Contracts, Transaction Costs and Agricultural Production in the Pampas

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Abstract

This paper presents an analysis of agricultural contracts using a transaction costs approach. We contend that in a context of modern agriculture, with well defined property rights, agricultural contracts must balance costs and benefits, aligning tenant and landlord incentives towards a similar objective. The study debates the potential effects of tenancy status and duration of contracts, over soil conservation and input use. We present empirical evidence about the effects over the soil and input use in tenant (fixed rent or sharecropping) and owner-operator farms using farm level data from the 2002 National Agricultural Census of Argentina. The empirical results show some differential effects but do not support a general and clear negative effect for tenancy arrangements. Our intuition is that the interaction among specific characteristics of farmers (education, experience, assets, etc.), the natural resources endowment (soil fertility) and the economic and institutional environment (labor markets, monitoring costs, property rights, rule of law etc.) are more important factors than the land tenancy or contract type itself.

Keywords: Contracts, Agriculture, Transaction Costs, Sharecropping, Property Rights, Land Tenancy

JEL Classification: D2; Q15

I. Introduction

Land tenure and contractual arrangements are controversial issues in the Pampean agriculture. The early colonial pattern of large land holdings dictated the system of sharecropping agriculture with immigrant farmers that developed after 1860. Some authors describe the sharecropper system as a rational economic arrangement that favored landlords and tenants. There was no collusion on the part of large landholders to bar access to land by the newly arrived European farmers and the land market was open and competitive without legal or economic barriers to entrance (Cortés Conde, 1995). However, other authors contend that tenure regime and sharecropping arrangements had negative social and productive consequences (Scobie, 1964; Ferrer, 1965).

Eventually, through inheritance or sale, many of the very large “estancias” (cattle ranch) were broken up, but the original pattern of land occupation resulted in larger landholdings than in similar regions of the U.S. as the “Corn Belt”. In spite of these differences in land tenure arrangements, Gallacher et. al. (2003) suggests that a similar overall performance is observed in agricultural production in both countries because farmers are efficient in resource allocation (including land tenure arrangements).

During the last 15 years, Argentine agricultural production has been rising and land rental (both fixed rent and sharecropping) is a growing practice, implying a greater separation between the property and control of land. In this paper, our objective is to show that land tenure arrangements in the Pampean agriculture align interests and incentives in an efficient way. Using a transaction costs approach, we present empirical evidence about the effects of agricultural contracts (fixed rent, sharecropping) on soil conservation practices and input use (fertilizers).

The organization of the paper is the following. Section II briefly reviews the literature and presents the theoretical background. Section III describes the characteristics of the study area and the data set from the 2002 National Agricultural Census (NAC). Section IV presents the econometric analysis. Section IV has the final comments.

II. Literature Review and Theoretical Background

The analysis of fixed rent and sharecropping contracts has been extensively developed in the literature. In a fixed rent contract, the tenant pays a fixed amount not related to farm production. On the other hand, the sharecropping contract allows the tenant only a fraction of the total product (e.g., between 65 and 70% in Pampean grain production).

In a sharecropping contract the tenant has incentives to under-utilize inputs, this is widely known as the sharecropping problem in its "Marshallian" version (Johnson, 1950). Several reasons have been proposed to explain the use of sharecropping contracts. One incorporates risk in the analysis of contracts (Stiglitz 1988). Under this explanation, sharecropping is a way to share risk between the landlord and the tenant and the sharecropping contract appears as a choice in order to avoid risks. Therefore, the tenant shares not only the product but also part of the risk associated with agricultural production. One reply to this argument is that if there are no restrictions to make multiple fixed rent contracts, it is possible to avoid risk diversifying the use of fixed contracts (Newbery 1977).

Alternatively, the “moral hazard” approach suggests that efficient contracts balance the exchange between the costs associated with the risk and the benefits derived from generating optimal incentives for both parties. A sharecropping contract can be seen as a result of this balance (Stiglitz 1988).

These models have been considerably developed in the literature and empirically applied in the study of the contractual relations. Empirical results are mixed about efficiency under fixed and sharecropping contracts, with studies focused on developing countries with traditional agricultural sectors.

Our analysis will concentrate on the relationship between the landlord and the tenant using a theoretical framework associated with the transaction costs approach. Cheung (1968) shows that with well defined property rights the type of contracts does not affect efficient resource allocation. A critical assumption is the absence of transaction costs and in particular the inexistence of monitoring costs in the use of inputs or the effort made by the tenant.

Following Allen and Lueck (2002), we do not consider risk and we add to the analysis the use of specific characteristics of land. Specifically, the soil attributes are treated as an additional input in the production process. When a producer carries out the production in his own land, he manages the resources taking into account the present and future implications of his decisions. By contrast, a tenant with a fixed rent contract will only worry about his current results. Then, if greater yields could be obtained by putting aside adequate soil management, applications of fertilizers or other practices, the tenant has incentives in this direction.

In sharecropping contracts, if effort is observed imperfectly and there are monitoring costs, there would be incentives to underutilize inputs by the tenant. This implies, also that he may have less incentives to use the soil attributes excessively or to carry out actions with potential harmful effects over the natural resources. This could be seen as a potential benefit of sharecropping contracts (Allen and Lueck 2002).

However, this does not imply that sharecropping is always the most convenient arrangement for the landlord. Transaction costs are important in controlling and dividing the output, because the tenant has incentives to underreport the quantity of crop to the landlord. Of course, the landlord is aware of this problem and he will do all that he can to avoid this behavior.

The relative advantage of a fixed rent contract is to avoid the quantity control. However, it presents the problem of over-utilization of soil attributes. The sharecropping contract reduces the incentives to dig the soil, but it has costs related to the control of quantity and quality of crop.

Some other factors can lead the actions of tenants and landlords to the optimal use of the resources. For example, repeated transactions can build a reputation and reduce the costs of control. If transactions are less frequent but the landlord has good knowledge of the activity, he can reduce the monitoring costs. If control of production is relatively more costly, then he can opt for fixed rent contracts.

It is often argued that short-term contracts do not generate adequate incentives for both the conservation of resources and investments. However, when an owner-operator decides how to manage his land, he has as an inter-temporal profit-maximizing objective. When he considers the option of renting the land to a tenant, the analysis cannot be different. The landlord surely is aware of the incentives that the tenant has to make an over use of the soil attributes in the short term.

Our working hypothesis is that the design of the contracts should align interests of tenants and landlords, minimizing transaction costs. The contract design should make the actions converge in such a way that the results for a tenant will be similar to those of an owner or landlord-operator. However, a greater alignment of interests tends to increase the complexity and the costs of the contracts. Longer contracts may stimulate the conservation of assets and soil, but at the same time require more detailed conditions that are costly to control and enforce.

Pampean agricultural production is based mostly on short-term contracts, but the transactions are repeated and frequent. The incentive to build a reputation can act as an alternative mechanism for long-term contracts. A repeated short term contract can have implicit renovation if the tenant carries out the expected actions, but it is revoked easily if not. Our intuition is that we should not observe a systematic bias in resource allocation between annual tenants (fixed rent or sharecropping) *vis à vis* landlord-operators[1].

Hence, our principal conjecture is that contractual arrangements must balance costs and benefits, aligning incentives towards an objective similar to a producer-landlord with full interest in maximizing and conserving his wealth. We do not expect major differences between owner operators and tenants in input use or natural resources conservation.

If the crop share contracts do not give full incentives for the optimal use of inputs, and there are monitoring and control costs, some differences in input use (e.g., fertilizers) could be found in case of fixed rent contracts with respect to sharecropping contracts.

These conjectures are empirically tested in section IV.

III. Study Area and Data

The geographic focus of this study is the central-eastern region of Argentina known as the Pampas, one of the most productive agricultural areas in the world and of major importance to the Argentine economy (85% of the total grain production). Wheat and corn have been the principal crops for the last 100 years and soybean is a more recent crop. The empirical

[1] In Pampean agriculture, annual contracts prevail. According to current legislation, all agrarian contracts must be signed for three years and registered in courts. Even though detailed statistical information is not available on the fulfilment of this requirement, it is a well-know fact in the rural media that the majority of contracts do not comply with this formality. The evidence points out that for different reasons, surely linked to the transaction costs, farmers have opted to set up informal contracts. In this sense, we consider that the actual legal framework is neutral for the selection of the contracts and the productive decisions.

analysis is carried out using farm level data from the National Agricultural Census 2002 (NAC 2002) of Pergamino County, Province of Buenos Aires.

<Please see Figure 1>

Cropping systems include maize, soybean, wheat-soybean double crop and characteristic rotations include maize and soybean. Pergamino is representative of the Pampas and it presents characteristics of modern agriculture (defined property rights, modern inputs and technological knowledge) which makes it comparable, for example, with the American “Corn Belt”. The available micro data includes productive, economic and management variables for 1117 farms in a total area of 285,992 hectares, averaging 256 hectares per farm. Figure 2 presents the frequency distribution of farms and area.

<Please see Figure 2>

IV. Econometric Analysis

We carry out estimations of binary election models (Probit) to explain the utilization of soil conservation practices (no tillage or reduced tillage). Selection models (Tobit) are used to explain the cultivated area with no till practices and total fertilized area. From the 1117 farms we considered those that produced at least some of the four principal crops (soybeans, corn, wheat and sunflower). The result is a total of 944 observations available for the study. Dependent and independent variables and their definitions are presented in Table 1.

<Please see Table 1>

CONS is a binary variable that identifies the use of the conservation practices (when CONS=1). A group of four continuous variables measures the relative adoption of no till practices (AREANT) and fertilizing (TOTFER), the relative fertilization in cereals (CWFER), and fertilization in oilseeds (SSFER).

The independent variables are grouped in those measuring the type of land tenancy (T, TF, TS, T_OTHER, OWN_TEN) and those that control by productive characteristics

(CULTA, SOY, SUMM, SERV, MAINT), physical capital (PLOWS, TRACT, DIR), human capital and management (EDU, RESID, MANAG, PUBEXT, PRIVADV).

Table 2 presents the probit estimation for the binary dependent variable CONS.

<Please see Table 2>

In the first model, the variables T and OWN_TEN were included to estimate the effect of these two forms of tenancy on CONS (controlling for covariates). In the second equation the tenancy status is distinguished by type of contract, including the variables TF, TSP and A_OTHER. Our main interest is on coefficients associated with tenancy variables (T, TF and TS), and we observe that those coefficients are not significant in any of the estimations. Only the coefficient associated with the category T_OTHER appears with negative sign and marginally significant at 10% in estimation 2. The estimated coefficient of TS has a positive sign and that of TF has a negative sign (and marginally significant at 11%). Following the theoretical conjecture that there are greater incentives to over use soil attributes in fixed rent contracts, this finding may imply a differential effect between fixed rent and crop share contracts. Table 4 (line A) presents a Wald test that contrasts the hypothesis of equality of both coefficients.

<Please see Table 4 >

The result shows that (marginally) at 11% we can reject the null hypothesis of equality. This suggests some differential effect of greater adoption of conservation practices in cases of sharecropping contracts. So, the tenancy status appears relatively neutral in terms of conservation practices, with a slightly superior adoption of conservation practices in crop share contracts.

Regarding control variables, it is clear that the quantity and type of available machinery affects the adoption of conservation practices, since the effect of PLOWS and TRACT over CONS appears to be systematically negative and significant, while the effect of

DIR is positive and significant. Variables related with human capital and management presents a positive and significant effect over the adoption of conservation practices.

Columns 3 to 6 in Table 2, present the estimations using no till area (AREANT) and fertilized area (TOTFERT) as a percentage of the total farming area as dependent variables. Farms that do not carry out soil conservation practices or do not fertilize always have a percentage equal to zero. To address this problem of sample selection, we used models of simultaneous selection (Tobit) to perform the estimations.

Equation 3, with no till practices (AREANT) as dependent variable, shows that the estimated coefficient for variable T is not significant. On the other hand, in equation 4, the coefficient associated with fixed rent (TF) is negative and significant. This result is similar to the conservation practices equation. In the same way, we perform a Wald test to contrast equality between the estimated coefficients for TF and TS. Results (line B Table 4) suggest a greater use of no till practices for crop share tenants.

The coefficient associated with tenancy (T) is negative and significant at 10% in equation 5. However, controlling by contract type, there are no significant differential effects relative to the base category (landlords). We also tested the null hypothesis of equality between these coefficients (line C Table 4). The Wald test does not reject the null hypothesis of coefficients equality.

The effect of the dummy variable SOY, that controls farms dedicated only to soybean production, appears negative and significant in fertilization equations. Fertilization in soybeans is much less frequent, since marginal yield response is reduced. In order to control this effect we analyzed the practice of fertilization in two sub samples. One sub sample includes farms producing cereal crops and the other those producing oilseeds. Estimation results for each sub sample are presented in Table 3 (equations 7 to 10).

<Please see Table 3>

Equation 7, shows that the tenancy variable is significant and positive when fertilization in corn and wheat (CWFERT) is the dependent variable. Equation 8 includes dummy variables for sharecropping and fixed rent contracts, and the Wald test (line D in Table 4) suggests equality between estimated coefficients.

For oilseed crops fertilization (SSFRT, equation 9) the coefficient associated with T is negative and significant. When the effects are separated by contract type (equation 10), the negative effect on fertilization by the tenants is explained principally by the group of sharecropping tenants. The Wald test (line E in Table 4) allows the rejection of the null hypothesis of equality.

Though the tenancy effect on fertilization is negative when all crops are considered together, it appears to be reasonable to differentiate the effect analyzing separately the cereal and oilseed crops, because they have a different marginal response. Cereal crops present a greater response to nitrogen fertilization. On the other hand, for soybeans this fertilizer has little marginal effect on yields. The application of phosphorus an element with positive residual effects for subsequent crops is more frequent.

The fertilization decision includes two criteria: sufficiency and replacement. The sufficiency criterion is to fertilize only when the level of nutrients in the soil is below the critical value. On the other hand, the replacement criterion, is to fertilize systematically, adding the quantities of nutrients that the crops extract.

We interpret the empirical findings as follows: for cereal crops, even though the tenants do not have incentives to apply the replacement criteria (because they only have a temporary property right on the land) they do have strong incentives to apply the sufficiency criterion to increase yields. Empirical results show that the effect of sufficiency criterion seems to be important, implying that tenants tend to fertilize, on average, more than the owner operators. We can conjecture that owner operators will resort to other practices that substitute the application of fertilizers in cereals (e.g. crop rotations or soybean fertilization as precedent crop).

The theoretical analysis indicates that incentives for fertilizing could be lower in sharecropping contracts. This situation is not clearly distinguished in the estimations since we do not find significant differences between coefficients. Perhaps, greater information about contracts is necessary to distinguish the effects. It is observed that in oilseed crops (soybeans) the effect of the tenancy category is clearly negative over fertilization, particularly in the case of the sharecropping contracts. In this case the sufficiency criteria may have a low impact, since the effects of fertilizers are reduced, and also there are low incentives for replacement, resulting in a clear negative effect.

Summarizing, for cereal crops the tenants (fixed rent or sharecroppers) tend to fertilize more than owners. For oilseed, due to the lower marginal response and the greater residual effect of phosphorus, a negative effect is observed for tenants, in particular for sharecroppers.

IV. Final Comments

Land tenancy and contract arrangements used in the Pampean agricultural production are important and controversial issues. However, at least to the best of our knowledge, there are no studies that approach the subject with a transaction costs analytical framework and empirically contrast the conjectures. Our study debates the potential effects over soil conservation or input use of tenancy and duration of contracts. The empirical results show some differential effects but do not support a general and clear negative effect in tenant farms.

Finally, our empirical results are consistent with the theoretical conjecture that the different contract arrangements tend to minimize transaction costs, resulting in a similar resource allocation without superiority of land ownership over land rental by tenants.

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Table 1. Definition of Variables

Dependent Variables:

CONS: Dummy variable that assumes the value of one if on the cultivated area some conservationist practice is carried out (e.g. no tillage, reduced tillage,).

AREANT: Area with no till practice as percentage of the total area cultivated with soybeans, corn, wheat and sunflower.

TOTFERT: Total fertilized area as percentage of the cultivated area in corn, wheat and sunflower.

CWFERT: Fertilized area in corn and wheat crops as percentage of the total implanted area with corn and wheat.

SSFERT: Fertilized area in soybeans and sunflower crops as percentage of the total implanted area with soybeans and sunflower.

Independent Variables:

T: Dummy variable for tenant farms. It assumes the value of one if the ratio between the own cultivated area (OA) and the total area of the farm (ATOT) is less o equal to 0.20 (0.20 ≥ OA/ATOT).

TF: Dummy variable for type T farms with fixed rent contract. It assumes the value of one if the rent is fixed in a proportion greater or equal than 0.80 with respect to the total rented area.

TS: Dummy variable for type T farms with sharecropping contract. It assumes the value of one if the sharecropped area is a proportion greater or equal than 0.80 with respect to the total area rented.

T_OTHER: Dummy variable that takes value of one for type T farms that belong neither to the category TF nor to the category TS (T_OTHER = T – TF – TS).

OWN_TEN: Dummy variable for farms that combine own land and tenancy. It assumes the value of one if 0.20 < OA/ATOT < 0.80.

CULTA: Total cultivated area with wheat, corn, soybeans and sunflower, in thousands of hectares.

SOY: Dummy variable that assumes the value of one if the farm produces only soybeans

SUMM: Dummy variable that assumes the value of one if the farm carries out just summer crops (corn-soybeans)

PLOWS: Total number of plows (or similar equipment)

TRACT: Dummy variable that takes the value one if the farm has one or more tractors.

DIR: Total number of machinery for direct seed-planting (no till machinery)

SERV: Total area contracted for services of plowing and soil preparation in thousand of hectares

MAINT: Total area contracted for maintenance work and conservation of the crops, in thousands of hectares.

EDU: Education of the producer measured in a scale between 1 and 7.5 (1: no education; 7.5: complete college education) (this variable assumes the value of zero when the farm is some type of partnership or corporation).

EDUD: Dummy variable that assumes the value of one when the variable EDU assumes the value of zero (it controls for possible bias in the coefficient associated with EDU due to the inclusion of zeros)

RESID: Dummy variable that assumes the value of one if the producer or any of the partners resides on the farm.

MANAG: Dummy variable that assumes the value of one if the farm keeps formal accounting and productive records.

PUBEXT: Dummy variable that assumes the value one if the farm receives extension services from some public organization (state or federal).

PRIVADV: Dummy variable that assumes the value of one if the farm uses some private technical advise (independent professionals, companies, NGOs)

Table 2. Probit (Conservation Practices) and Tobit (No Till - Fertilization) Estimates

Variables	CONS (1)	CONS (2)	AREANT (3)	AREANT (4)	TOTFERT (5)	TOTFERT (6)
T	-0.177 (-1.55)		-2.654 (-0.56)		-7.593 (-1.91)*	
TF		-0.251[A] (-1.63)		-11.192[B] (-1.75)*		-5.901[C] (-1.13)
TS		0.119[A] (0.59)		4.867[B] (0.57)		-11.034[C] (-1.47)
A_OTHER		-0.300 (-1.68)*		3.426 (0.48)		-7.845 (-1.30)
OWN_TEN	-0.103 (-0.89)	-0.106 (-0.92)	-1.986 (-0.42)	-2.035 (-0.43)	-2.347 (-0.62)	-2.342 (-0.62)
CULTA	-0.365 (-2.43)**	-0.361 (-2.39)**	-2.964 (-0.50)	-20.754 (-0.47)	-7.036 (-1.40)	7.119 (-1.42)
SUMM	-0.156 (-1.62)	-0.165 (-1.71)*	-23.440 (-5.82)***	-23.825 (-5.92)***		
SOY					-63.220 (-15.58)***	-63.122 (-15.54)***
PLOWS	-0.177 (-5.42)***	-0.177 (-5.42)***	-6.291 (-4.85)***	-6.192 (-4.78)***		
TRACT	-0.676 (-5.12)***	-0.670 (-5.04)***	-27.386 (-4.91)***	-28.174 (-5.04)***	-7.798 (-1.78)*	-7.770 (-1.77)*
DIR	0.585 (6.87)***	0.594 (6.93)***	23.749 (7.76)***	23.893 (7.80)***	4.333 (1.84)*	4.299 (1.83)*
SERV	0.552 (2.34)**	0.557 (2.36)**	20.453 (2.18)**	21.407 (2.28)**		
MAINT					5.635 (2.70)***	5.578 (2.67)***
EDU	0.107 (3.36)***	0.111 (3.50)***	4.738 (3.53)***	4.860 (3.62)***	2.593 (2.32)**	2.548 (2.27)**
EDUD	0.627 (3.20)***	0.650 (3.30)***	20.461 (2.45)**	20.322 (2.44)**	16.190 (2.36)**	16.104 (2.35)**
MANAG	0.241 (2.25)**	0.238 (2.21)**	6.436 (1.44)	7.136 (1.60)	13.906 (3.73)***	13.843 (3.69)***
PUBEXT	0.458 (2.16)**	0.452 (2.13)**	13.312 (1.57)	13.260 (1.56)	9.621 (1.37)	9.695 (1.38)
PRIVADV	0.221 (2.00)**	0.210 (1.90)*	9.725 (2.13)**	9.514 (2.08)**	4.441 (1.15)	4.569 (1.18)
RESID	-0.271 (-2.45)**	-0.270 (-2.42)**	-14.960 (-3.28)***	-14.897 (-3.28)***	-7.642 (-2.07)**	-7.673 (2.07)**
Constant	-0.224 (-1.05)	-0.236 (-1.11)	44.939 (5.00)***	44.695 (4.99)***	19.833 (2.61)***	19.956 (2.62)***
Method of Estimation	Probit	Probit	Tobit	Tobit	Tobit	Tobit
No. Observations	944	944	944	944	944	944
Censored Observations (Dep. Var.<=0)	-	-	324	324	353	353
Not Censored Obs.	-	-	620	620	591	591
Log-Likelihood	-524.05	-521.15	-3620.897	-3618.903	-3243.137	-3242.953
LR Test	213.44***	219.26***	240.12***	244.11***	390.10***	390.46***
Pseudo R^2	0.171	0.174	0.0321	0.0326	0.0567	0.0568

Notes: z statistics in parentheses; *** Significant at the 1%; **Significant at the 5%; *Significant at the 10%;

A and B: see Table 6 for Wald test of coefficients equality

Table 3. Tobit Estimates (Cereals and Oilseeds Fertilization)

Variables	CWFERT (7)	CWFERT (8)	SSFERT (9)	SSFERT (10)
T	15.757 (2.65)***		-44.403 (-2.33)**	
TF		12.054[D] (1.59)		-31.592[E] (-1.30)
TS		22.316[D] (1.97)**		-129.616[E] (-2.34)**
A_OTHER		17.491 (1.91)***		-28.223 (-0.98)
OWN_TEN	9.995 (1.83)*	10.032 (1.84)*	13.518 (0.82)	13.680 (0.83)
CULTA	-3.316 (-0.95)	-6.111 (-0.92)	-40.744 (-1.41)	-42.146 (-1.45)
TRACT	-2.447 (-0.35)	-2.732 (-0.39)	-25.239 (-1.39)	-27.166 (-1.50)
DIR	10.007 (3.03)***	10.049 (3.05)***	-0.068 (-0.01)	-0.316 (-0.03)
MAINT	3.033 (1.12)	3.124 (1.15)	25.986 (2.47)**	25.666 (2.43)**
EDU	3.613 (2.15)**	3.675 (2.19)**	5.124 (1.05)	4.339 (0.89)
EDUD	24.803 (2.46)**	24.937 (2.24)**	18.245 (0.60)	14.485 (0.47)
MANAG	20.514 (3.72)***	20.742 (3.73)***	54.670 (2.98)***	55.606 (3.03)***
PUBEXT	24.788 (2.42)**	24.706 (2.41)**	-5.005 (-0.16)	-4.807 (-0.16)
PRIVADV	9.158 (1.53)	8.821 (1.47)	9.492 (0.56)	10.924 (0.67)
RESID	-11.683 (-2.17)**	-11.544 (-2.15)**	-32.624 (-1.85)*	-33.204 (-1.88)*
Constant	61.878 (5.35)***	61.840 (5.26)***	-185.040 (-5.09)***	-180.928 (-4.98)***
Method of Estimation	Tobit	Tobit	Tobit	Tobit
No. Observations	584	584	943	943
Censored Observations (Var. Dep.<=0)	51	51	824	824
Not Censored Observatons	533	533	119	119
Log likelihood	-2951.476	-2951.1134	-965.845	-963.829
Likelihood Ratio Test	79.87***	80.59***	35.79***	38.92***
Pseudo R2	0.013	0.013	0.018	0.020

Notes: z statistics in parentheses; *** Significant at the 1%; **Significant at the 5%; *Significant at the 10%;

C, D and E: see Table 6 for Wald test of coefficients equality

Table 4. Wald Test of Coefficients Equality (Fixed Rent and Sharecropping Contracts)

	Statistic	p-value	Statistic	p-value	
A	chi2(1)= 2.44	0.11	D	F(1, 570)= 0.66	0.42
B	F (1, 928) = 2.64	0.10	E	F(1, 929) = 2.81	0.09
C	F(1, 929) = 0.36	0.55	-	-	-

Figure 1. The study area.

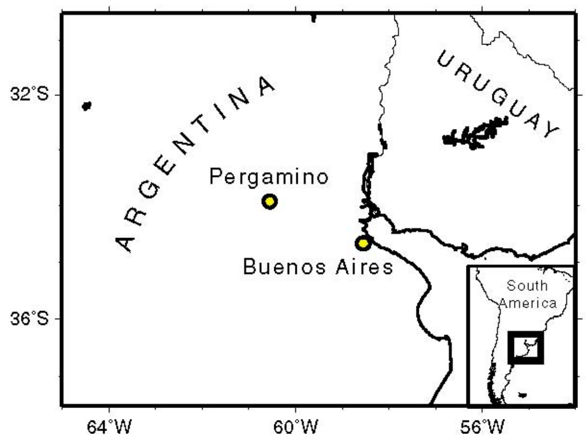

Figure 2. Frequency Distribution of Farms and Area