

# Who Wants Credit?

## Explaining the Demand for Land Titling in Mexico

*This paper examines the link between land titling and credit in the Mexican land titling program - dominio pleno. Land titling programs assign secure property rights on land assets and potentially increase credit with titled assets being used as collateral to obtain loans. These programs can bring new economic opportunities to the poor who often lack formal ownership over their assets. The empirical evidence on the effect of titling on credit access, however, is mixed, and many authors have suggested the need to account for non-randomness in allocation of titles. This study addresses non-randomness of titling by examining the demand for dominio pleno, arguing that only those who expect titling to bring higher profits would adopt the program. Regression analysis shows that individuals obtain titles to sell their land for urbanization rather than to ask for credit. Therefore, land titling may not increase credit because individuals are not acquiring titles to obtain credit in the first place. The main implication of this study is that land titling effects are, in part, endogenous to the decision to acquire titling.*

*Fernando Galeana*

*Don Ramon looks at the maize growing in his parcel and thinks of the day, 30 years ago, when he received from the Mexican government the right to cultivate these two hectares of land. That day, Don Ramon became an ejidatario – a member of the social tenure system known as the ejido. Nevertheless, it was not until two years ago that Don Ramon received an individual certificate from the government program PROCEDA that detailed his parcel's boundaries. Today, Don Ramon is going to the Asamblea Ejidal to discuss with the other ejidatarios the option to adopt domino pleno or full dominion over their parcels. Ejidatarios were not allowed to sell, rent, or mortgage their parcels until 1992, when the government changed the law to give them the option to adopt domino pleno and receive individual titles. With titling, Don Ramon would be able to sell his parcel or use it as collateral for a loan. Don Ramon knows he needs money to buy inputs, like fertilizer, pesticides, and seeds, for next season. He also knows that a real*

*estate developer is interested in buying his land to build a housing project. Don Ramon looks at the maize sprouting in his parcel and thinks...*

Today, farmers like Don Ramon are at the center of a widespread debate over land titling. Governments around the world have implemented land titling programs to bring tenure security to informal landholders. The groundbreaking work of economist Hernando De Soto has been an important vehicle to spread this new interest on land titling. De Soto (2000) argues that titled property creates capital because landholders can use their assets as collateral for loans. Therefore, land titling programs can foster economic growth among the poor who lack formal ownership over their assets. I examine the link between land titling and credit access in the Mexican ejido sector. Rather than assuming that ejidatarios would acquire titles to increase credit access, I ask what factors would drive the demand for dominio pleno. I find that ejidatarios

are more likely to acquire titling to sell their land for urbanization than to ask for credit. Therefore, land titling may not increase credit access in the ejido sector. The main contribution of this analysis is that the effect of land titling programs is endogenous to the participants' decision to acquire title.

Throughout much of Mexican history, land was concentrated in large, centrally-managed estates known as *haciendas*. After the Revolution of 1910, the government committed to carry out a land reform to redistribute many of these estates among landless farmers, resulting in the ejido system. Ejidatarios are granted the right to enjoy the *usufruct*, agricultural output, but they cannot transfer their assets through selling, renting, or mortgaging. Although the ejido fulfills the original objective of providing ejidatarios with land to cultivate, as times change, its restrictions creates constraints on other efficient uses of the land. The restriction on land mortgaging makes ejidatarios reliant on government development

banks to receive credit. The restriction on land sale forces ejidatarios into illegal markets to sell their land at lower prices than the legal real estate market. These restrictions became more inefficient since the 1980s as development banks decreased their financing and the demand to transform agricultural land into urban land increased.

In 1992, the government decided to lift these restrictions by giving ejidos the option to adopt *dominio pleno* and receive individual titles to their parcels. For ejidatarios, *dominio pleno* is an additional step to the land certification program PROCEDE that also began in 1992 to grant individual ejido certificates. *Dominio pleno*, however, represents organizational and monetary costs to ejidatarios. A quorum of ejidatarios must vote in favor of the program in the *Asamblea Ejidal*, the governing unit of the ejido. After *dominio pleno* has been accepted, ejidatarios are responsible for requesting their individual titles and paying taxes at the higher private property rates. The question that I address in my research is what would make ejidatarios want to adopt *dominio pleno* and, specifically, whether ejidatarios acquire titles to use their land as collateral or to sell it for urbanization. I argue that land titling is endogenous in the sense that its effects depend on the reasons why individuals decided to acquire titles.

The rest of the paper is organized as follows: first, I address the literature that has examined the link between land titling and credit access; second, I describe the economic and econometric models I use to explain demand for *dominio pleno*; third, I show the results from the empirical analysis; and finally I conclude with some remarks about how to study land titling programs.

## Literature Review

One of the main methodological challenges in empirical studies is the endogeneity of land titling. When the allocation of titles across households is not random, individuals choose to

join these programs based on various economic, political, and social reasons. Therefore, studies that ignore land titling endogeneity tend to have biased estimates of the effects on credit access due to the selection bias in the titled sample. Some studies (Field 2002; Galiani and Schargrotsky 2003) solve the problem of endogeneity by selecting natural experiments where title allocation is random. Most land titling programs, however, are not natural experiments and empirical studies have found contradictory conclusions.<sup>1</sup> These mixed results are often attributed to the problem of addressing the endogeneity of titling (Field 2002).

In Mexico, empirical studies have found no significant impact of the land certification program PROCEDE on increasing credit access. Deininger, Lavadenz, Bresciani, and Diaz (2001) argue that the 1995 financial crisis in Mexico and the banks' unwillingness to accept the mortgaging of agricultural output are the main reasons land certification is not able to increase credit. Johnson (2002) tests the hypothesis that farmers face asset-based credit constraints due to a lack of collateral. The analysis does not support this hypothesis, and Johnson concludes that PROCEDE may not have a significant direct impact on ejidatarios' decisions regarding credit and capital use.

I address the issue of endogeneity by examining the factors that determine allocation of titles. I introduce the concept of urban constraint, adding to the credit constraint described by Johnson, to describe ejidatarios that would like to transfer their land to real estate developers but are hindered by legal restrictions. Also, I depart from previous studies about Mexico by using data from *dominio pleno* rather than the land certification program.

## Economic Model

I assume that the two factors driving adoption of *dominio pleno* are demand for agricultural credit and de-

mand to engage in the market for urban land. In relation to demand for agricultural credit, Feder and Feeny (1993) determine the existence of a collateral-constrained regime in which borrowing is exhausted and can only improve with an increase in the amount of collateralizable assets. Given that titling increases the amount of collateralizable assets, Johnson (2002) assumes that in a collateral-constrained regime adoption of *dominio pleno* must be driven by desire to expand credit. Similarly, the ejido is in an urban-constrained regime if the amount of land available for urbanization is less than the amount demanded by the market, including ejidatarios and public or private real estate developers. Given the legal constraints to urbanize land, in an urban-constrained regime, adoption for *dominio pleno* must be driven by desire to participate in the market for urban land. Whether the ejido is collateral- or urban-constrained, there are potential benefits available from *dominio pleno*.

Nevertheless, not all ejidos that present either constraint are going to participate, since *dominio pleno* represents a cost to the ejido. Therefore, an ejido will decide to acquire titles if the benefits outweigh the cost of titling. The benefits are the profits generated by either credit-enabled agricultural production or land sale for urbanization. Profits are the result of the revenue and costs involved in each activity.<sup>2</sup> Thus, even if some ejidos are collateral or urban constrained, they will not acquire titling if the cost outweighs the benefits.

To determine the demand for *dominio pleno*, we can analyze *ex-post* the titled ejidos and extrapolate which activity generated higher expected profits. Since the ejidos had to conduct a cost-benefit analysis *ex-ante* to determine whether benefits outweighed costs, then we can examine the characteristics of titled ejidos – like spatial location and economic activity – to infer whether agricultural production or urbanization was more profitable. For

<b>Table 1 - Descriptive Statistics</b>					
<b>Morelos</b>					
	<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>S.D.</b>
Land Titling	180	0	1	0.067	0.250
Urban Population 50,000 - 500,000	180	0	1	0.050	0.219
High Level of Urbanization	180	0	1	0.122	0.328
Population working in urban activities (%)	180	0.018	0.283	0.136	0.049
Ejidos Reporting Nonagricultural Activity (%)	180	0	0.556	0.276	0.164
Population working in agriculture, cattle, and fishing (%)	180	0.015	0.739	0.279	0.162
Ejidos that Have Agricultural Machinery (%)	180	0	1	0.672	0.268
Irrigated Land in Municipio	180	0	1	0.211	0.409
Ejidos that Received Credit form Banrural (%)	180	0	0.667	0.161	0.195
Households with sewage and electricity (%)	180	0.132	0.930	0.701	0.167
Parceled Hectares per Member	180	0	50.453	3.804	4.251
Land that is Forested in Municipality (%)	180	0	0.450	0.032	0.091
Number of Ejidatarios	180	14	880	176.072	156.654
<b>National</b>					
	<b>N</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>S.D.</b>
Titled Ejidos in the Municipality (%)	2201	0	1	0.048	0.135
Urban Population more than 50,000	2201	0	1	0.058	0.233
High Level of Urbanization	2201	0	1	0.001	0.030
Population Working in Urban Activities (%)	2201	0.001	1	0.122	0.111
Ejidos Reporting Nonagricultural Activity (%)	2201	0	1	0.162	0.252
Population working in agriculture, cattle, and fishing (%)	2201	0	0.998	0.553	0.242
Ejidos that Have Agricultural Machinery (%)	2201	0	1	0.410	0.360
Irrigated Land in Municipality (%)	2201	0	1	0.051	0.169
Ejidos that Received Credit from Banrural (%)	2201	0	1	0.158	0.236
Households with sewage and electricity (%)	2201	0	0.972	0.322	0.246
Parceled Hectares per Member	2201	0.13	120.5	7.572	8.631
Land that is Forested in the Municipality (%)	2201	0	0.99	0.102	0.180
Average Number of Ejidatarios	2201	9	4322	210.377	316.228

example, if the titled ejido is situated in an irrigated area, then agricultural productivity is likely to be high and ejidatarios will adopt dominio pleno in order to demand credit. If the ejido is instead located near an urban zone, then the price of urban land is likely to be high and ejidatarios adopt dominio pleno to sell land to urban developers. To conduct the analysis, I examine the association of land titling with groups of variables that signal demand of agricultural credit and demand for urbanization.

## Data

The data to generate the two sets of variables is obtained from three main sources: the 1991 VII National Ejido Census, the 1990 Population and Household National Census, and 2003 Dominio Pleno results published by the National Agrarian Register (RAN). Data are available for all thirty-two states in Mexico at the municipio level. A municipio is the equivalent of a county in the United States. A municipio may have from anywhere from 1 to 206 ejidos within its boundaries. Since the decision to adopt dominio pleno is conducted at the ejido level, it would be ideal to obtain observations at this level. This disaggregated

data is not easily accessible and could only be found for the state of Morelos. Therefore, the analysis includes one dataset for Morelos, with 180 observations, and another dataset for the nation, with 2201 observations. Morelos is not necessarily considered a representative state, but it allows the estimation of the demand at a more desirable scale.

The endogenous variable of land titling is calculated using 2003 Dominio Pleno results. For the Morelos dataset, this variable is a binary (0,1) and takes the value of zero if the ejido is not titled and one if the ejidos is titled. Out of 180 ejidos, only twelve are titled. For the national dataset, the land titling variable is the proportion of the ejidos titled in the municipio. Out of 2201 municipalities, 507 have at least one titled ejido.

The exogenous variables are selected from the 1991 VII National Ejido Census and 2000 National Census, and are assigned to a vector representing urban demand, another representing demand for agricultural credit, and finally one representing control variables. The descriptive statistics for these variables are in Table 1.

In the urban ejidos, high demand from real estate developers is expected to transform agricultural land into urban land. The urban vector includes four variables: a population variable that assigns a value of 1 if there is community in the ejido or municipio with more than 50,000 inhabitants and 0 if otherwise; a spatial variable that assigns a value of 1 if the ejido is geographically located inside one of the Morelos's three main urban zones<sup>3</sup> and 0 otherwise, or -1 in the case of the nation - 1 if the municipio is inside a city with more than 1 million inhabitants and 0 otherwise; a variable indicating the proportion of the population working in urban economic activities, including manufacturing, financial, and professional services; and a variable showing the proportion of ejidos reporting nonagricultural activities.

In the agricultural ejidos, demand for agricultural credit is expected to continue investment of that credit in productivity. This agricultural credit vector includes four variables: the proportion of population in the municipio working in agriculture, cattle ranching, or fishing; the proportion of ejidos in the municipio that own agricultural machinery; the proportion of irrigated land available in the municipio for cultivation; and the proportion of farmers that received credit from Banrural, the government development bank for agriculture.

The variables included in the control group are factors present to partial out any other possible characteristics that may affect titling and could be correlated with either agriculture or urbanization. These variables are: the proportion of households in the municipio

that enjoy the basic services of sewage and electricity, the average parceled hectares per member, the proportion of land forested in the municipality, and the number of ejidatarios in the ejido.

### Econometric Technique

The structural model to determine demand factors has land titling as an endogenous variable and includes the exogenous variables for the urban, agricultural credit, and control clusters.

$$\begin{aligned} \text{Land Titling (1,0)} = & \\ & - \beta_0 + \\ & - \beta_1(\text{urban vector}) + \\ & - \beta_2(\text{agricultural credit vector}) + \\ & - \beta_3(\text{control group}) + \\ & - \epsilon \end{aligned}$$

For the Morelos dataset, OLS and logistic regression techniques are used. Since the dependent variable is a binary variable, the linear probability model has several well-known shortcomings, notably that the predicted probabilities may not lie between 0 and 1. In this case, the binary logistic regression model is used to estimate the probability that an event occurs. For the national dataset only OLS regression is used.

### Results

The regression results show there is clear evidence of association between the urban vector and dominio pleno in Morelos and more mixed, but still significant, association in all of Mexico. In column 1 of Table 2, the OLS results for the structural model for Morelos show that high level of urbanization is positive and significant at the 5% level. In column 2, the logistic results show that in the urban cluster the variable for urban populations larger than 50,000 is negative and significant at 5% level and high level of urbanization is positive and significant at the 10 % level. In the agricultural credit cluster, the variable of rural employment is negative and significant at

the 5%, but the credit variable is positive and significant at the 10% level. In column 3, the OLS results for the structural model for the national dataset show that urban populations larger than 50,000 and urban employment are positive and significant at the 5% level in the urban cluster. In the agricultural credit cluster, rural employment is negative and significant at the 5% level, but agricultural machinery and credit variables are positive and significant at the 5% level.

### Conclusion

I examine whether ejidatarios adopt dominio pleno either to demand agricultural credit or participate in the market for urban land. The statistical analysis suggests that demand to participate in the market for urban land is the main incentive to acquire titling. The significance of this analysis is to show that land titling effects are endogenous to the demand for titling. For example, if an empirical study finds no effect of dominio pleno on credit access, we now know that part of the reason is that ejidatarios do not acquire titles to increase their credit in the first place. As a result, estimates of access to credit as a function of land titling might easily find no result in areas where titling is demanded mostly for urbanization purposes. Even if land titling programs provide landowners with titled assets, this is a necessary, but not sufficient, condition for this collateral to be able to be used for credit. Owners must first demand credit, and then other institutional features, such as a good legal structure, will determine whether credit is supplied on the basis of this collateral.

<b>Table 2 - Regression Results</b>			
Morelos Dependent Variable = Land Titling (0,1)			
National Dependent Variable = Land Titling (0-1)	Morelos	Morelos	National
	(1)	(2)	(3)
<b>Urbanization</b>			
Urban Population more than 50,000	-0.120	-3.029**	0.091**
	(0.079)	(1.548)	(0.013)
High Level of Urbanization	0.256**	1.532*	0.071
	(0.069)	(0.916)	(0.087)
Population working in urban activities (%)	0.011	5.967	0.084**
	(0.590)	(13.545)	(0.035)
Ejidos Reporting Nonagricultural Activity (%)	0.029	0.194	-0.010
	(0.143)	(3.360)	(0.011)
<b>Agricultural Credit</b>			
Population working in agriculture, cattle, and fishing (%)	-0.431	-20.044**	-0.078**
	(0.276)	(10.031)	(0.021)
Ejidos that Have Agricultural Machinery (%)	0.051	6.357	0.032**
	(0.087)	(4.540)	(0.008)
Irrigated Land in Municipio (%)	-0.325	-15.973	0.004
	(0.528)	(13.400)	(0.016)
Ejidos that Received Credit form Banrural (%)	0.167	11.296*	0.030**
	(0.133)	(6.948)	(0.012)
<b>Control Variables</b>			
Households with sewage and electricity (%)	-0.145	-8.216	0.057**
	(0.221)	(6.533)	(0.016)
Parceled Hectares per Member	-0.003	-0.516	0.000
	(0.004)	(0.360)	(0.000)
Land that is Forested in Municipality (%)	0.230	19.435	0.008
	(0.254)	(12.734)	(0.015)
Number of Ejidatarios (x10,000)	0.779	44.729	-0.174**
	(0.000)	(0.003)	(0.000)
Constant	0.236	1.523	0.043**
	(0.260)	(5.468)	(0.018)
R-squared	0.185	-	0.178
Adjusted R-square	0.126	-	0.174
Akaike Information Criteria	-2.826	-	-4.196
Schwarz BIC	-2.593	-	-4.163
Number of Observations	178	178	2205
* p-values < .10			
** p-values < .05			

## Author Notes

<sup>1</sup>Some studies in Brazil and Honduras find a positive impact of titling on credit (Alston, Libecap, and Muller 1999; Lopez 1997). Other empirical studies done in some rural areas of Kenya, Ghana, Rwanda, Somalia, and Paraguay, however, find that land titling has no significant effects on economic development (Migot-Adholla, Hazell, Blarel, and Place 1991; Carter, Wiebe, and Blarel 1991; Roth, Unruh, and Barrows 1994; Place and Migot-Adholla 1998; Carter and Olinto 2002).

<sup>2</sup>Agricultural credit profits =  $\lambda * P^f * f(K_p) - K_f - (1 + \lambda * r) * B$ , where ( $\lambda$ ) is the risk to agricultural income, ( $P^f$ ) is the relative price for agricultural output, ( $f$ ) is agricultural production which is a function of capital ( $K_p$ ), ( $B$ ) is credit available at interest rate ( $r$ ), and ( $\lambda$ ) is the transaction cost that makes the market interest rate different from the effective rate (Johnson 2002). Urbanization profits =  $\lambda * P^u * u(K^u) - K^u - \Omega$ , where ( $\lambda$ ) is the probability of finding a real estate developer, ( $P^u$ ) is the relative price for urban land, ( $u$ ) is urban production which is a function of capital ( $K^u$ ), and ( $\Omega$ ) is transaction cost associated with closing a deal.

<sup>3</sup>The three main urban zones in Morelos are Cuernavaca, Cuautla, and Jojutla.

## References

- Alston, Lee J., Libecap G.D., and B. Mueller. 1999. *Titles and Land Use: The Development of Property Rights on the Brazilian Amazon*. University of Michigan Press.
- Carter, Michael, Keith Wiebe, and Benoit Blarel. 1991. "Tenure security for whom? Differential Impacts of Land Policy in Kenya." Land Tenure Center Research Paper No. 106, University of Wisconsin-Madison.
- Carter, Michael, and Pedro Olinto. 2002. "Getting Institutions Right for Whom? Credit Constraints and the Impact of Property Rights on the Quantity and Composition of Investment." *American Journal of Agricultural Economics* vol.85(1):173-86.
- De Soto, Hernando. 2000. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*. New York: Basic Books.
- Deininger, Klaus, Isabel Lavadenz, Fabrizio Bresciani, and Manuel Diaz. 2001. *Mexico's "second agrarian reform:" Implementation and impact*. Washington DC: World Bank.
- Dominio Pleno. 2003. Last update September 30, 2003. Available at <http://www.ran.gob.mx> Accessed 15 December, 2004
- Feder, Gershon, and David Feeny. 1993. "The Theory of Land Tenure and Property Rights." In *The Economics of Rural Organization: Theory, Practice, and Policy*, Edited by Karla Hoff, Avishay Braverman, and Joseph Stiglitz. New York: Oxford University Press.
- Field, Erica. 2002. "Entitled to Work: Urban Property Rights and Labor Supply in Peru." Working Paper.
- Galiani, Sebastian, and Ernesto Scharfrodsky. 2003. "Effect of Land Titling". Working Paper. INEGI. VII Censo Ejjidal. 1991. Available at <http://www.inegi.gob.mx> Accessed 15 December, 2003
- INEGI. XII Censo General de Población y Vivienda. 2002. Available at <http://www.inegi.gob.mx> Accessed 26 January, 2004
- Johnson, Nancy L. 2001. "Tierra y Libertad: Will Tenure Reform Improve Productivity in Mexico's Ejido Agriculture?" *Economic Development and Cultural Change* v.49(2):291-309.
- Lopez, R. and C. Romano. 1997. "Rural Poverty in Honduras: asset distribution and Liquidity constraints." Working Paper.
- Migot-Adholla, S.E., Peter Hazell, Benoit Blarel, and Frank Place. 1991. "Indigenous land rights systems in Sub-Saharan Africa: A constraint on productivity?" *World Bank Economic Review* v.5(1):155-175.
- Place, Frank and S.E. Migot-Adholla. 1998. "The economic effects of land registration for smallholder farms in Kenya: Evidence from Nyeri and Kakamega Districts." *Land Economics* v.74(3):360-73.
- Roth, M., J. Unruh, and R. Barrows. 1994. "Land registration, tenure security, credit use, and Investment in the Shebelle Region of Somalia." Pp. 199-230 in *Searching for Security of Tenure in Africa*, edited by Bruce and Migot-Adholla. Dubuque, IA: Kendall-Hunt.
- Seyde, Federico. 2000. "La incorporación de tierras de propiedad social al desarrollo Urbano en México: marco legal y estrategia de la política pública." Pp. 71-86 in *Los Pobres de la Ciudad y la Tierra*, edited by Alfonso Iracheta and Martim Smolka. Mexico: El Colegio Mexiquense and Lincon Institute of Land Policy.

---

### ***Fernando Galeana***



Fernando Galeana is a senior from Cuernavaca, Mexico. He is an Economics major with a focus in development economics. Since coming to Stanford, he has interned with the World Bank, studied the impacts of ecotourism in an Ese-Eja community in the Peruvian Amazon, and conducted field research in Mexico for his honors thesis in Latin American Studies. Fernando would like to thank Professors David McKenzie and Avner Greif for their invaluable advice; Alexandra Gerbasi, Sabrina Lee, and Joanne Yoong for their support; and the Center for Latin American Studies and Undergraduate Research Opportunities for their sponsorship. He would like to thank his mentor David McKenzie.