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Land Rental and Sales Markets in Paraguay

by

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ABSTRACT

This paper examines the claim that the land rental market can be an effective means of redistributing access to, if not ownership of, land to the rural poor, using Paraguay as our model. The land sales market is also examined. The land rental market in Paraguay's rural areas is found to be very thin, due at least in part to a lack of available credit for inputs. Renting-in substantial amounts of land is found to contribute significantly to household per-capita income.

JEL Classifications: D39, O12, Q15

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1. INTRODUCTION

The staggering inequality of access to land in Paraguay,[1] coupled with some of the highest poverty rates in Latin America, lend urgency to the study of the land market in Paraguay. There is general agreement that a primary means for alleviating rural poverty is access to land. Land conflicts are another motivation: the unrest, violence, and suffering associated with them could be eliminated by redistributing land (Deininger 2003). And the stylized fact of the inverse relationship between farm size and productivity means that redistributing land can increase overall welfare by increasing overall production.

The inverse relationship between land productivity and farm size raises the question of why the land market has not redistributed land to more efficient farmers. Proposed answers have usually taken the form, in theoretical work, of looking at the imperfections in actual land markets, such as information asymmetry, transactions costs, unclear property rights, credit rationing, and linked credit and input markets. The World Bank has in recent years focused on making the land sales market work "properly" as a means of alleviating rural poverty (Deininger and Binswanger 1999). Policy prescriptions have included land titling, market-assisted land reform (grants given to landless peasants to buy land), and land banks with credit assistance. The World Bank has emphasized land titling as a precursor to functioning land markets in its funded projects, however. The argument for titling is that it clarifies property rights, thus enabling the land market to function more freely.

Part of the packages of structural adjustment programs imposed by the IMF and the World Bank has been the removal of laws limiting the buying, selling, and renting of land. This has met with mixed results throughout Latin America. The distribution of land in Paraguay is highly unequal, and the land sales market suffers from all the impediments (lack of clear property rights, high transactions costs, lack of access to credit) noted in the literature on the subject. Can land rental markets effectively redistribute land and reduce poverty? And, have rental markets been effective at redistributing access to land? My hypothesis is that *they cannot and have not*. I now briefly review the extensive recent literature on land market reform policies, the literature on land rental markets, and on the history of Paraguayan agricultural policy. Then, I outline the

[1]The Gini coefficient for operational land holdings for 2001 is 0.847 (calculated using MECOVI, 2000–2001 data, see Table 1).

data and methodology I use to study the land markets, present my results, and provide some concluding remarks.

2. LITERATURE REVIEW

Generally speaking, the microeconomic theory of competitive markets has little to say about agricultural land markets. Perfectly competitive markets require a homogeneous good, free entry and exit for buyers and sellers, enough buyers and sellers so that no one buyer or seller can influence the market price, and complete and perfect information (of the present and future) for all participants. Land sales and rental markets fall far short of this mark. Land is certainly not a homogeneous good—it varies with geology, geography, and climate. Information about land is unevenly collected and distributed. Information about buyers and sellers (important especially in rental markets) is rarely complete. Entry and exit are not free in many instances, and in many areas the potential buyers far outnumber potential sellers, giving the latter considerable market power (Muñoz 1999).

Neither are the competitive market theory's implications for land sales market outcomes observed. Given a competitive market, land will be transferred from less to more efficient users. If there were homogeneous technology and homogeneous farmers, at the market equilibrium, all farms would operate identical amounts of land (determined by the efficient scale for the technology). If we allow for heterogeneity of farming skill and land quality, we would have an optimal distribution of different-sized operational holdings. Within this optimal distribution, efficiency would not vary once the variations in farmer skill and land quality were controlled for (Binswanger, Deininger, and Feder 1995). Yet, there is a large and growing literature that documents an inverse relationship between farm size and productivity throughout much of the world.

The inverse relationship and skewed land distributions imply at least two possible critiques of the competitive market theory vis-à-vis land markets. The first is that the land market, though working "properly," is not bringing about the expected outcome, and so the theory is incorrect. The second implication is that the land market is not working properly. If we accept the latter, then if the market could be made to function perfectly, it would redistribute land to the more efficient, smaller farmers, enhancing both equity and efficiency. This possibility has gained popularity in light of the widespread failure of government imposed solutions (such as

redistribution) to the skewed distribution of land and its concomitant inequality (Griffin, Khan, and Ickowitz 2002). These failures are taken to prove that the state cannot address the problem and so the market is the last bastion of hope for equitable redistribution.

Those calling for market-oriented land reforms run the gamut from fervent free-marketeers to more cautious advocates of some qualified land market policy prescriptions. Many of the suggested reforms, though, focus on making the land market perform ”better,” that is, more efficiently. These reforms include titling, registration, cadastral surveys, and land information databases that are free and open, all in the interest of reducing transactions costs. There is an implicit assumption that getting markets as close to perfect as possible is equivalent to providing the means to the best outcome possible. This can not be the case even if perfect markets were to bring about the best outcome. The land market can never be “perfect” because of the heterogeneous nature of land itself. In addition, owning land brings benefits that cannot be measured simply in the value of output brought to market. Prestige, social status, political power, economic power, and the inherently unmeasurable satisfaction of a connection to the earth are benefits that do not easily fit into the neoclassical framework, even the modified framework that includes market imperfections.

Some other reforms aim towards enabling those disadvantaged in the land market to engage in it more effectively, thereby leveling the playing field. Examples of this type of reform include provision of credit for land purchases and for inputs, and creating a transparent land conflict adjudication process. These types of reforms tend to be more costly and to have more political opposition. As such, they are less likely to be enacted, due to certain real world conditions that present real obstacles. In many contexts, neoliberal policies, with their emphasis on a smaller, less interventionist state, reign supreme. In fact, most countries with high levels of rural poverty that might think about initiating land market reforms are characterized by the dominance of the neoliberal agenda, due to either externally-imposed structural adjustment, the internal political power of comprador elites, or both.

The World Bank has made efforts at land policy a centerpiece of its rural poverty alleviation program, both in theory and practice. The current land policy consensus of the World Bank rests on four principles. First, family owned and operated farms are desirable on both efficiency and equity grounds. Second, secure land property rights are essential for eliciting effort, promoting investment, and providing the basis for land market transactions. Third, the policy and regulatory environment should promote the transfer of land from less to more efficient uses. And

fourth, an egalitarian distribution of land has a positive impact. Land sales markets were seen as an alternative to state-initiated land reforms, due to an ideological shift that brought focus back to markets and away from states, which were blamed for the failure of redistributive land reform efforts. A major change in focus for the World Bank since its 1975 Land Reform Policy document is that land rental markets are now seen as more equitable and efficient than land sales markets where other markets (most notably, credit markets) are imperfect (Deininger 2003). Thus, what would be considered a second-best solution if other markets were working is now considered the first-best solution given the current context.

Turning to the impact of nonland market imperfections on the ability of land markets to redistribute land to poorer, more efficient farmers, the structure of the rural labor market makes the small or landless peasant more competitive, while the credit market and the insurance market (or lack thereof) impose constraints on small and landless peasants to participate in the land market. I'll briefly review each of these effects.

Rural labor markets are often imperfect. Agricultural wages are frequently lower than peasants could make working their own farm (i.e., their average product). Often this implies that family labor is used most intensively by small farmers, but this labor market imperfection also implies that land rental markets will improve the welfare of landless peasants by providing an opportunity to increase their incomes (Deininger 2003).

Small farms are likely to have a competitive advantage in land markets. They are more efficient and have a greater demand for land than large landowners, but the ability to capitalize on this advantage is likely to be reduced by credit markets that are imperfect (Carter and Zimmerman 2000). A well-functioning credit market is essential for the land sales and rental markets to perform well for two important reasons. First, because of the long time gap between incurring the costs of inputs and receiving the revenues from sales of the output, credit enables farmers to cushion consumption, as well as to purchase inputs to production. If credit for operating costs is scarce, then the incentive to increase land holdings is greatly reduced. This first effect is important for both sales and rental markets. Second, in the absence of large savings, credit is required for making land purchases. Without it, no sales are going to happen. Since credit markets are notoriously imperfect in rural regions worldwide, land sales markets will be handicapped in their ability to redistribute land. Thus, credit market reforms should be, but seldom are, an integral part of most proposals for reforming land markets. Of course, traditional redistributive land reforms went some distance towards easing the input and

consumption credit constraint (as well as the land pressure) since they provided farmers with collateral.

Finally, insurance markets also play an important role in agriculture. Because output depends on that most uncontrollable of variables, the weather, some form of crop insurance is desirable. Insurance is notoriously scarce in poor rural areas. Even if land sales markets work well, imperfect credit and insurance markets will lead to greater land concentration (Carter and Zegarra 1999). Local agricultural economies are characterized by covariate risk due to localized factors such as climate and disease. This leads to covariance of incomes within regions. Land is both a store of wealth and a form of collateral. Since land is used as collateral in loans for working capital, however, land purchases must be financed out of savings. Thus, in the absence of insurance markets, good years may be characterized by general ability to buy but unwillingness to sell, while bad years may be characterized by inability to buy. Consecutive bad years will increase the number of sales, but moneylenders or large landholders will buy these plots, since other farmers have little or no savings with which to buy (Binswanger, Deininger, and Feder 1995). Thus, imperfections in markets for labor, credit, and insurance will have profound impacts on the functioning of both the land sales and land rental markets. But government policies also have an impact.

Policy can make markets work better or worse and can produce increases or decreases in equity and efficiency. Most of the literature focuses on the effects of policy on the functioning of the land market itself. These effects can be divided into those that directly affect the price of land and those that affect transactions costs. Many policy options can lead land prices to exceed the present value of the income to be derived from ownership. Credit subsidies may have the perverse effect of increasing land prices. Lower taxes on agricultural income may increase the price of land as well (Binswanger, Deininger, and Feder 1995).

Cadastral surveys, registration, and titling enhance the functioning of the land sales and rental markets in a number of ways. They reduce asymmetric information by increasing the amount of information about particular parcels that is public knowledge, making land more easily transferable and more valuable as collateral (Binswanger, Deininger, and Feder 1995). Registries can provide verification of ownership to buyers and sellers. This security enhances the incentive to improve land. Titling can enable large landholders to control more land, however, leading to greater land concentration. Thus, titling programs need to be well-publicized, so that everyone knows the rules and they should be systematic, not subject to the demands of a portion

of the population (Binswanger, Deininger, and Feder 1995). Corruption is a vital concern in this area, since titling can effectively transfer land to those with the money or influence to pay for titles with bribes or favors. Transparency is a necessary, but not sufficient, condition to alleviate this concern.

The deck seems stacked in many areas against the poor being able to purchase land. If the poor cannot buy land, can land rental markets lead to an efficient and equitable distribution of operational land holdings? I now review the theoretical and empirical basis for promoting land rental markets as an avenue for improving rural welfare.

Theoretically, land rental markets have several advantages over land sales markets, both on equity and efficiency grounds. They allow greater flexibility to transfer use of land to more efficient producers with relatively low transactions costs. They are less vulnerable to credit market imperfections. Peasants don't need as much credit to rent land. The problem of securing credit to purchase inputs still remains, but the cost of land purchase need not be borrowed (Deininger and Binswanger 1999; Deininger 2003). The lack of credit markets for inputs is one obstacle to small and landless peasants' buying land of their own. If small landowners can't get credit for working capital, how and on what terms will a renter get credit for inputs? Some types of rental contracts including inputs might be used to offset this lack of credit (Sadoulet, Murgai, and de Janvry 2001).

Finally, land rentals may be one rung in an "agricultural ladder" out of landless wage labor up to land ownership. While renting land, farmers may be able to save enough to buy land of their own, while gaining valuable experience that will enable them to farm successfully when they do become owners (Sadoulet, Murgai, and de Janvry 2001).

Some disadvantages of land rental contracts include a lack of incentives to work hard, improve the land, or use inputs. A tenant may not work as hard or use the same level of inputs if some of their output is going to someone else. A tenant with a short term contract has a short time horizon for planning and decision making and thus, is much less likely to make investments in soil quality and conservation than an owner of a similar plot. However, these contracts are used virtually everywhere, so perhaps they are an efficiency-enhancing solution to problems of credit constraints, risk, and "low" incentives (Binswanger, Deininger, and Feder 1995). Theoretical models lend support to this argument.

Binswanger, Deininger, and Feder (1995) use a static maximization model (of the efficiency wage variety) in which tenants choose effort to maximize utility and landlords choose the number of tenants and the type of contract to maximize income. Under conditions of certainty and perfect enforceability of contracts, all contracts yield equivalent outcomes. But, if we allow imperfect enforceability, fixed rent contracts dominate. Under uncertainty, a share contract will trade off risk for effort, providing partial insurance for the tenant. If the model is extended to multiple periods, reputation effects lower tenant shirking and landlord cheating (Binswanger, Deininger, and Feder 1995). However, the latter is a dubious claim, given the common rural land market structure of oligopolistic (if not monopolistic) landlords facing numerous poor (and often desperate) peasants.

In the Latin American context, rental contracts have traditionally been viewed as linked to the old, exploitative hacienda system. Thus, the motives for restrictions on land rental markets have been to reduce exploitation. These restrictions have included rent ceilings and land to the tiller redistributive reforms. Many of these types of reforms have actually led to worsening conditions (dried up rental markets, for example) for the landless peasantry. Thus, replacing these restrictions with clear regulations could increase productivity and welfare (as has been done in many cases of neoliberal land market reforms), argue Deininger and Binswanger (1999).

Empirical work on land rental markets remains somewhat scarce for Latin America. Most of the attention to date has focused on land sales. However, the evidence so far is not encouraging. A new study of rural land rental markets in Nicaragua finds that, despite reforms in 1995, rental markets were not only not effective in redistributing land to smaller, more efficient farmers, the reforms enacted in Nicaragua actually increased tenure insecurity and decreased productivity. Throughout Latin America, the evidence suggests that land rental markets are constrained by weak property rights and ineffective conflict resolution institutions (Deininger, Zagarra, and Lavadenz 2003).

Deininger, Zagarra, and Lavadenz (2003) find that land rental markets are having some equalizing effect on the operational distribution of land in Nicaragua, but are far from achieving total equalization. Since they also find a significant negative relationship between operational holdings and agricultural profits, it is clear that better-working land rental markets would increase overall productivity and equity in Nicaragua. Their work also points to the importance of tailoring policy to the context in question for the best hope of achieving positive outcomes.

Land rentals could possibly redistribute land access, if not land ownership. The

arguments above make land rental seem a likely candidate for a better welfare-enhancing mechanism, when compared with land sales markets. Carter and Salgado (2001) find that Paraguayan land rental markets are allowing some land access to poor and landless peasants. I now move on to discuss the development of agricultural policy in Paraguay from the 1960s to the 1990s.

3. PARAGUAYAN AGRICULTURAL POLICY

In the early 1960s, the great challenge facing Paraguayan agriculture was the great congestion in the Central Region, the area immediately surrounding Asunción. The Agrarian Statute of 1963 (Ley 854) aimed to change the country's agrarian structure. The Instituto Bienestar Rural (IBR), created by another law (Ley 852) in the same year, was charged with eliminating the minifundia/latifundia system and replacing it with a "just system of ownership, tenure, and land exploitation." The IBR started its work by initiating a colonization program in eastern Paraguay (Zoomers 1988). The IBR settled tens of thousands of families on newly-opened state lands, but lack of infrastructure, roads, credit, and access to markets meant that there was little progress in exploiting the colonized lands (Baer and Birch 1984).

The results of the colonization program were mixed. New roads into the east and south from Asunción and the bridge over the Paraná River meant that access to markets slowly improved. In the 1970s, the new roads brought waves of immigrants flowing from Brazil, Argentina, and Japan into the eastern frontier area and boosted Paraguayan economic growth. The settlers grew soy and cotton for export (Baer and Birch 1984), but the government, after setting up schools and hospitals in the colonized areas, cut back support. The "pioneers" reproduced the dual agrarian structure of the old Minifundia zone, but the colonization effort did greatly increase the number of farmers and the amount of land under cultivation (Weisskoff 1992).

Paraguayan colonists, as opposed to immigrants, were not substantially better off in the colonized areas than they had been in their old homes. In the Central Region, little changed, since most of those who left had small plots and there were no radical land reforms undertaken. Many stayed behind because they had diversified activities that allowed them greater income than could be had farming alone, which was the only option in the colonies (Zoomers 1988).

In addition to colonization, the IBR was also empowered to expropriate and redistribute latifundias (properties larger than 20,000 hectares in the Chaco and larger than 10,000 hectares

in the eastern part of the country that were not being rationally exploited) and consolidate minifundias. The IBR also devised a program of granting titles to those occupying state lands. However, the titling program was not well thought out in practice and so did not produce much in the way of agricultural modernization. The expropriation process was carried out with little vigor (Zoomers 1988).

At the end of the 1980s, the frontier was effectively closed. This meant that one of the attractors for the excess population from the Minifundia zone was gone (the other was the urban industrial and informal sectors). Thus, in the early 1990s, pressure for land heated up in the Minifundia zone, as well as in the Colonization zones. The most heated struggles for land, however, were erupting in the modernized frontier zone, where peasant differentiation was greatest, while land rents and prices were rising sharply (Carter and Galeano 1995).

Little changed in Paraguayan agricultural policy with the democratization process that began after the ouster of Stroessner in 1989. The moves that were made, even when proclaimed to be in the service of progress for the marginalized rural populations, were mere continuations of Stroessnerite agricultural policy, favoring large landholders, cattle ranchers, and Colorado Party favorites. For example, in 1993, as a result of a 1991 consultation with a FIDA delegation, el Fondo de Desarrollo Campesino (FDC) began operations. The contemporary national rural credit organizations (el Banco Nacional de Fomento [BNF], el Fondo Ganadero [FG], and el Crédito Agricola de Habilitación [CAH]), were not eligible to receive FIDA funding because they did not effectively include the rural population and because of excessive administrative costs. Unlike BNF and CAH, which did not loan to small peasants, the FDC was specifically set up to address the credit needs of the smaller peasantry in Paraguay using FIDA funds. However, in practice, only about 40% of funds went to actual agricultural credit, with the rest swallowed up in high administrative costs (González 1997).

What has been the effect of this history on Paraguayan land markets? The most detailed study of Paraguayan land markets to date is Carter and Galeano's *Campesinos, Tierra, y Mercado* (1995). Its focus is on the land sales market, but it provides some analysis of the land rental market as well. In Paraguay, due to the historical context summarized above, tenure structure varies greatly by region. Based on a 1991 survey of 300 farms carried out in three departments (Paraguarí, representing the Minifundia zone, Itapúa, the Frontier zone, and San Pedro, the Colonization zone) they find that in San Pedro, there were no farmers renting or

share-cropping, in Itapúa, 12.6% were renting or share-cropping and in Paraguarí, 6.8% were renting or share-cropping land (Carter and Galeano 1995).

The pressure for land is getting greater with time due to the aforementioned processes of minifundization in the Minifundia and Colonization zones, and, most ferociously, differentiation in the Frontier zone. This increasing pressure implies that there is great demand among the small and landless peasants for land, and so the rental and sales markets could conceivably provide an outlet. However, Carter and Galeano find that, despite being competitive in the land market (having a high demand and willingness to pay a reasonable price), small peasants are kept out of the land market by land market segmentation (large landowners sell and rent to each other, not small or landless campesinos) and credit market limitations (Carter and Galeano 1995). In addition, some farm characteristics make it likelier that a farmer will want to rent land in. In their study of Paraguayan panel data from 1991 and 1994, Carter and Salgado (2001) found that those farmers with a high land/labor ratio were likeliest to be renting out, while those with a low land/labor ratio were likeliest to be renting in.

This paper endeavors to assess whether any progress has been made in the 1990s from the rather grim beginning of 1991. The government of Paraguay has done little to address the problem of land pressure from small and landless peasants, beyond continuing the slow process of granting title to occupants of state-owned lands through the IBR and carrying forward a general land titling program. Thus, hopes of the situation having reversed itself are slim.

4. DATA AND METHODOLOGY

This essay used the 1991 Censo Agropecuario and the 2000–2001 Mejoramiento de las Encuestas de Hogares y la Medición de Condiciones de Vida (MECOVI) survey. These datasets contain rich information about land tenure (including gender, in the latter case), farm management, and production. I take a random sample of 1% of farms in the census data, which gives me roughly 3,000 farms, similar to the number of rural farms in the MECOVI survey.

For this study, I follow the method of Deininger, Zagarra, and Lavadenz's (2003) study of land markets in Nicaragua. I begin with a descriptive analysis of land markets. I investigate the incidence of sales by farm size category in the two periods. This will tell us who is buying and who is selling land in each period. I expect to find that the land sales market is segmented: large

landowners doing most of the buying and selling of large plots, while small landowners buy and sell small plots. Then I examine the incidence of land rental by farm size category. This will indicate who is renting in and who is renting out in each period. The rental market should theoretically be less segmented than the sales market, and generally more accessible. I also compare the operational distribution of land with the ownership distribution in each period. This comparison will give a first approximation of the effect of the land rental market on the distribution of land in Paraguay.

Next, I regress household income (for the 2001 data only) on tenure variables. This will test the benefits of participation in rental markets, versus ownership and landlessness. The point here is that rental markets are being offered as possibly a better solution to rural poverty than the sales markets. I expect to find that rental does not improve household income relative to ownership or agricultural wage labor. Another argument is that land rental provides an agricultural ladder—an intermediate rung between agricultural wage labor and land ownership. Thus, I test farm income on tenure variables as well. I expect to find little advantage in rental over land occupation, for example.

Finally, I examine the determinants of buying, selling, and renting land in and out. I expect to find: that credit availability affects rental as well as sales markets; that the sex of the household head affects participation in the land markets; and that the former effect has grown stronger over time. This latter result is expected because, over the course of the 1990s, Paraguay has carried out financial liberalization, which has led to dwindling credit availability (Gibson and Molinas 1998). This combination of static and dynamic effects will give a rich picture of the evolving functioning of the land market in Paraguay in the late 1990s.

5. LAND MARKETS

Table 1 presents both the operational and ownership Gini coefficients for 1991 and 2001. In addition, Lorenz curves of ownership and operational landholdings in 1991 and 2001 are presented in Figures 1–4.[2] In each period, operational holdings are more equally distributed than

[2]I use the method suggested by Griffin, Khan, and Ickowitz (2002), adjusting per capita land holdings by soil quality. Data on access to water is available only for 1991, so neither period is adjusted for water access. The sample I use, however, is all rural households for both ownership and operational holdings, since I want to estimate the impact of land rental markets on the distribution of access to land.

owned land. But in 2001, operational holdings have a smaller redistributional impact than they did in 1991. This may indicate that the rental markets are operating less well than they did in 1991, or that other sources of land access for small farmers (land occupations, for example) are no longer possible.

Tables 2–4 show the number and the median and maximum size and owned land of rural farms in the two periods and the four regions under consideration in this essay.[3] The difference between the beginning of the 1990s and the end seems dramatic—in 2001, the maximum overall farm size is a little more than one tenth of what it was in 1991. This difference may be due to the samples drawn for each year. However, the median farm size also shrank in all but the Minifundia region (though it shrank by only 7% in the Colonization region). In the Central region, the median farm size is less than one half hectare in 2001, while this region was the only one that saw the maximum farm size increase. Land ownership is similarly changed—the median farm owned over three times as much land in 1991 as in 2001. The differences among regions are also pronounced. The median farm in the Central region is the smallest and owns the least land in both 1991 and 2001. In 1991, the Frontera region has the highest median farm size and land owned, but the Colonization region is largest in both categories in 2001. The median farm in the Central region was one quarter the size of the median farm in the Frontera region in 1991, and one-fourteenth the size of the median farm in the Colonization region in 2001. While the median farms in the Central and Frontera regions shrank both in terms of farm size and land owned between 1991 and 2001, the median farms in the Minifundia and Colonization regions remained largely unchanged. All regions except the Central region saw remarkable decreases in the maximum farm size and land owned over the same period.

The only land transaction comparisons possible between the two periods are those involving renting land in (Table 5). The incidence of land rentals is considerably lower in 2001, but the average size is more than three times as great. Regionally this pattern shows up most starkly in the Colonization region, which has less than half the rentals, but the average size is fourteen times as large in 2001. By region, the demand for rentals is least active in the Central region, which has one quarter the number of rentals as the Minifundia region in 2001, and the lowest average size (under two hectares). In terms of renting land out and of buying and selling land, the Central region is also the least active in 2001 (see Table 6). It has the smallest number of

[3]Since both land ownership and farm size are very unequally distributed, I report the median, rather than the average, farm size and area owned.

each type and the lowest average size of transaction in all but purchases (the Minifundia region has a slightly lower average amount of land bought). The Minifundia and Frontera regions are the most active in terms of number of transactions, but the Colonization region has the largest average size of land sales.

Most farms in Paraguay are relatively small, and the percentage of farms that are small has increased: in 1991, 40% of farms were less than five hectares in size, while in 2001, 51% were (see Table 7).[4] In 1991, 75% of the farms were between one and twenty hectares in size, while in 1991, this share is down to 67%. Part of the explanation is the change in rental market participation. While in 1991, 49% of the farms with less than one hectare rented land in, by 2001 the participation rates were 10.6% (see Tables 8 and 9). Size categories larger than one hectare, in most cases, saw *increased* renting in of land, in terms of either participation, average amount of land rented in, or both. Most of the incidence of renting land out was concentrated in farms between one and fifty hectares in 2001, although the greatest participation rates were found among farms between five and 100 hectares (see Tables 10 and 11). Similarly, most of the purchases and sales of land were concentrated among farms with less than fifty hectares. For sales market transactions, though, the largest farms had the highest participation rates. It is hard to see from the evidence presented here how the land rental market could be contributing significantly to land redistribution. However, it is worth noting that the smallest farmers are four times as likely to rent in land as purchase it.

6. LAND MARKET PARTICIPATION

In this section, I test the determinants of participation in land markets. I hypothesize that potential rental market participants suffer from similar constraints as potential sales market participants—lack of access to credit. This argument is not as straightforward as the argument for sales markets, but in order for a campesino to feel confident enough to enter into a rental contract for land, he or she must know that the inputs needed to farm effectively will be within reach. This is where a lack of access to credit can be a binding, if indirect, constraint. This constraint is, in fact, in operation in Paraguay—the Ministerio de Agricultura y Ganadería has

[4]For the farm size categories, I use the total operated area for Table 7 only; for all other tables in this section, I use the current area operated plus land that was rented out or sold minus land rented in or bought. This pretransaction farm size enables me to get a clear picture of who is renting or selling how much land.

found its ability to promote cotton production limited, even though it is distributing free seed. The reason is that farmers will not take seed since they have no access to credit for other associated inputs (EIU 2001).

Figures 5–8 provide a visual impression of land rental markets in Paraguay over the decade of the 1990s. The first two figures provide fitted values from nonparametric regressions of rental demand on the amount of land owned per adult household member in 1991 and 2001.[5] Both demand regressions slope upward. This seems counterintuitive, since a high owned land to labor ratio should lead to lower demand and because we have observed that efficiency falls as farm size increases. The second two figures provide fitted values from nonparametric regressions of rental supply and net rental on land owned per adult household member in 2001. We would expect the net land rentals to fall as land owned per adult household member rises, but we see it rising then falling back to zero. The sales market seems to behave more as we would expect (see Figures 9–11). Although the demand for land again rises with land owned, the net purchases decline (though only after 250 hectares per adult household member). While nonparametric regressions such as these give a feel for the data, they cannot test the significance of the relationship they depict. So, I proceed to a more standard regression analysis of the land rental and sales markets.

I test the determinants of participation in land markets in two ways: both the fact of and the extent of participation. Thus, I use both dummy variables for participation and the amount of land rented, sold, etc. I use Logit regressions for each of the four dependent dummy variables: *Sold*, *Bought*, *RentedOut*, and *RentedIn*. The specification for the Logit regressions, using *Bought* as an example, is:

$$\begin{aligned} Bought = {} & \beta_1 numadult + \beta_2 preOW + \beta_3 age + \beta_4 female\_head \\ & + \beta_5 land\_credit + \beta_6 input\_credit + \beta_7 capital\_credit \\ & + \beta_8 farmAssets + \beta_9 Titled + \beta_{10} front + \beta_{11} colon + \beta_{12} cent, \end{aligned} \qquad (1)$$

where *numadult* is the number of adult household members, *preOW* is the amount of land owned prior to transactions (in hectares), *age* is the age of the household head, *female_head* is a dummy variable taking one for households with a single female head of household, *land_credit* is a

[5]Following Deininger, Zagarra, and Lavadenz (2003).

dummy variable indicating that the household received credit for purchasing land (used only in the regression of *Bought*), *input_credit* is a dummy variable indicating that the household received credit for purchasing inputs to production, *capital_credit* is a dummy variable indicating that the household received credit for purchasing capital equipment, *farmAssets* is the value of the productive assets that the household owns, in millions G, *Titled* is a dummy variable indicating that the household has secure title for land that it owns, and *front*, *colon*, and *cent* are dummy variables for the Frontier, Colonization, and Central regions, respectively. The estimated coefficients resulting from the maximum likelihood estimation of the Logit model are interpreted as increasing or decreasing the likelihood of buying, selling, renting in, or renting out land, respectively.

I use Tobit regressions, rather than ordinary least squares (OLS), for each of the four continuous dependent variables, *AreaSold*, *AreaBought*, *AreaRentedOut*, and *AreaRentedIn*, since many farms in the sample do not participate in the land sales and rental markets, and thus, are censored at zero. Tobit analysis applies maximum likelihood estimation to dependent variables that are censored. The resulting estimated coefficients have properties similar to OLS estimated coefficients if the sample size is sufficiently large. The sample size in this analysis is large enough to allow interpretation of the estimates as though they were OLS estimates. The specification for the Tobit regressions I run are identical to that in Equation 1, above.

Tables 12–13 provide summary statistics for the regression variables I use in this analysis. One striking difference is that the average farm is over twice as large in 1991 as in 2001, while the average rural farm household owned less than a third of the land in 2001 as the average in 1991. While in 1991, 12.5% of the farms were tenants, only 8.5% were in 2001. The average size of rentals in 2001 was more than double that of 1991. Also, while in 1991, 9.7% of households were female-headed, in 2001 over 19.8% of households were. The percentage of farms receiving some kind of credit assistance dropped from over 34% of farm households in 1991 to less than 8.4% in 2001. Over 60% of farms held title to land in 1991, but only 36.7% did in 2001. The regression results are presented in Tables 14–23. Note that the 1991 agricultural census data contains information only about land rented in. So, for land rented out, land purchases, and sales, only regressions for 2001 are presented. In addition, the regressions for selling and renting out land include only those households that owned land, eliminating about one thousand households from the sample.

Unfortunately, there are no easy methods to assess the relative merits of different specifications with Logit or Tobit analysis. I compare χ^2 statistics for lack of a better method. I begin with the land sales market. Except for the inclusion of the sex of the household head and credit, this follows the model used in the Nicaragua study (Deininger, Zagarra, and Lavadenz 2003). Notice first that for both incidence and amount of land sold, the prior amount of land owned is a significant positive contributor to participation. Since one must have land in order to sell it, this result makes sense. In the case of the survey Logit regression of selling land (Table 14), it is the only significant contributor. For the Tobit regression of the amount of land sold (Table 15), access to input credit assistance significantly reduces the amount of land sold (by an estimated forty-eight hectares!). Farm assets also significantly reduce the amount of land sold by about two hectares per million G in assets. Farmers in regions other than the Minifundia region sold significantly more land.

On the demand side of the 2001 land sales market, different factors appear to be important. Older, more educated household heads are significantly less likely to buy land than younger, less educated household heads. And farms with female household heads are also significantly less likely to buy land. Farm assets have a significant, positive (though very small) impact on the likelihood of buying land. And holding title significantly increases the likelihood of a household buying land (Table 16). As far as the amount of land bought is concerned (Table 17), some of the same patterns hold—older household heads and female-headed households buy less land, farms with more assets and with titled land buy more land. However, though access to credit for inputs did not significantly increase the likelihood of a farm buying land, input credit access does significantly increase the amount of land bought. It is interesting to compare the size and significance of the estimated impacts of owning land and holding title. The amount of land owned has little impact and is not significant, while holding titled land has a relatively large positive impact and is significant, both for the likelihood of buying and for the amount bought. Clearly, the value of title as collateral in gaining access to the land sales market is important.

In terms of the supply of rented land in 2001, having secure title to land is a significant contributor to renting out land (Table 18) and in the amount of land rented out (Table 19). This may be due to the fear of losing land to the tiller being greater without secure title. The more land and the fewer assets a farm owns, the more land it is significantly likely to rent out. Less educated and older household heads are significantly more likely to rent out land and rent out

significantly more land. Landholders in the Frontier region are significantly more likely to rent out land and rent out significantly more land. Those in the Central region are significantly less likely to rent out land and rent out significantly less land. Meanwhile, farm households in the Colonization region rent out significantly more land.

Turning to the demand for rented land (Tables 20–23), we see interesting similarities and differences between the beginning and end of the decade. In 1991, those farms with secure title to land were significantly less likely to rent land and rented significantly less land. In 2001, titled landholders rented a significantly greater amount of land. In 1991, neither the number of adults in the household nor the amount of land owned were significant contributors to the likelihood of renting or the amount of land rented. In 2001, more adults significantly increased the likelihood of renting and the amount of land rented, while the amount of land owned by the household decreased both the likelihood and amount of rentals significantly. In 1991, the age of the household head was not a significant determinant of renting in, but in 2001, older household heads were significantly less likely to rent and rented significantly less land. In 2001, female household heads were significantly less likely to rent land, though this is not the case for 1991. This change may have to do with the increase in the percentage of single female household heads in the intervening decade. In both years, access to credit was a significant determinant of renting in land. In 2001, input credit was especially important. In 2001, a farm's assets contributed significantly to its participation in the rental market.

To summarize, participation in land markets in Paraguay is limited, ranging from 1.5% of farms for sales to just under 9% for rentals in 2001. The demand side is restricted by a lack of access to credit, especially for inputs. This restriction is most strongly felt in the land rental market. While the distribution of resources such as land and labor play a part, as well as demographic factors, it seems clear that in order to stimulate the demand for land rentals in Paraguay, input credit will be required. Assuming for the moment that this could happen, can we say that rural poverty will be alleviated significantly? To help answer this question, I examine the relationship between participation in the land markets and rural household incomes.

7. TENURE AND INCOME

One of the arguments put forward in favor of land rental markets is that they form part of an agricultural ladder, an intermediate rung between agricultural wage labor and land ownership. In order for that to be true, tenancy would have to offer a greater chance of saving for future purchases of land. In short, household income would need to be significantly higher for tenants than for the landless. This section explores the question of land rental's effects on household income. Ideally, panel data on individual farm households over time could be used to a full understanding of this issue. Future work will incorporate such data, but for now, I examine the relationship between participation in land rental and sales markets and household income in 2001.

First, I break down households by tenancy type (see Table 24).[6] Owners are those households who own half or more of their operational holdings (or who at least own more land than they rent). As we can see, this is the largest group, with 51% of the total, or 1,6700 households. The next largest group is "loanees." These households report that half or more of their operational holdings are lands loaned to them (*cedido*). These households constitute 32% (1,052) of the total. Next come tenants, those households that hold most of their operational holdings as rentals (or at least rent more land than they own). They account for 3% of rural households. Squatters are those households that are occupying more than half of their operational holdings. "Common" households are those operating more than half of their farms on common land. These two groups make up about 1% each of rural households. And finally, 12% of households own and operate no land at all, making up the third largest group.

Table 25 reports average land owned and farm size for each of the tenure categories. Unsurprisingly, owners own the most land (13.8 Ha., almost twice the overall average) and the landless own none. In addition, tenants and those who make use of common lands also own substantial amounts of land (2.2 and 4.2 Ha. on average, respectively). The distribution of operational holdings among these categories is somewhat surprising. Owners operate less than a third of a hectare more than they own, on average, while tenants operate, on average, 16.4

[6]For this section's analysis, I remove outliers based on net household income per capita and farm size. I define outliers as those households who are outside the range defined by the mean plus or minus five standard deviations. This procedure removes seven of the 3,289 rural households in the survey.

hectares. Commoners operate an average of 144 hectares (this is primarily due to one very large farm).

I next examine how household income breaks down by these same categories (see Table 26). Looking first at net household income per capita,[7] we see that tenants have the highest overall net household income (on average, about 3.24 million G or $879 per person). The landless had 3.12 million G per person, and owners had 2.13. The main difference between the categories is that tenants get 44% of their income from agriculture, while the rest of the rural households' incomes come mostly from off-farm sources. Interestingly, though, tenants get almost as much nonfarm income, on average, as owners. "Loanee" farms get the next highest average net household income, with 90% of it from off-farm sources. Based on this descriptive analysis, tenancy certainly seems to offer advantages, especially in terms of farm income. Although there are few tenants in Paraguay, they appear to be doing well as farmers. I now move on to a regression analysis to test the significance of the observed impact of tenancy on rural incomes.

Table 27 gives the summary statistics for the variables I use in the subsequent econometric analysis of the impact of tenure on net household, net nonfarm and net farm income per capita. The average household head is 46 years old with almost six years of education. Just under one out of five household heads are female. Of rural households, 6.9% rented some land, while 2.4% were landlords; 1.8% bought land, and 1.1% sold land. Over 30% of households held title to land. The average farm size was 11.3 hectares. The greatest concentration (30.7%) of rural households was in the Central region, while the Colonization region had the fewest (19.3%).

I use two models for each income variable. The first uses dummy variables for the transaction types:

$$\begin{aligned} y = {} & \beta_1 age + \beta_2 educ + \beta_3 female\_head + \beta_4 Renter + \beta_5 Landlord \\ & + \beta_6 Buyer + \beta_7 Seller + \beta_8 Titled + \beta_9 AreaOwned + \beta_{10} AreaOperated \\ & + \beta_{11} central + \beta_{12} frontera + \beta_{13} colonizacion, \end{aligned} \qquad (2)$$

[7]Defined here as net household income divided by the number of people in the household.

where *y* is income (net household, net nonfarm, or net farm income per capita), *age* is the age of the household head, *educ* is the years of education of the household head, *female_head* is a dummy variable for those households with a single female head, *Renter*, *Landlord*, *Buyer*, and *Seller* are the dummy variables for land market participation by the household, *AreaOwned* is the amount of land owned by the household in hectares, *AreaOperated* is the farm size in hectares, and *central*, *frontera*, and *colonizacion* are regional dummy variables. The second model uses the amounts of land held in each type of tenure:

$$\begin{aligned} y=&\beta_1 age+\beta_2 educ+\beta_3 female\_head+\beta_4 AreaRentedIn \\ &+\beta_5 AreaRentedOut+\beta_6 AreaBought+\beta_7 AreaSold+\beta_8 AreaOwned \\ &+\beta_9 AreaOperated+\beta_{10} AreaCedido+\beta_{11} AreaOcupado \\ &+\beta_{12} central+\beta_{13} frontera+\beta_{14} colonizacion, \end{aligned} \tag{3}$$

where *AreaRentedIn* is the amount of land rented by the household (in hectares), *AreaRentedOut* is the amount of land rented out by the household (in hectares), *AreaBought* is the amount of land bought by the household (in hectares), *AreaSold* is the amount of land sold by the household (in hectares), *AreaCedido* is the amount of land loaned to the household (in hectares), *AreaOcupado* is the amount of land occupied by the household (in hectares), and all other variables are identical to those in the first model.

For each income variable, Equation 3 proved to be a slightly better model for explaining outcomes. Starting with overall net household income per capita, we see that the education of the household head significantly improves the household's fortunes (see Tables 28 and 29). Interestingly, both renting land out and the amount of land rented out significantly decrease net household income per capita, while renting land in increases it (though not significantly). The amount of land owned by the household has a significant positive impact on net household income per capita. Households in the Frontier region enjoyed significantly higher incomes, while those in the Colonization region had significantly lower incomes.

Turning to the regressions of nonfarm income, it seems that the benefits of education apparently are in its impact on off-farm opportunities—additional years of education for the household head significantly increases a household's nonagricultural income (see Tables 30 and 31). Both tenants and landlords receive significantly less net nonagricultural income and the

latter decreases significantly with the amount of land rented out or bought by a household. Since rental income must increase with the area rented out, this is an interesting result. The more land owned by a household, the significantly higher is their nonfarm income. Again, those households in the Frontier region got significantly more and those in the Colonization region got significantly less nonagricultural income.

Finally, coming to net agricultural income, we expect to see that greater land ownership and, secondarily, access to land via tenancy will increase this share of overall income. Mere participation in the sales or rental markets is not estimated to significantly contribute to a farm's agricultural income however (see Tables 32 and 33); nor is the amount of land transacted. However, in the second regression, the amount of land owned is estimated to significantly increase agricultural income per capita. Although there is statistical evidence to suggest both that tenants do better than landless rural households, and even that they are better off in terms of overall net household income per capita than land owners, there appears to be no statistically significant connection between tenancy and incomes.

8. CONCLUSION

The single most important result of this study is the strong impact of access to credit for inputs on participation in land rental and sales markets. Those farms with input credit rented in over seven additional hectares of land. This amount is well above the average rental, indicating that lack of access to credit for inputs may be a deal breaker in many cases. This essay confirms that the land market situation has not improved since the earlier study by Carter and Galeano (1995). In fact, it suggests that the situation is worse for smaller farmers.

A second significant finding of this essay is that there is little evidence to support the theory that tenancy may be a way out of poverty for rural households. The descriptive statistics seem to confirm at least one aspect of the argument that the World Bank employs in promoting rental markets—that access to land rental improves income-generating possibilities for the small peasants and landless farm laborers (Deininger 2003). However, there is no significant positive relationship between any measure of participation in rental markets and household income, the only significant relationship is negative! A likely interpretation is that the apparent benefits of tenancy are not accruing to those households on the bottom. Instead, a very small number of

medium-sized farms that rent in large parcels of land are seeing the benefits. More detailed study of the distribution of rentals and income among households will be required to clarify this question. What is clear is that land ownership is superior to tenancy, at least in the scope of this study.

From previous work (Masterson and Rao 1999), we know that smaller farms are more productive in the measure that makes the most sense for Paraguay (with its rural poverty, highly skewed distribution of land, and lack of nonfarm rural or urban employment opportunities): output per hectare of operated land. From this study, we conclude that evidence does not support, and in fact contradicts, the idea that tenancy can improve the lot of the rural poor. And we have seen that an important prerequisite for the land rental market to operate on the demand side is the availability of credit for agricultural inputs. But credit has dried up in Paraguay since the process of liberalization got under way at the end of the 1980s, and this has meant that the smallest peasants have lost out; credit, where available, goes to the large, well-connected farms. This lack of credit availability may explain the apparent disadvantage that tenancy seems to carry with it—without credit, farm income generation is more difficult.

If the rental market is to have the redistributive effects that are claimed for it, it is clear that the lack of credit available to those most in need, the smallest farmers, must be remedied. Two remedies exist. The first, increasing state intervention in rural credit markets seems highly unlikely, given the class composition of Paraguay's government (large landowners, cattlemen, etc.), even if there were no external pressure for fiscal austerity. The second, that a functioning financial market that does not skim the benefits of access to land off the top could miraculously appear seems even more unlikely. In this context, the fact that the World Bank encourages fiscal austerity while simultaneously acting as a booster for the land markets as the means for land redistribution and poverty reduction calls into question either the World Bank's analysis or its intentions. At the very least it is myopic. Deininger, Zagarra, and Lavadenz (2003) devote one short line on the possible impact of credit on the rural land markets, but they do not attempt to estimate its impact on the Nicaraguan land market, though they use survey data similar to the MECOVI dataset.

Even if we accept that rental markets are the way to go, they will require almost as much state intervention as land sales markets or expropriation and redistribution would have taken to be effective. If this is the case, why rely on markets to redistribute land at all?

FIGURES

Figure 1: Operational Distribution of Land, 1991

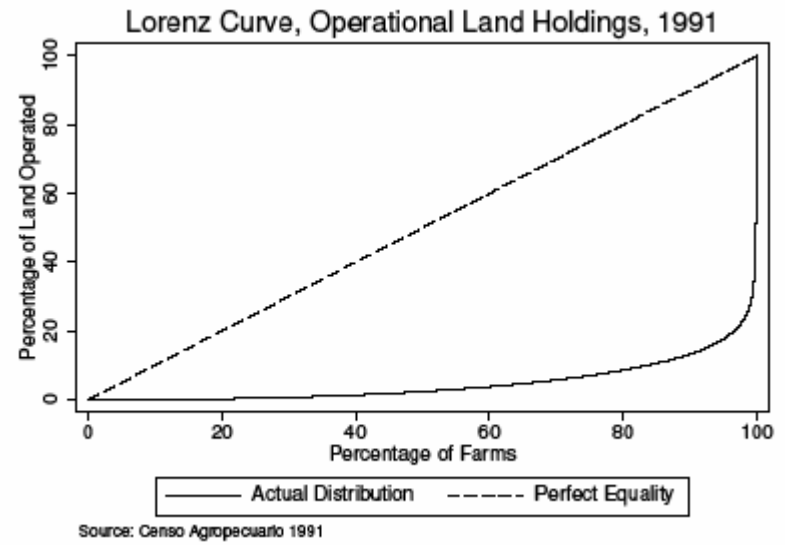


Figure 2: Ownership Distribution of Land, 1991

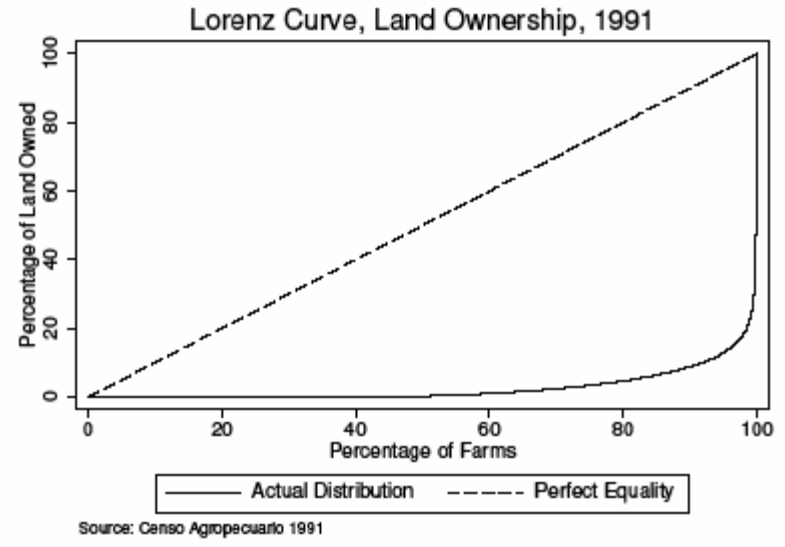


Figure 3: Operational Distribution of Land, 2001

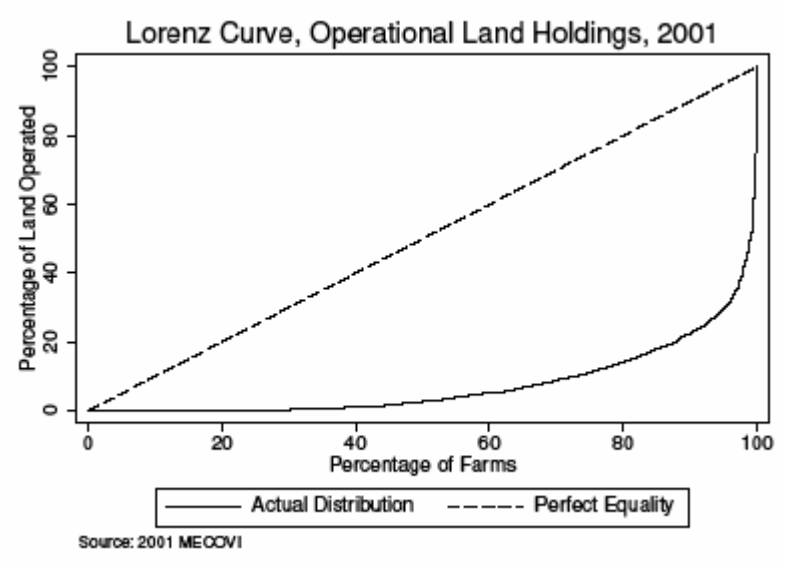


Figure 4: Ownership Distribution of Land, 2001

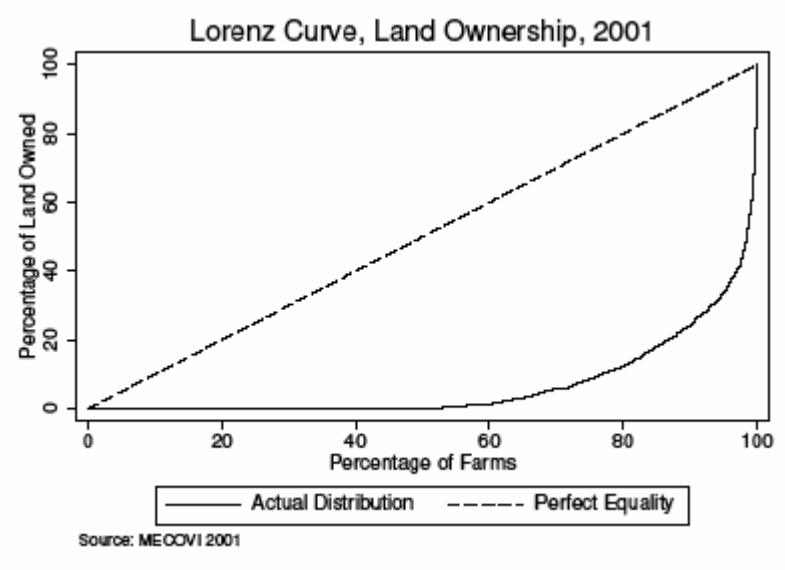


Figure 5: Nonparametric Regression of Land Rental Demand on Owned Land

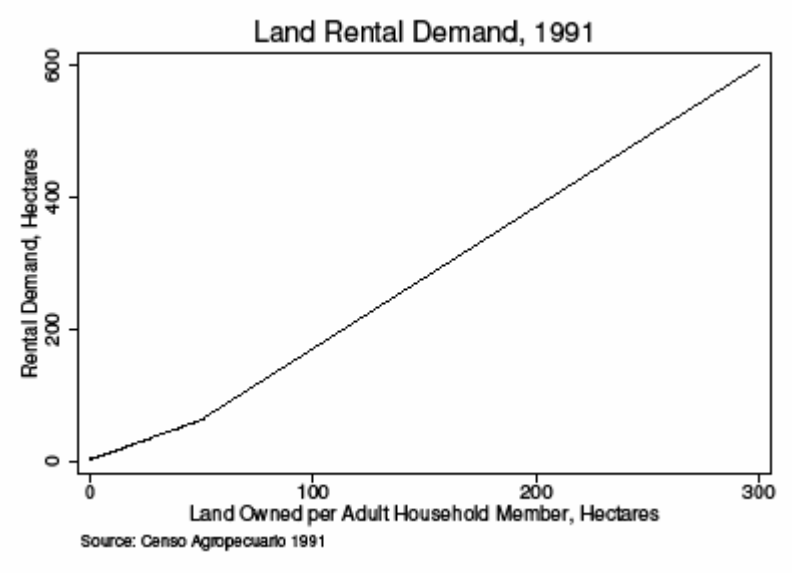


Figure 6: Nonparametric Regression of Land Rental Demand on Owned Land

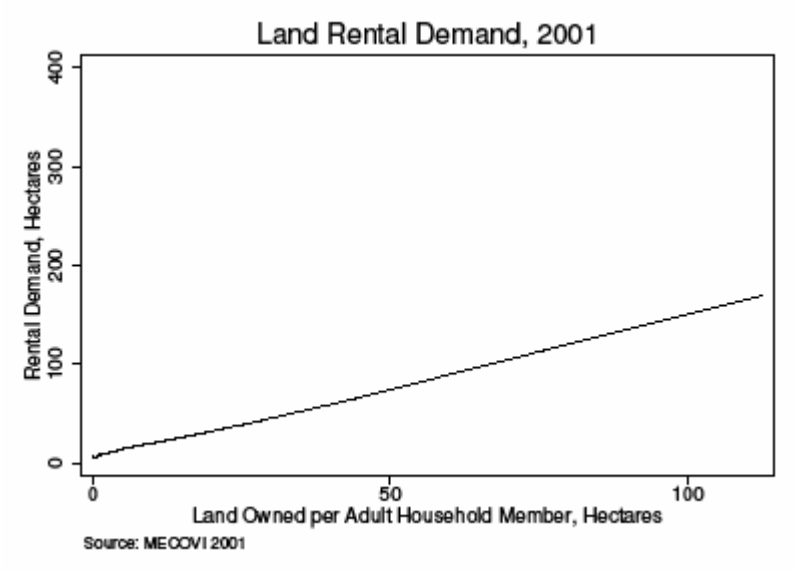


Figure 7: Nonparametric Regression of Land Rental Supply on Owned Land

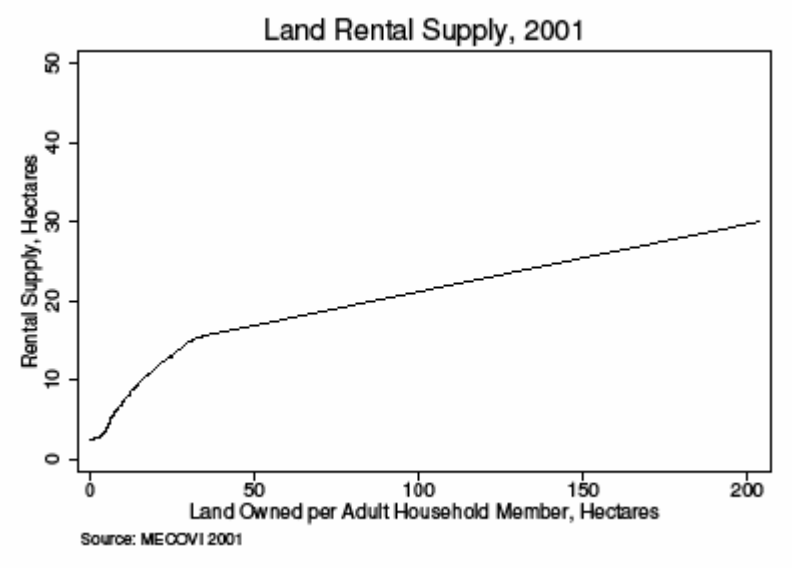


Figure 8: Nonparametric Regression of Net Land Rentals on Owned Land

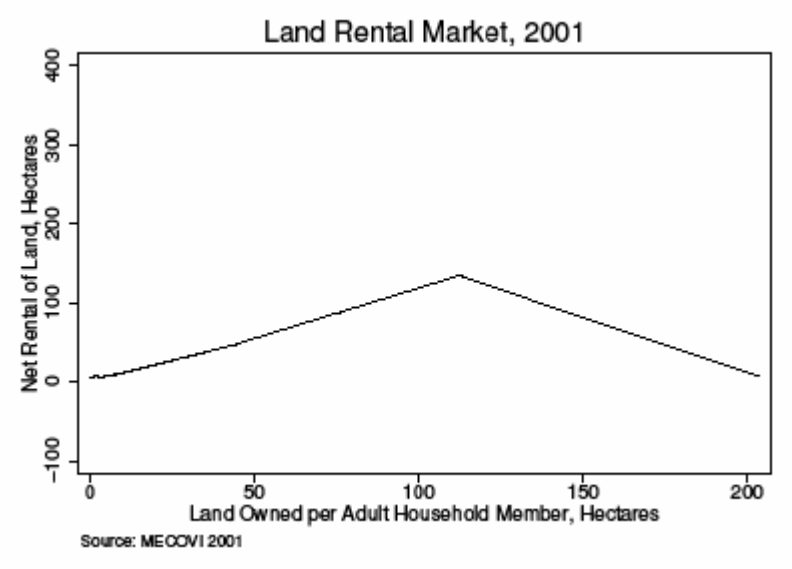


Figure 9: Nonparametric Regression of Land Purchases on Owned Land

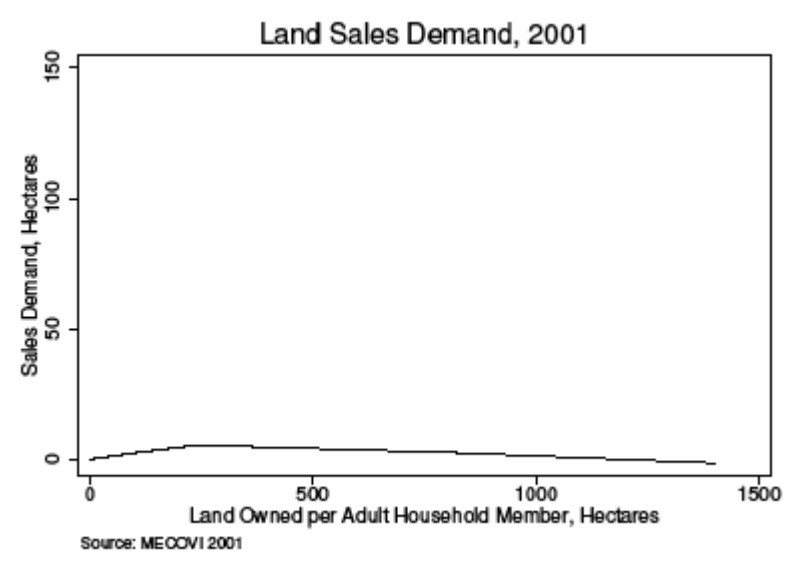


Figure 10: Nonparametric Regression of Land Sales on Owned Land

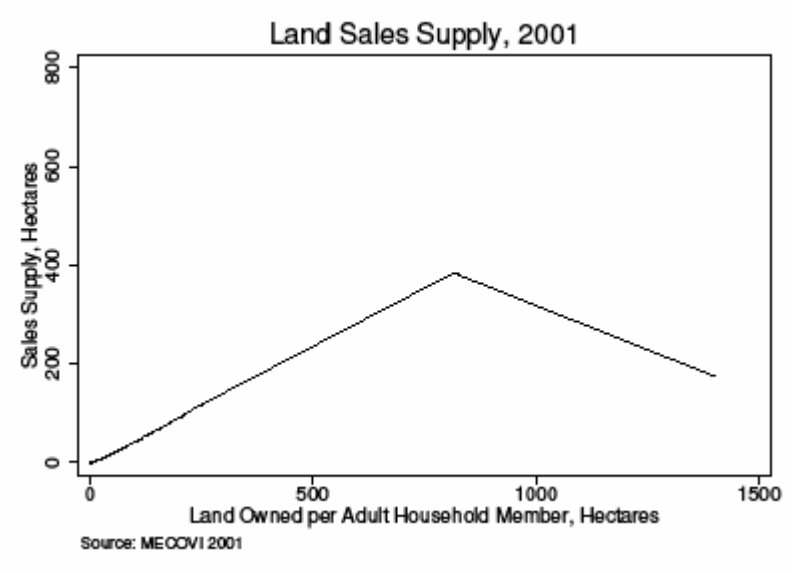
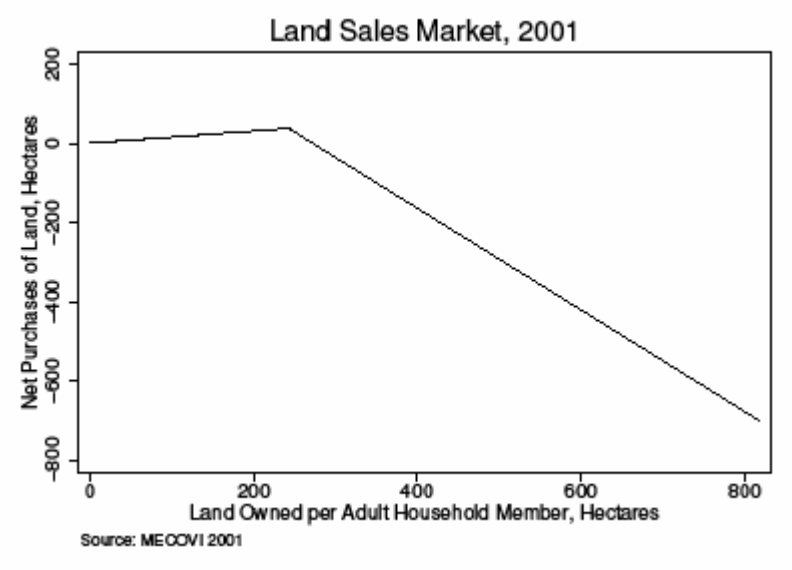


Figure 11: Nonparametric Regression of Net Land Purchases on Owned Land



TABLES

Table 1: Ownership and Operational Land Gini Coefficients, Region Oriental, 1991 and 2001

Year	Ownership	Operational
1991	.944	.901
2001	.862	.847

Source: Censo Agropecuario 1991 and MECOVI 2001

Table 2: Number of Farms by Region and Year

	Year		
Region	1991	2001	Total
Central (#)	573	777	1,350
% of Year	20	28	24
Minifundia (#)	789	638	1,427
% of Year	27	23	25
Colonizacion (#)	780	637	1,417
% of Year	27	23	25
Frontera (#)	785	753	1,538
% of Year	27	27	27
Total (#)	2,927	2,805	5,732
% of Year	100	100	100

Source: Censo Agropecuario 1991 and MECOVI 2001

Table 3: Median and Maximum Farm Size (in hectares) by Region and Year

Region	1991	2001
Central	2.50	0.49
	522.00	611.00
Minifundia	5.00	5.00
	12,498.00	1,602.00
Colonizacion	7.50	7.00
	7,000.00	1,500.00
Frontera	10.00	6.00
	14,700.00	1,400.00
Total	6.00	4.50
	14,700.00	1,602.00

Source: Censo Agropecuario 1991 and MECOVI 2001

Table 4: Median and Maximum Area Owned (in hectares) by Region and Year

Region	1991	2001
Central	0.88	0.04
	470.00	150.00
Minifundia	1.10	1.00
	6,292.00	618.00
Colonizacion	5.00	5.00
	7,000.00	1,000.00
Frontera	5.00	2.50
	14,700.00	1,400.00
Total	2.50	0.75
	14,700.00	1,400.00

Source: Censo Agropecuario 1991 and MECOVI 2001

Table 5: Number and Average Size of Land Rented In (in hectares) by Region and Year

Region	1991	2001
Central	71	23
	1.8	1.4
Minifundia	94	102
	3.2	9
Colonizacion	111	47
	5.1	70
Frontera	100	72
	15	10
Total	376	244
	6.7	24

Source: Censo Agropecuario 1991 and MECOVI 2001

Table 6: Number and Average Size of Transactions (in hectares) by Region, 2001

Region	Rented Out	Bought	Sold
Central	3	10	9
	1.4	6.1	1.6
Minifundia	23	24	11
	4	3.7	3.2
Colonizacion	7	15	11
	2	5	42
Frontera	35	24	11
	6.4	14	3.3
Total	68	73	42
	5.2	7.6	18

Source: MECOVI 2001

Table 7: Number of Farms by Farm Size (Operated Area) and Year

	Year		
Farm Size	1991	2001	Total
Less than 1 ha. (#)	294	737	1,031
% of Year	10	25	17
>=1 to <5 ha. (#)	903	754	1,657
% of Year	30	26	28
>=5 to <10 ha. (#)	661	574	1,235
% of Year	22	20	21
>=10 to <20 ha. (#)	695	529	1,223
% of Year	23	18	21
>=20 to <50 ha. (#)	276	217	493
% of Year	9	7	8
>=50 to <100 ha. (#)	74	54	128
% of Year	2	2	2
>=100 to <200 ha. (#)	37	25	62
% of Year	1	1	1
>=200 to <500 ha. (#)	26	14	40
% of Year	1	0	1
>=500 to <1,000 ha. (#)	6	12	18
% of Year	0	0	0
>1,000 ha. (#)	24	5	29
% of Year	1	0	0
Total (#)	2,994	2,922	5,916
% of Year	100	100	100

Source: Censo Agropecuario 1991 and MECOVI 2001

Table 8: Number of Rentals and Average Size of Land Rented In by Farm Size Category and Year

Farm Size	1991	2001
Less than 1 ha.	261	59
	4.35	72.5
>=1 to <5 ha.	56	71
	2.07	2.26
>=5 to <10 ha.	17	47
	2.63	3.19
>=10 to <20 ha.	17	44
	2.9	11.8
>=20 to <50 ha.	14	17
	7.54	29
>=50 to <100 ha.	7	5
	36.6	18.6
>=100 to <200 ha.	3	0
	67	.
>=200 to <500 ha.	0	2
	.	154
>=500 to <1,000 ha.	1	0
	600	.
>1,000 ha.	0	0
	.	.
Total	376	245
	6.67	24

Source: Censo Agropecuario 1991 and MECOVI 2001

Table 9: Percent of Farms Renting In Land (Participation Rate) by Farm Size Category and Year

Farm Size	1991	2001
Less than 1 ha.	49.06	10.59
>=1 to <5 ha.	7.41	8.90
>=5 to <10 ha.	2.78	8.48
>=10 to <20 ha.	2.53	7.65
>=20 to <50 ha.	5.15	6.44
>=50 to <100 ha.	9.72	7.35
>=100 to <200 ha.	8.33	0.00
>=200 to <500 ha.	0.00	7.41
>=500 to <1,000 ha.	14.29	0.00
>1,000 ha.	0.00	0.00
Total	12.51	8.72

Source: Censo Agropecuario 1991 and MECOVI 2001

Table 10: Number and Average Size of Transactions by Farm Size Category, 2001

Farm Size	Rented Out	Purchases	Sales
Less than 1 ha.	0	15	3
	.	2.04	.333
>=1 to <5 ha.	4	15	5
	1.56	4	.832
>=5 to <10 ha.	19	17	11
	2.07	2.99	1.32
>=10 to <20 ha.	22	14	12
	4.03	11.2	5.17
>=20 to <50 ha.	18	10	7
	7.57	6.96	7.58
>=50 to <100 ha.	4	0	2
	19.4	.	59.2
>=100 to <200 ha.	0	2	2
	.	23.2	23.9
>=200 to <500 ha.	1	3	2
	30	40.2	26.6
>=500 to <1,000 ha.	0	1	1
	.	48	24
>1,000 ha.	0	0	1
	.	.	700
Total	68	77	46
	5.23	7.86	18

Source: MECOVI 2001

Table 11: Participation Rates by Farm Size Category, 2001

Farm Size	Rented Out	Purchases	Sales
Less than 1 ha.	0	2.74	.549
>=1 to <5 ha.	.515	1.93	.644
>=5 to <10 ha.	3.26	2.92	1.89
>=10 to <20 ha.	3.52	2.24	1.92
>=20 to <50 ha.	6.71	3.73	2.61
>=50 to <100 ha.	5.7	0	2.85
>=100 to <200 ha.	0	5.1	5.1
>=200 to <500 ha.	4	12	7.99
>=500 to <1,000 ha.	0	9.5	9.5
>1,000 ha.	0	0	5.22
Total	2.18	2.59	1.47

Source: MECOVI 2001

Table 12: Summary Statistics of Regression Variables for 1991

Variable	Mean	Std. Dev.
Land Owned (has.)	30.42	366.99
Farm Size (has.)	33.76	367.53
Tenants (%)	12.55	33.14
Land Rented In (has.)	0.84	11.74
Number of Adult HH Members	2.74	1.56
Age of HH Head	45.19	16.7
Education of HH Head (Years)	4.16	2.56
Female-headed HHs (%)	9.67	29.56
Credit (% receiving)	34	47.38
Farm Assets (millions G)	0.21	1.77
Titled land (% holding)	60.12	48.97
Minifundia Region (%)	26.89	44.35
Frontier Region (%)	26.72	44.26
Colonization Region (%)	26.72	44.26
Central Region (%)	19.67	39.76
N	2979	

Source: Censo Agropecuario 1991

Table 13: Summary Statistics of Regression Variables for 2001

Variable	Mean	Std. Dev.	N
Land Owned (has.)	8.65	43.21	2727
Farm Size (has.)	14.56	74.78	2727
Sellers (%)	1.38	11.66	2727
Land Sold (has.)	0.24	9.06	2727
Buyers (%)	2.21	14.71	2727
Land Bought (has.)	0.17	2.55	2727
Tenants (%)	8.48	27.86	2727
Land Rented In (has.)	2.04	46.64	2727
Landlords (%)	2.92	16.84	2727
Land Rented Out (has.)	0.15	1.39	2727
Number of Adult HH Members	2.58	1.18	2727
Age of HH Head	48.47	15.51	2727
Education of HH Head (Years)	5.43	3.57	2727
Female-headed HHs (%)	19.85	39.89	2727
Credit (% receiving)	8.44	27.8	2727
Land Credit (% receiving)	0.01	0.94	2727
Input Credit (% receiving)	8.27	27.55	2727
Equipment Credit (% receiving)	0.27	5.16	2727
Animal Credit (% receiving)	0.02	1.46	2727
Farm Assets (millions G)	2.28	16.32	2727
Titled land (% holding)	36.7	48.21	2727
Minifundia Region (%)	22.76	41.94	2727
Frontier Region (%)	26.83	44.32	2727
Colonization Region (%)	22.71	41.9	2727
Central Region (%)	27.7	44.76	2727

Source: MECOVI 2001

Table 14: Logit Regression of Likelihood of Selling Land, 2001

Variable	Coefficient	(Std. Err.)
numadult	-0.096	(0.183)
preOW	0.007*	(0.003)
age	0.006	(0.015)
educ	-0.024	(0.073)
female_head	0.064	(0.584)
input_credit	-0.916	(0.755)
farmAssets	-0.018	(0.013)
Titled	-0.512	(0.431)
front	0.031	(0.522)
colon	0.559	(0.505)
cent	-0.360	(0.574)
Intercept	-3.637**	(0.788)
N	1752	
Log-likelihood	.	
$F_{(11,315)}$	1.545**	

Source: MECOVI 2001

Table 15: Tobit Regression of Land Sold, 2001

Variable	Coefficient	(Std. Err.)
numadult	-3.372	(3.911)
preOW	0.523**	(0.080)
age	0.058	(0.327)
educ	-1.710	(1.483)
female_head	12.759	(10.732)
input_credit	-48.300*	(22.124)
farmAssets	-2.066**	(0.609)
Titled	-14.118	(9.733)
front	32.405*	(14.459)
colon	70.402**	(13.997)
cent	35.844*	(14.596)
Intercept	-145.305**	(30.770)
_se	53.383**	(5.942)
N	1752	
Log-likelihood	-395.597	
$F_{(11,1741)}$	95.180**	

Source: MECOVI 2001

Table 16: Logit Regression of Likelihood of Buying Land, 2001

Variable	Coefficient	(Std. Err.)
numadult	-0.212	(0.166)
preOW	0.001	(0.001)
age	-0.022*	(0.009)
educ	-0.078†	(0.044)
female_head	-1.033*	(0.457)
input_credit	0.214	(0.539)
capital_credit	0.603	(1.535)
farmAssets	0.005†	(0.003)
Titled	1.146**	(0.363)
front	-0.189	(0.357)
colon	0.272	(0.478)
cent	-1.144*	(0.518)
Intercept	-2.095**	(0.620)
N	2726	
Log-likelihood	.	
$F_{(12,324)}$	3.139**	

Source: MECOVI 2001

Table 17: Tobit Regression of Land Bought, 2001

Variable	Coefficient	(Std. Err.)
numadult	-1.661	(1.375)
PreOW	0.007	(0.018)
Age	-0.246*	(0.120)
educ	-0.376	(0.475)
female_head	-8.590†	(5.000)
land_credit	45.281	(44.275)
input_credit	7.585†	(3.937)
capital_credit	3.550	(17.130)
farmAssets	0.109*	(0.046)
Titled	13.930**	(3.245)
front	12.610**	(3.901)
colon	18.509**	(4.067)
cent	2.496	(4.941)
Intercept	-46.398**	(8.377)
_se	21.574**	(2.091)
N	2727	
Log-likelihood	-609.336	
$F_{(13,2714)}$	92.353**	

Source: MECOVI 2001

Table 18: Logit Regression of Likelihood of Renting Out, 2001

Variable	Coefficient	(Std. Err.)
numadult	-0.147	(0.147)
AreaOwned	0.004	(0.003)
age	0.019†	(0.011)
educ	-0.127*	(0.057)
female_head	0.016	(0.434)
input_credit	0.041	(0.585)
farmAssets	-0.014	(0.014)
Titled	1.037**	(0.353)
front	1.541**	(0.431)
colon	0.184	(0.551)
cent	-2.779**	(0.812)
Intercept	-4.451**	(0.885)
N	1765	
Log-likelihood	.	
$F_{(11,315)}$	6.274**	

Source: MECOVI 2001

Table 19: Tobit Regression of Land Rented Out, 2001

Variable	Coefficient	(Std. Err.)
numadult	-0.835	(0.791)
AreaOwned	0.048*	(0.023)
age	0.165*	(0.073)
educ	-0.814*	(0.365)
female_head	3.336	(2.276)
input_credit	1.070	(2.654)
farmAssets	-0.264†	(0.153)
Titled	9.829**	(2.368)
front	21.617**	(3.320)
colon	11.138**	(3.234)
cent	-12.973†	(6.748)
Intercept	-48.084**	(7.409)
_se	13.835**	(1.541)

N	1765
Log-likelihood	-450.574
$F_{(11,1754)}$	168.719**

Source: MECOVI 2001

Table 20: Logit Regression of Likelihood of Renting In, 1991

Variable	Coefficient	(Std. Err.)
numadult	-0.008	(0.046)
AreaOwned	-0.002	(0.002)
age	-0.003	(0.004)
educ	0.044†	(0.024)
female_head	-0.198	(0.227)
credit	0.425**	(0.124)
farmAssets	0.024	(0.034)
Titled	-1.609**	(0.131)
front	0.139	(0.162)
colon	0.228	(0.160)
cent	0.195	(0.176)
Intercept	-1.520**	(0.261)
N	2979	
Log-likelihood	-1013.634	
$\chi^2_{(11)}$	223.845**	

Source: MECOVI 2001

Table 21: Tobit Regression of Land Rented In, 1991

Variable	Coefficient	(Std. Err.)
numadult	-0.445	(0.896)
AreaOwned	0.001	(0.004)
age	0.011	(0.086)
educ	0.963*	(0.480)
female_head	-5.515	(4.496)
credit	8.322**	(2.497)
farmAssets	0.464	(0.652)
Titled	-26.135**	(2.641)
front	6.483*	(3.223)
colon	4.419	(3.252)
cent	2.983	(3.551)
Intercept	-44.200**	(5.456)
_se	37.385**	(1.454)
N	2979	
Log-likelihood	-2436.662	
$F_{(11,2968)}$	151.307**	

Source: MECOVI 2001

Table 22: Logit Regression of Liklelihood of Renting In, 2001

Variable	Coefficient	(Std. Err.)
Numadult	0.235**	(0.073)
AreaOwned	-0.029**	(0.010)
Age	-0.020**	(0.006)
Educ	-0.047	(0.030)
female_head	-0.667*	(0.272)
input_credit	0.636*	(0.275)
capital_credit	1.908†	(1.044)
farmAssets	0.051**	(0.017)
Titled	-0.061	(0.207)
front	0.104	(0.267)
colon	-0.113	(0.286)
cent	-0.987**	(0.366)
Intercept	-1.529**	(0.442)
N	2726	
Log-likelihood	.	
$F_{(12,324)}$	5.099**	

Source: MECOVI 2001

Table 23: Tobit Regression of Land Rented In, 2001

Variable	Coefficient	(Std. Err.)
numadult	7.829**	(1.675)
AreaOwned	-2.738**	(0.080)
age	-0.542**	(0.163)
educ	-0.895	(0.640)
female_head	-8.638	(5.862)
input_credit	21.607**	(5.595)
capital_credit	33.270	(26.489)
farmAssets	4.689**	(0.091)
Titled	11.524**	(4.327)
front	25.973**	(5.012)
colon	24.559**	(5.244)
cent	1.192	(6.077)
Intercept	-73.501**	(9.952)
_se	46.800**	(2.142)
N	2727	
Log-likelihood	-1836.486	
$F_{(12,2715)}$	792.141**	

Source: MECOVI 2001

Table 24: Distribution of Rural Households by Tenure

Tenure	Number	Per cent
Owner	1,670	51
Loanee	1,052	32
Tenant	100	3
Squatter	30	1
Common	41	1
Landless	389	12
Total	3,282	100

Source: MECOVI 2001

Table 25: Average Land Owned and Operated (hectares) by Tenure

Tenure	Land Owned	Land Operated
Owner	13.85	14.17
Loanee	0.34	9.04
Tenant	2.24	16.41
Squatter	0.20	5.41
Common	4.24	143.73
Landless	0.00	0.00
Total	7.26	11.29

Source: MECOVI 2001

Table 26: Average Net Household Income, Net Nonagricultural Income and Net Agricultural Income per Capita (millions G) by Tenure

Tenure	Household	Nonfarm	Farm
Owner	2.88	2.03	0.85
	0.79	0.72	-0.09
Gifted	1.93	1.73	0.19
	0.65	0.72	-0.06
Tenant	11.24	1.78	9.47
	0.88	0.70	-0.03
Squatter	0.87	0.92	-0.05
	0.46	0.27	-0.20
Common	0.86	1.05	-0.20
	0.62	0.29	0.12
Landless	3.12	3.23	-0.10
	1.96	1.96	0.00
Total	2.86	2.13	0.73
	0.98	0.93	0.00

Source: MECOVI 2001

Table 27: Summary Statistics for Income Regressions

Variable	Mean	Std. Dev.
Net Household Income (millions G)	2.25	8.27
Net Nonfarm Income (millions G)	2.07	5.27
Net Farm Income (millions G)	0.18	4.61
Age of Household Head	46.64	15.68
Education of HH Head (years)	5.84	3.83
Female-Headed HHs (%)	19.63	39.73
Renters (%)	6.87	25.3
Landlords (%)	2.39	15.28
Buyers (%)	1.84	13.46
Sellers (%)	1.14	10.64
Title (% holding)	30.42	46.01
Land Rented In (has.)	0.52	7.82
Land Rented Out (has.)	0.13	1.26
Land Bought (has.)	0.15	2.51
Land Sold (has.)	0.12	2.66
Land Owned (has.)	7.26	37.03
Farm Size (has.)	11.29	54.81
Land Occupied (has.)	0.06	0.76
Central Region (%)	30.67	46.12
Frontier Region (%)	27.52	44.67
Colonization Region (%)	19.33	39.49
Minifundia Region (%)	20.17	40.14
N	3282	

Source: MECOVI 2001

Table 28: Survey Regression of Net Household Income per Capita

Variable	Coefficient	(Std. Err.)
age	-0.002	(0.011)
educ	0.267**	(0.051)
female_head	-0.198	(0.237)
Renter	0.150	(0.620)
Landlord	-1.756*	(0.735)
Buyer	4.717	(4.158)
Seller	-0.778	(0.940)
Titled	-0.079	(0.344)
AreaOwned	0.059†	(0.031)
AreaOperated	0.031	(0.021)
central	0.470	(0.363)
frontera	1.190*	(0.571)
colonizacion	-0.616†	(0.341)
Intercept	-0.332	(0.806)
N	3282	
R^2	0.233	
$F_{(13,359)}$	6.907**	

Source: MECOVI 2001

Table 29: Survey Regression of Net Household Income per Capita

Variable	Coefficient	(Std. Err.)
age	-0.002	(0.010)
educ	0.258**	(0.050)
female_head	-0.255	(0.238)
AreaRentedIn	0.139	(0.089)
AreaRentedOut	-0.225†	(0.120)
AreaBought	0.000	(0.139)
AreaSold	-0.031	(0.034)
AreaOwned	0.089**	(0.022)
AreaOperated	0.001	(0.002)
AreaCedido	0.044	(0.040)
AreaOcupado	-0.082	(0.051)
central	0.488	(0.354)
frontera	1.103*	(0.547)
colonizacion	-0.587†	(0.344)
Intercept	-0.282	(0.774)
N	3282	
R^2	0.247	
$F_{(14,359)}$	7.226**	

Source: MECOVI 2001

Table 30: Survey Regression of Net Nonagricultural Income per Capita

Variable	Coefficient	(Std. Err.)
age	-0.001	(0.007)
educ	0.229**	(0.039)
female_head	-0.238	(0.199)
Renter	-0.416†	(0.212)
Landlord	-1.385**	(0.483)
Buyer	0.913	(1.410)
Seller	-0.587	(0.786)
Titled	-0.227	(0.235)
AreaOwned	0.054*	(0.023)
AreaOperated	0.009	(0.006)
central	0.366	(0.287)
frontera	0.571	(0.349)
colonizacion	-0.784**	(0.242)
Intercept	0.314	(0.563)
N	3282	
R^2	0.255	
$F_{(13,359)}$	9.204**	

Source: MECOVI 2001

Table 31: Survey Regression of Net Nonagricultural Income per Capita

Variable	Coefficient	(Std. Err.)
age	-0.003	(0.006)
educ	0.224**	(0.037)
female_head	-0.223	(0.204)
AreaRentedIn	0.001	(0.011)
AreaRentedOut	-0.182†	(0.095)
AreaBought	-0.169†	(0.094)
AreaSold	-0.019	(0.025)
AreaOwned	0.065**	(0.021)
AreaOperated	0.001	(0.001)
AreaCedido	0.014	(0.011)
AreaOcupado	-0.087**	(0.030)
central	0.396	(0.284)
frontera	0.586†	(0.350)
colonizacion	-0.786**	(0.240)
Intercept	0.348	(0.537)
N	3282	
R^2	0.262	
$F_{(14,359)}$	9.505**	

Source: MECOVI 2001

Table 32: Survey Regression of Net Agricultural Income per Capita

Variable	Coefficient	(Std. Err.)
age	-0.002	(0.005)
educ	0.038	(0.023)
female_head	0.040	(0.103)
Renter	0.566	(0.550)
Landlord	-0.370	(0.365)
Buyer	3.803	(3.020)
Seller	-0.191	(0.393)
Titled	0.148	(0.191)
AreaOwned	0.005	(0.017)
AreaOperated	0.023	(0.016)
central	0.105	(0.189)
frontera	0.619†	(0.337)
colonizacion	0.167	(0.179)
Intercept	-0.646†	(0.367)
N	3282	
R^2	0.116	
$F_{(13,359)}$	3.592**	

Source: MECOVI 2001

Table 33: Survey Regression of Net Agricultural Income per Capita

Variable	Coefficient	(Std. Err.)
age	0.001	(0.005)
educ	0.034	(0.024)
female_head	-0.032	(0.111)
AreaRentedIn	0.138	(0.086)
AreaRentedOut	-0.043	(0.043)
AreaBought	0.170	(0.103)
AreaSold	-0.012	(0.011)
AreaOwned	0.025**	(0.005)
AreaOperated	0.000	(0.001)
AreaCedido	0.031	(0.029)
AreaOcupado	0.006	(0.028)
central	0.092	(0.176)
frontera	0.517†	(0.311)
colonizacion	0.200	(0.180)
Intercept	-0.630†	(0.355)
N	3282	
R^2	0.165	
$F_{(14,359)}$	3.611**	

Source: MECOVI 2001

REFERENCES

Baer, W. and M. H. Birch. 1984. “Expansion of the Economic Frontier: Paraguayan Growth in the 1970s.” *World Development* 12(8): 783–798.

Binswanger, H. P., K. Deininger, and G. Feder. 1995. “Power, Distortions, Revolt, and Reform in Agricultural Land Relations.” in J. Behrman & T. Srinivasan (eds.) *Handbook of Development Economics*, Vol. III. Amsterdam: Elsevier Sciences B.V.

Carter, M. R. and L. A. Galeano. 1995. *Campesinos, Tierra, y Mercado.* University of Madison, WI.: Land Tenure Center.

Carter, M. R. and R. Salgado. 2001. “Land Market Liberalization and the Agrarian Question in Latin America.” in A. de Janvry, G. Gordillo, J.-P. Platteau, and E. Sadoulet (eds.) *Access to Land, Rural Poverty, and Public Action.* Oxford: Oxford University Press.

Carter, M. R. and E. Zegarra. 1999. “Land Markets and the Persistence of Rural Poverty: Post-Liberalization Policy Options.” in Ramon Lopez and Alberto Valdes (eds.) *Rural Poverty in Latin America: Analytics, New Empirical Evidence, and Policy*. New York: St. Martin’s Press.

Carter, M. R. and F. Zimmerman. 2000. “Can Time and Markets Eliminate Costly Land Ownership Inequality?” Paper prepared for the Annual Bank Conference on Development Economics, World Bank, April 18–20, 2000.

Deininger, K. 2003. *Land Policies for Growth and Poverty Reduction*. Oxford: World Bank and Oxford University Press.

Deininger, K. and H. Binswanger. 1999. “The Evolution of the World Bank’s Land Policy: Principles, Experience, and Future Challenges.” *The World Bank Research Observer* 14(2): 247–76.

Deininger, K., E. Zagarra, and I. Lavadenz. 2003. “Determinants and Impacts of Rural Land Market Activity: Evidence from Nicaragua.” *World Development* 31(8): 1385–1404.

EIU. 2001. “Uruguay and Paraguay.” *Economist Intelligence Unit Country Reports*.

Gibson, B. and J. Molinas. 1998. “La liberalización y crisis financieras en Paraguay: Un modelo computable de equilibrio general dinámico.” Technical report, Ministério de Hacienda de la República del Paraguay and the United Nations Development Programme.

González, B. S. 1997. *Políticas Agrarias, y Desarrollo, Paraguay: 1954-1994.* Asunción, Paraguay: Amambay Ediciones.

Griffin, K., A. R. Khan, and A. Ickowitz. 2002. “Poverty and the Distribution of Land.” *Journal of Agrarian Change* 2(3): 279–330.

Masterson, T. & Rao, J. M. 1999. *Agricultural Productivity in Paraguay: Analysis and Proposals for Economic Growth Policies*. Technical report, Ministério de Hacienda de la República del Paraguay and the United Nations Development Programme.

Muñoz, J. A. 1999. *Los Mercados de Tierras Rurales en Bolivia.* Santiago, Chile: CEPAL/Sociedad Alemana de Cooperación Técnica.

Sadoulet, E., R. Murgai, and A. de Janvry. 2001. "Access to Land via Land Rental Markets." in A. de Janvry, G. Gordillo, J.-P. Platteau, and E. Sadoulet (eds.) *Access to Land, Rural Poverty, and Public Action*. Oxford: Oxford University Press.

Weisskoff, R. 1992. "The Paraguayan Agro-Export Model of Development." *World Development* 20(10): 1531–1540.

Zoomers, E. 1988. *Rural Development and Survival Strategies in Central Paraguay*. Amsterdam: Centro de Estudios y Documentación Latinoamericanos.