Parties give to other Parties, but also interested persons, the possibility to comment on their risk analysis. This is another sign of the aim to facilitate the inclusion of interested groups in SPS measures development. The problem is that, given the technical complexity of risk analysis, it is possible that only resourceful counterparts and their operators or interested groups will be able to make informed comments. For the CPTPP Parties, this could amplify the current gap in regulatory performance on SPS that already exists between WTO developed and developing countries due to their different scientific capabilities (Boza and Muñoz, 2017). In this sense, the CPTPP SPS Chapter assumes that every Party, and in this case also their interested groups, had a similar infrastructure "for doing science", which is not factual whatsoever (Strether, 2015).

The approach that the CPTPP SPS Chapter adopts for the cooperation between Parties is quite different from the *technical assistance* and *special and differential treatment* provisions of the WTO-SPS Agreement, materialized, for example, in the Standards and Trade Development Facility. The CPTPP focuses on cooperation in terms of facilitating trade and exchanging information, but is not very specific on what comprises technical assistance. In fact, it establishes that the objective of cooperation in SPS is *eliminating unnecessary obstacles to trade between the Parties* (art. 7.15.2).

An important means to facilitate trade is the recognition of equivalence of other Parties' SPS measures. In this sense, the CPTPP Agreement goes further than the WTO-SPS Agreement (SPS-Art. 4), as it establishes that, beyond the specific measures, *the Parties shall apply equivalence to a group of measures or on a systems-wide basis* (art. 7.8.1). The recognition of equivalence starts at the request of the exporting country, which is followed by an assessment carried out by the importing country. This evaluation has to be based on *available knowledge, information and relevant experience, as well as the regulatory competence of the exporting Party* (art. 7.8.5). The last criterion, "regulatory competence", can be especially challenging, as it is difficult to quantify, and can lead to different interpretations. A measure, group of measures or systems wide basis is considered equivalent when it *achieves the same level of protection as the importing Party's measure; or has the same effect in achieving the objective as the importing Party's measure* (art. 7.8.6). These requirements are more specific than those in the WTO-SPS Agreement, which considers a measure equivalent if it guarantees an "appropriate" sanitary or phytosanitary protection level for the importer.

An additional way to facilitate trade is "regionalization", a principle in the WTO-SPS Agreement and also explicitly recognized in the CPTPP SPS Chapter. The CPTPP pro-

cess declaring pest or disease-free areas, and areas of low pest or disease prevalence is very similar to the one specified for the equivalence assessment. It has to be requested by the exporting country, evaluated by the importing country and maintain a continuous exchange of information during the procedure. In this case the CPTPP Agreement is quite similar to the WTO-SPS Agreement and WTO-SPS Committee guidelines.

As already mentioned, transparency is one of the principles that the CPTPP SPS Chapter tries to enhance the most. To that end, another novelty proposed in the CPTPP is the auditing of the competent authorities and inspection bodies by the other Parties. That procedure is not mentioned in the WTO SPS Agreement. The objective of audits is *to determine an exporting Party's ability to provide required assurances and meet the sanitary and phytosanitary measures of the importing Party* (art. 7.10.1). Before the audit starts, both the auditing and the audited Parties will discuss the objectives, scopes, requirements to be assessed, and the procedures to assess them. The audit process does not imply a moratorium on the establishment of new SPS measures.

The results of the audit will be known by the audited Party, which can make comments that have to be considered by the auditing Party in the preparation of the final report of the conclusions of the process. Meanwhile, the information generated during the auditing procedures will not be released to the general public. The costs of the audit will be borne by the auditing Party, unless both Parties decide otherwise.

The CPTPP Agreement allows the auditing Party to take decisions or actions considering the results of the audits. However, those decisions have to be based on *objective evidence and data that can be verified*, *taking into account the auditing Party's knowledge of, relevant experience with, and confidence in, the audited Party* (art. 7.10.6). It is important to consider that the generation of "objective evidence and data" requires an adequate level of technical capabilities that are specialized in SPS issues. As we have already mentioned, the costs of the process are assumed by the auditing Party. It is therefore reasonable to wonder whether this mechanism will be used much more frequently by CPTPP Parties with the lowest specialized human resource constraints.

Additional interesting innovations in the CPTPP SPS Chapter are related to the procedures for the inspection of imports. First, if required, Parties have to exchange complete information about the character, frequency and criteria of their inspections. The CPTPP Agreement establishes that Parties can adjust the frequency of inspections considering past experience, as well as "actions or discussions" under the agreement. According to the CPTPP Agreement, if a Party decides to refuse the import of a good from another Party, it has to notify *the importer or its agent; the exporter; the manufacturer; or the exporting Party* at the very least (art. 7.13.6). That notification has to be communicated *no later than seven days after the date of the decision* (art. 7.13.7) containing the reasons for the refusal, the legal basis and the situation of the rejected goods. One important thing to note is that, according to this provision, the Party refusing the shipment is not obligated to communicate its decision to the Party from which it proceeds, but only to the producer or to the trader. Again, the CPTPP is encouraging the role of the private sector. It allows the affected party to request a review of the decision, providing any relevant information during the process. That review process has received some criticism that considers it to be a mechanism that allows a sort of "State-to-State" or "Business-to-State" dispute (Food and Water Watch, 2015).

The CPTPP SPS Chapter also establishes parallel mechanisms to those under the WTO SPS Agreement. For example, the Cooperative Technical Consultations (CTC) can be used by a Party whenever there is an SPS matter that can potentially affect its trade and cannot be solved administrative or bilaterally. The CTC process is initiated when the concerned Party presents its request in writing and the responding Party acknowledges receipt. Both Parties have to meet within 30 days and attempt to resolve the matter within 180 days. The documents generated during the CTC remain confidential, unless the Parties agree otherwise. This concealment follows an aim of protecting Confidential Business Information, but neglects that the SPS objective, i.e. protection of public, animal and plant life and health, is of a collective nature (Suppan, 2015).

When Parties are not able to arrive at a solution within the CTC, the concerned Party can use the CPTPP Dispute Settlement Procedure, one of the most significant novelties of the agreement. This dispute settlement will begin operating progressively: for disputes related to equivalence principle, audits or import checks the procedure will be available one year after the agreement comes into effect for the responding Party; for disputes related to science and risk analysis, two years later.

There are specific provisions on equivalence and risk analysis that the CPTPP explicitly excludes from the dispute settlement. In the first case, that Parties have to recognize the equivalence of an SPS when it *has the same effect in achieving the objective as the importing Party's measure* (art. 7.8.6.b.). The second is the already mentioned article 7.9.2., according to which Parties have to assure that their SPS measures follow international standards, guidelines or recommendations or, if not, that they are based on *documented and objective scientific evidence that is rationally related to the measures*. These exceptions within the scope of disputes are not present in the WTO.

The details of how the CPTPP Dispute Settlement will operate are described in article 28 of the agreement. One of the most interesting features is that the deadlines for each stage of the dispute process are specified and are quite constraining. For example, once the panel has been fully established, it has 150 days to deliver a preliminary report on the case and another additional 30 days to present the final report to the disputing parties. If these terms were followed and are not regarded as a hopeful declaration of intentions, they would be much shorter than what is common for the WTO Dispute Settlement. That seems to be one of the main motivations for the establishment of the CPTPP Dispute Settlement. In any case, the CPTPP allows for the concurrent use of both the WTO and CPTPP Dispute Settlements.

Finally, indirectly related with future SPS disputes under the CPTPP is the inclusion of the "Trade of Products of Modern Biotechnology" in the National Treatment and Market Access for Goods Chapter. This means that any controversy between CPTPP Parties related to biotech food products, Genetically Modified Organisms (GMO's) included, will be primarily approached via the CPTPP Dispute Settlement considering principles of market access, rather than those of sanitary or phytosanitary protection. This is a completely different scenario than the 2003 WTO dispute on the European Union moratorium on the import of biotech products. In that case, the panel decision and aspects of the procedure were exclusively based on the WTO-SPS Agreement.

4. Concluding remarks

The TPP Agreement is a paradigmatic example of a mega trade agreement given the high proportion of the world economy that is included. The economic weight and level of development of CPTPP partners is heterogeneous, however. If we focus on the agricultural sector, we can also see important differences in both production and trade patterns; for instance, the level of productivity, which is expected to be largely related to technical capabilities.

The SPS-CPTPP chapter has a stated goal of higher integration between partners. However, all of the above differences can make achieving this difficult. Particularly, dissimilarities in technical capabilities must be taken into account, as they are essential in the context of SPS. Thus, although the chapter provides equal rights for all members, the power to properly exercise some of those rights seems very unequal. An important consequence of this is that the developed partners might override the rest.

The TPP SPS chapter also encourages the participation of companies in the discussion related to partners' SPS measures. Although this can be very positive because companies are directly related to compliance with SPS, those in the most developed economies might have higher technical and human capabilities.

It is therefore strongly recommended to consider mechanisms for technical assistance in SPS issues among the countries in the CPTPP, which are not limited to information exchange only, but also balance capabilities to a greater extent.

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