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SEQUENCING CAPITAL AND LAND MARKET REFORMS FOR BROADLY BASED GROWTH

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1. Class Basis and Bias of Agrarian Growth

Rapid agrarian growth can become socially problematic to the extent that it bypasses and even negatively affects large segments of the rural population. An export-led growth boom, for example, can affect individuals directly in their roles as producers by increasing revenues when they adopt export crops, or by changing their access to land and other resources. A boom can also affect individuals indirectly by changing their wage income or access to employment. A growth boom has a "class basis" if a restricted subset of agricultural producers participate in it. A growth boom exhibits a malignant "class bias" if it generates spillover effects which negatively affect non-participants. Such spillovers can be transmitted through markets in the form of price changes, or pecuniary externalities. For example, a boom can increase land prices and thereby squeeze out non-competitive producers, or, if it induces mechanization, wages and employment may fall. Spillover effects may also appear as an "induced institutional change," as happened during earlier Central American export booms which saw large farms expand through the siezure and privatization of public domain lands (see Williams 1985).

After developing a conceptual apparatus, this paper econometrically explores the basis and bias of agrarian growth in contemporary Paraguay, a country where increasing land scarcity and rural unrest have occurred in the midst of rapid export growth. By taking apart the microeconomics of the growth boom, the goal is not only to uncover what is happening, but to identify policy options which might modify the outcome. The paper's chief finding is that more broadly based or inclusionary growth not only requires a microeconomic activism which reaches beyond the broad dictates of liberalization, but also attention to the specific temporal sequencing or ordering of these sectoral policies.

1.1 Induced Structural Change and the Linkages between the Basis and Bias of Agrarian Growth

In a simple world of identical farmers, and scale neutral markets and technologies, the economic impact of, say, a boom in a lucrative export crop would be relatively easy to conceptualize measure. There would be no particular class basis to the boom as large and small farmers would be equally able to participate in it. Nor would any producer stratum be disadvantaged by land prices driven up by an economic opportunity beyond their reach.

In this simple world, growth would not induce spillovers systematically biased against the access of the rural poor to land. The indirect employment or labor absorption effects of the boom would be similarly easy to understand as all producers would produce the export crop with the same mix of land, labor and capital. Comparison of labor absorbed per-hectare under the pre-boom cropping pattern with boom crop labor absorption would suffice to predict the net employment impact on landless and part-time farming households.

Reality is in fact more complex than this simple world of homogenous adoption and labor absorption. Producers, especially in the dualistic agrarian structures characteristic of Latin America, are heterogeneous, perhaps in terms of their behavioral logic, but almost certainly in terms of their access to factor and product markets. When market access is class-based, or farm size sensitive, participation in a growth boom may be uneven across classes, and there may no such thing as *the* labor intensity of an export crop independent of the sort of producer who grows it. The structure of production becomes *welfare-relevant*, meaning that structure affects the efficiency and equity of growth. Who produces boom crops determines how intensively they are produced, that is how much land is allocated to them and how much employment is generated. Thus, while employment and land access effects of a growth boom are to a degree separable (e.g., buoyant employment growth could offset negative consequences of large scale displacement of small farmers), they are interlinked:

> In the Short Term, the employment generated by a boom may depend on the size distribution of the farms which initially adopt the production of boom crops. As a massive body of theoretical and empirical literature indicates, large farms are likely to produce any given crop with less labor per-hectare than would a small farm.
>
> In the Medium Term, a class-based boom could induce a pattern of structural change which in turn generates further changes in net employment by systematically shifting land among classes which face distinct shadow or efficiency prices of labor.

As Section 3 below discusses, in the boom region along Paraguay's eastern frontier, production structure appears welfare relevant with labor absorption strongly influenced by operational holding size.

The socio-economic impacts of export growth in the real world thus depend critically on the interacting effects of differential adoption, induced structural change and labor absorption. The interaction can be positive, with structural shifts in land to small scale producers who thus benefit directly and who also generate more

employment per-hectare. [1] The interaction can also be negative, as it was in 17th century United Kingdom (Lachman 1987) and mid-20th century Central America (Williams 1985) where an unsavory interaction of diminished land access for the rural poor and weak labor absorption surrounded rapid agrarian growth with social controversy and political instability. The growth booms of contemporary Latin America present a varied experience which includes both broadly-based and highly exclusionary processes. [2]

1.2 Exclusionary Export Growth and the Agrarian Policy Question in Paraguay

Land pressure in Paraguay has increased in recent years, as the processes which mitigated land hunger in the past have functioned less and less effectively. State-owned land available for distribution through the colonization program was significantly diminished by the late 1970's. The construction of roads into the fertile eastern border areas in the late 1970's and 1980's encouraged many foreigners, especially Brazilians, to immigrate to these areas, where land was often one-tenth the price of similar land across the border (Wilson *et al.*, 1989:207). While fueling an agro-export boom in the frontier area, this immigration of better capitalized, large scale farmers who found Paraguayan land prices a bargain tended to push prices up in the border areas, making land increasingly more difficult for poor Paraguayans to buy. In addition, throughout the 1980's, population continued to grow at 3.2%, one of the highest rates in Latin America, but since land had become more valuable, new squatters were more often evicted. The confluence of these circumstances left the younger generation with very few options for obtaining land to farm as they entered adulthood. Organized land invasions, sometimes ending in violent confrontations, became more and more common throughout the 1980's.

In the face of this evolving agrarian problem, the search is on for policies which can reduce the exclusionary, class-biased nature of growth and enhance peasant land access. Section 2 below puts forward a conceptual framework which highlights two factors which shape the nature of peasant land access and induced structural change: the core economic competitiveness of different strata of producers; and, the operation of the

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[1] Barham, Carter and Sigelko (forthcoming) find evidence of such a process in their analysis of an agro-export boom in highland Guatemala.

[2] See Carter *et al.* (1993).

land market itself as the arena in which inter-class competition potentially reshapes structure. Section 3 then introduces the survey applied in 1991 to 300 farms distributed across the three primary regions of Paraguay, the colonization region of San Pedro, the traditional minifundia zone of Paraguarí, and the Itapúa zone bordering Brazil where exports are growing rapidly. Section 4 employs the survey data to econometrically characterize the economic competitiveness regime and the functioning of the land market in Paraguay. Using the econometric results, Section 5 then examines the likely effectiveness of two policy instruments which hold some promise of modifying the biased nature of growth, land and capital market reform. In some regions, land market reform policies hold out substantial promise, while in others land market reform which is not accompanied or preceded by capital market reform is likely to actually diminish peasant land access. Section 6 concludes the paper by gathering these findings into a call for conditional (or region and time specific) policy sequences for broadly based growth.

2. Economics of Induced Structural Change

Over time, differences in economic returns to land across different sized farms might be expected to induce structural change in the distribution of land. Incentives for induced structural change are driven by shifts in what can be termed the *class competitiveness regime*. The class competitiveness regime is the mapping between farm size and land valuation. [3] Whether incentives generated by shifts in the competitive regime actually effect structural change depends on how the land market itself works to resolve them. This section highlights in turn the economics of the competitiveness regime and of the land market.

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[3] While the term class can be understood to mean no more than size strata, an emerging body of literature suggests that conventional socio-economic understandings of class can be projected onto the continuum of agents arrayed according to their wealth levels. Roemer (1986) formally develops the notion of class correspondences which map endowment levels into "class." Carter and Zimmerman (1993) apply similar concepts to the analysis of agrarian class structure.

2.1 Access to Capital and the Class Competitiveness Regime

For an individual "i", the capitalized value of the expected production returns from an additional unit of land, ρ_i, can be written as:

$$\rho_i = \Sigma_{t=1}^{H_i} (\Delta_{it})/[1+\mu_i]^t \qquad (1)$$

where "t" denotes years, "H_i" is the individual's time horizon, "Δ_{it}" denotes the increment in net income which "i" can earn in year "t" with the additional unit of land, and "μ_i" is the rate of interest used by "i" to discount the stream of future income.[4] The discounted sum given by equation (1) is a reservation price for land in the sense that it represents the maximum amount the individual could pay for the unit of land without losing money. If the market price is below the individual's reservation price, then the individual would be made better off (in terms of expected income) purchasing the land. Symmetrically, if the market price lies above ρ_i, then the individual would be better off selling land and investing the proceeds in an alternative activity which yields the opportunity cost rate of return, μ_i.

For a given agrarian population, there exists a distribution of reservation prices. The class competitiveness regime can be defined as the conditional expectation function which relates reservation price to farm size, $E(\rho|T)$. Note that empirically, there would always be a distribution of individual reservation prices around the conditional mean. Such differential valuation by individuals within the same size class would create incentives for intra-class transactions. While potentially important, the analysis here will focus on systematic inter-class differentials (which emerge as technology and market opportunities change) which hold the potential for reshaping agrarian structure, or size distribution of farms.

There are a number of size-sensitive factors which might be hypothesized to shape the class competitiveness regime. Among these is the time horizon "H_i" in (1). A weak legal system which leaves small holders vulnerable to a taking of their property would, for example, tend to shorten the time horizon, and reduce land

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[4] Note that expression (1) only includes the current income value of land. Land may have other values as well, including returns based on expected appreciation and tax advantages. In addition, in a dynamic programming context, land may have strategic accumulation value, as Carter and Zimmerman (1994) discuss. However, because the focus here is on growth booms which shift the production value of land, the analysis well be developed only in terms of the current income concept.

valuation, by small holders. Fixed transactions costs which make land registration relatively expensive (on a per-hectare basis) for small holders might also have a similar effect.

Others sources of size sensitivity include both the numerator (Δ_{it}) and the denominator (μ_i) of the reservation price expression (1). The Δ_{it} and μ_i can be respectively conceptualized and measured as the shadow value of land and the shadow value of capital to individual "i's" annual income maximization problem. Formally, let π denote the optimum value function which expresses the net family income achievable under optimal resource allocation as a function of the individual's endowments, market opportunities and other constraints. In the spirit of Feder (1985) and Carter and Mesbah (1993), the optimum value function can be defined as:

$$\pi(T_i,K_i,M_i,L_i,p) \equiv \underset{\ell,x}{\text{Max}}\ p_q Q[T,M,\ell,x] - pl_d + \Phi(L-\ell_h, p_w) \quad (2)$$

$$\text{s.t.}$$

$$p_x x + p_w \ell_d \leq K$$

$$\ell = \ell(\ell_h,\ell_d)$$

where the optimum value function depends on the fixed inputs of machinery (M_i) and family labor stock (L_i), the vector of market prices for inputs and outputs (p), the farm's current land holdings (T_i), the level of liquidity or working capital (K_i). Note that the comings function $\Phi(\bullet)$ gives family labor market earnings as a function of labor supplied by the family to the market. On farm production is specified as a function of efficiency labor " ℓ" (which may be some complex function of inputs of family (l_h) and hired-in labor (ℓ_d)) and purchased inputs, x. Note that the purchase of inputs and labor is constrained by available liquidity as shown by the working capital constraint.

Using (2), the marginal scarcity or shadow value of land would thus be:

$$\Delta_i = \partial\pi/\partial T_i\ , \quad (3a)$$

To the extent that additional land allows more capital to be leveraged under the existing financial market structure, working capital becomes a function of land. Using total, as opposed to partial differentiation, the shadow price of land under the existing capital access regime, $\tilde{\Delta}_i$, can be defined as:

$$\tilde{\Delta}_i = \partial\pi/\partial T_i + (\partial\pi_i/\partial K_i)dK_i/dT_i, \quad (3b)$$

Note that if working capital is not a binding constraint ($\partial\pi_i/\partial K_i = 0$), or if marginal capital access is zero ($dK/dT = 0$), then (3b) reduces to (3a). Finally, it is useful to define the shadow price of land under the counterfactual capital market assumption that all farms can access a constant amount of working capital per unit land $(K/F)^*$:

$$\Delta^*_i = \partial\pi/\partial T_i|_{(K/T)^*} + (\partial\pi/\partial K)(K/T)^*, \quad (3c)$$

where Δ^*_i is the counterfactual shadow price. Under any of the shadow price definitions, the relationship between current land holding and the shadow price of land could be non-linear and non-monotonic (depending on the structure of access to capital and labor markets), as Carter and Mesbah (1993) discuss.

If financial markets are deep and the individual can access any amount of capital at a parametrically given market rate of interest, then the shadow price of capital used to discount future returns in the reservation price expression (1) would simply be the market rate of interest. If these conditions do not hold, and available liquidity is a binding constraint, then analogous to expression (2), the individual specific shadow price of capital in production can be written as:

$$\mu_i = \partial\pi/\partial K_i \, . \quad (3d)$$

Note that use of this shadow price as the rate of discount in (1) imposes the financial rationality that rates of return be equal in investment in farm intensification and farm extensification.

How shadow prices change as farm size changes determines the nature of the class competitiveness regime. Individuals who are tightly constrained in factor markets or otherwise disadvantaged may be unable to adopt remunerative production strategies, and would thus have fairly low Δ's and ρ's. This characterization might apply to large farms which rely on expensive (in efficiency terms) hired labor. It is precisely this efficiency labor cost advantage of family labor farms versus larger, labor hiring farms which underlies theories of the economic dominance of family farms (e.g., Binswanger *et al.*, forthcoming; Schmitt 1992).

While labor market advantages may tend to make small farms relatively competitive, the structure of financial markets may create a countervailing disadvantage for small scale producers. As expression (1) makes clear, access to capital has a double-edged impact on the reservation price for land, affecting both its numerator

and denominator. While there are diverse theoretical perspectives on how rural financial markets operate, most tend to point toward some sort of size-sensitivity in the shadow price of liquidity. [5]

Finally it should be noted that equations (3a-3c) define the shadow price of land in terms of an infintessimally small change in land stock. Reservation prices defined on this basis will be symmetric in the sense that the reservation price for purchasing a unit of land will be identical to that for selling that infintessimally small unit of land. However, as Carter and Kalfayan (1989) explore, the buy and sell reservation prices may diverge if they are defined for transactions of some minimum discrete size. In particular, they note that a large wedge between the buy and sell reservation prices will emerge for small scale households in areas where the demand for off-farm labor is weak or uncertain. In effect, households which supply labor to the market will capitalize into their reservation sale price the expected increase in unemployment (and proportionately large dip in optimized family income, π) which would accompany the sale of land.

To summarize, it is impossible from a theoretical perspective to *a priori* characterize the class competitiveness regime, other than to note that interacting multiple market failures are likely to render it other than horizontal in farm size space. Metaphorically, the slope of the class competitiveness regime describes degree to which an agrarian market recovery departs form a "level playing field," and tilts in favor of one class or another. Whether the likely labor market advantages of small farms outweigh their potential financial market disadvantages, and tilt the playing field in their favor, is an empirical question which will be addressed for Paraguay in Section 4 below. [6]

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[5] Risk and information loom large in capital market theory. For example, the fixed costs of information have been used to suggest that the full cost of borrowing (interest plus transaction/costs) decrease with loan size. Other theoretical traditions arrive at qualitatively similar conclusions based on information asymmetries, transaction costs and competitiveness characteristics of collateral markets. For more discussion, see Barham, Boucher and Carter (1994).

[6] The observation that cheap labor is the small farm sector's only advantage is not meant to denigrate its potential importance. Nor does this observation deny the broad historical drift to family labor agriculture which has characterized the economic development of now wealthier countries. However, in the context of the capital, risk and quality requirements of export agriculture, it is important to keep in mind the sharp difference in the *absolute* size of, say, a North American family farm and a Latin American peasant producer.

Access to cheap and well motivated interactive family labor may indeed provide the decisive competitive advantage for a 100 hectare family labor farm versus a 1000 hectare wage labor or collective farm. Both the 100 and the 1000 hectare farms are large enough that the fixed costs of information which shape various input and output

2.2 Transaction Costs, Segmentation and Prices in Land Markets

For a given competitiveness regime, the transactions which actually take place depend on two factors. The first is the (perhaps size sensitive) effective market price faced by the individual which determines whether he or she wants to enter the market on the supply or the demand side. The second are barriers to exchange between farm size classes. Transactions costs potentially shape both the effective market prices and the inter-class barriers to exchange.

There are two sorts of economically important transactions costs which might attend land market transactions, conventional fixed costs and bargaining costs which attend inter-class transactions. Registration and titling costs are examples of conventional fixed costs which attend any transaction such fixed costs could have two effects. First, they could make the effective per-hectare price (net of transaction costs) higher on smaller purchases. Second, by making infinitely small transactions prohibitively expensive, fixed transactions costs may drive a wedge between an individual's reservation sale price and his or her reservation purchase price. If an individuals marginal reservation price is decreasing in farm size, then the discrete reservation sale price would lie above the discrete reservation purchase price (i.e., it would cost more to buy out a hectare from the individual then he or she would be maximally willing to pay for an additional unit of land). The individual would have no incentives for any transactions when the net market price fell between his or her reservation sale and purchase prices. Such a phenomenon may help to explain the low transactions land market equilibria discussed by Basu (1986) and others.

The second kind of transaction costs specifically confronts inter-class transactions. Inter-class transaction costs may make it very costly for small holders to buy a small piece of land from a much larger unit because of subdivision and legal costs. Similarly, wealthier individuals who wish to buy large pieces of land may find it extremely costly to consolidate a single holding out of multiple small holdings. Such transaction costs

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markets are irrelevant. Family farms in North America are more than large enough to deal with these information costs. The same can also be said of many of the emergent mid-sized or capitalized family farms observed to exist in central Chile and elsewhere in Latin America (see especially Scott 1985, and Lehmann 1986). However, the same can not be said about the 1 or 2 hectare, family labor farms in Latin America. For such farms, two orders of magnitude smaller than family farms elsewhere, the labor cost advantage may not suffice to overcome countervailing competitive disadvantages created by the size sensitive factor and output markets discussed earlier. Rosenzweig and Binswangers' (1993) evidence concerning the asymmetric impact of risk on small farm production may reflect this financial market disadvantage of small units.

might be sufficiently high to *segment* the land market, meaning that the market for a small piece of land is really a different market than that for a large piece of land. The price of land may be different in the two markets. Such land market segmentation would obviously pose a barrier to induced structural change, whether it be a shift of land to large or to small scale farms.

The actual pattern of land market price(s) and induced structural change will thus depend on the distribution of agents across the competitiveness regime, and the nature of the transaction costs which may pose barriers to fundamental structural change. If structural change is induced, then, as discussed above, the new land distribution will generate further changes in net-employment as the pattern of employment changes from that on the pre-existing farms to that on the newly formed farm units. Note that if changes in structure induce changes in wage rates and other prices, then the competitiveness regime may itself evolve over time, dampening or heightening incentives for structural change. Again, theory suggests that a multiplicity of outcomes are possible, depending on the empirical importance and magnitudes of various transaction costs. [7]

3. Region and Class in Contemporary Paraguay

The Paraguayan economy is overwhelmingly dependent on agriculture and related activities. In 1989, a full 96% of total exports were accounted for by agricultural, livestock, and forestry products. While stagnant relative to the rest of Latin America up through the 1950's, Paraguay's agricultural economy has been one of fastest growing in the region since 1970. In particular, the export sector has grown rapidly over this period (FIDA 1990). While the rate of expansion slowed with recession in the 1980's, agrarian growth has remained healthy.

Unlike many other Latin American countries, Paraguay's export sector depends heavily on small farm production. Cotton is primarily produced by small farmers--almost 70% of the area dedicated to cotton in 1981 was on farms less than 20 hectares in size--and cotton alone accounted for more than a third of total exports in

[7] Carter and Zimmerman (1993) use a dynamic general equilibrium model to expl ore these issues, relating their results to such classic work as that of Kautsky who suggested that structural change induces price change which alter what this paper calls the class competitiveness regime.

1990. Despite this dependence on the small farm sector, Paraguay has a highly skewed land distribution. [8] With almost 60% of the population rural, the unequal distribution of land is potentially an issue of considerable importance. Nevertheless, until recently the country had not experienced the sort of violent agrarian conflict common to many countries with an extremely skewed land distribution. Nor has Paraguay undergone the rapid, uncontrolled urbanization which has been typical of many other Latin American countries and is indicative of a rural population losing its access to land.

One reason why concentration of land ownership has not until recently proved to be an explosive issue is that in the past, owners of large amounts of land tolerated widespread squatting on areas that they were not using, often a major proportion of their holding. In addition to informal occupation, there were also legal ways to lay claim to unused land. From the 1960's onward an official colonization policy distributed state-owned land, much of it in remote parts of the interior and border areas, while also encouraging private colonization schemes. Through the 1970's, farmers feeling the land squeeze had the option of joining one of these official colonization programs, or, as many thousands more did, of simply occupying newly opened lands in the hope that their presence would convince the owner, private or public, to sell it to them, a strategy which frequently worked.

However, as discussed in section 1.2 above, the closing of the land frontier has created a new era of agrarian tension and motivated a closer look at the form of agrarian growth. Galeano (1992) examines agricultural census data in an effort better understand the ongoing processes of induced structural change. The picture which emerges from his analysis is one in which the small farm sector which is at best stagnant, and at worst disintegrating; in which the capitalized family farm sector is unable to compete with agribusinesses; and, in which the small agribusiness sector losing ground to larger agribusinesses.

Galeano's analysis emphasizes several points. The first is that the difficult position of medium-sized farms is directly related to the economic crisis of the 1980's and particularly to the fall in world prices of Paraguay's major cash crops. The second is that the stagnation and disintegration of the small farm sector is dependent on a number of interacting conditions, especially the possibilities for off-farm employment and the

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[8] Conventional land distribution figures for Paraguay overstate land concentration because of the extreme ownership concentration in the Gran Chaco (western) region of Paraguay characterized by harsh agro-climatic conditions.

existence of an agricultural frontier. He notes that the small farm sector as a whole has shown remarkable staying power due to households' ability to adapt their survival strategies to changing circumstances. Finally, Galeano notes that the medium and large scale agribusiness sector has benefitted from state policies which favor these farms' production methods and the crops they tend to grow. These policies have undergone some change recently and are sure to be modified further as the new government in Paraguay works out its economic strategy. In short, the trends Galeano locates are not inexorable historical processes, but rather are dependent on particular circumstances and are subject to change induced by both the economic and the policy environments.

To probe more deeply the economics of different sized farms--their productivity and land accumulation potential--300 farm production units were surveyed in late 1991. Following a typology suggested by Galeano (1990), the eastern region of Paraguay was divided into three zones:

1. The old "Minifundia Zone" where farms are generally very small and the soil depleted due to centuries of continual use;

2. The "Colonization Zone" settled largely by migrants from the Minifundia Zone during the government's colonization policy in the 1960' ś and 1970's; and

3. The "Frontier Zone" bordering Argentina and Brazil characterized by foreign immigrants (especially Brazilians and German-Brazilians) and penetration of large scale modern farming.

For sampling purposes, a single department was selected within each zone: Paraguarí for the Minifundia Zone; San Pedro for the Colonization Zone; and, Itapúa for the Frontier Zone. Using a multi-stage sampling procedure, approximately 100 farm units were selected within each department. To assure adequate representation, the final sample frame was stratified by farm size, and large farm units were oversampled relative to their weight in the population. Cross-sectional production and retrospective longitudinal land accumulation data were collected from each unit.

Table 1 displays the structure of the sample and basic descriptive statistics. Apparent in the figures is striking heterogeneity across farm size strata. Such heterogeneity makes induced structural change both likely and potentially problematic. The informal tenure figures reveal that between 50% and 80% of small farm units operate under legally insecure tenure regimes, a factor which may shorten their time horizons and dampen their competitiveness as discussed earlier. The labor absorption figures signal widely different choices of technique and enterprise across farm sizes, suggesting that agrarian structure is what section 1.1 termed "welfare relevant."

To the extent that the higher labor absorption on small farms signals their access to cheap efficiency labor, these figures indicate a competitive advantage for the small farm sector. Access to capital (measured crudely by credit use per-hectare) only unambiguously favors large farms in the frontier region. The net-income figures signal the poverty of smaller scale producer. As average, not marginal, figures, they do not necessarily say much about land valuation and class competitiveness. The self-reported willingness to pay for land figures hint at regionally differentiated competitiveness regimes. Small farm units appear dominant in the colonization and minifundia regions, while large farms appear to be the economically strongest stratum in the frontier region. Understanding how all these factors fit together to shape growth and induce structural change, is the next section's task.

4. Econometric Analysis of Competitiveness Regimes and Induced Structural Evolution in Paraguay

Using the data drawn from the sample described above, this section undertakes three tasks. It first characterizes the economic competitiveness of different classes of producers. It then generates evidence on the importance of transactions costs within the land market itself. Third and finally, it explores the actual patterns of induced structural change which have been created with economic growth in the agricultural sector.

After an initial characterization of the class competitiveness regime based on self-reported reservation prices, this section uses production data to construct reservation prices based on estimates of the separate components which form the basis for economic competitiveness. While the results of this latter exercise yield a competitiveness regime which mirrors the regime estimated from the self-reported reservation price estimates, the value of the synthetically constructed reservation prices is that they lay the basis for Section 5's simulation of the competitiveness impact of changing policy parameters which impinge on the distinct components which shape land market competitiveness.

4.1 Self-Reported Direct Estimates of the Reservation Price, Class Competitiveness Relationship

As part of the 300 household survey, respondents were asked a set of questions about their willingness to pay for a hectare of land of good quality and legally titled. Respondents were also asked to assume that they would have access to long term loan to finance the purchase. In addition, individuals were also asked to report the price they would demand to sell one hectare of land they already possessed. As responses to hypothetical

questions, these self-reported reservation price estimates should be interpreted cautiously. Nonetheless, they provide a first window in the economics of land market competitiveness in contemporary Paraguay.

A simple OLS regression specification, which controlled for respondent age, was used to portray the regional class competitiveness regimes shown in Figure 1. The precise regression specification can be gleaned from Table 2. The solid lines are the estimated regression functions for each region which relate willingness to pay for land to farm size. The dashed line for the colonization region is the estimated regression function relating farm size to the price an individual would demand to sell a hectare of land. The functions are truncated at different points to match the domain covered by the regional sub-samples (see Table 1).

Two economically noteworthy features appear in Figure 1. The first is the gap between the reservation purchase and sale prices in the Colonization zone. The self-reported reservation sale price is nearly 50% higher than the purchase price for the smallest farms in this region. For farm sizes less than 20 hectares, a similar but less pronounced gap of about 20% characterizes the functions for the other two regions as well. As discussed in section 2.1 above, this wedge between sale and purchase price gives an idea about the additional value imputed to land as a source of self-employment. In the Colonization Zone, which is the most isolated of the three regions, the self-employment premiums almost 300,000 guaranies ($230) per-hectare. Premia of this size give an indication of the resistance of these small holders to being bought out in a land market even if their reservation purchase price were to show them to be economically uncompetitive in terms of expansion capacity.

The second noteworthy feature in Figure 1 is the markedly different competitiveness regimes across the three regions. In both Minifundia and Colonization zones, willingness to pay slopes downward over 1 to 40 hectare range--a pattern which is entirely consistent with Chayanovian and other notions of small farm competitiveness built on their access to cheap family labor. While there is some weak indication of an upturn in those curves around the 50 hectare mark, the sample in neither region contains many farms this large (see Table 1).

In contrast to these two regions, the competitiveness regime in the Frontier region shows that willingness to pay for land montonically increases with farm size. The reservation price curves suggest that smaller farm units are not at all competitive in this zone. The reservation purchase price gap between a 10 hectare farmer and a 100 hectare producer is almost 800,000 guaranies ($615) per-hectare, or nearly 80% more than the 10 hectare

producer's declared maximum ability to pay for land. Interestingly, across all three zones, reservation prices for the smallest holders are relatively similar in magnitude. The larger cross-regional difference appears between the large farm strata.

In all three regions the competitiveness regimes indicate the existence of sharp incentives for inter-class, structure reshaping transactions. Whether or not such transactions take place depends on whether transaction costs inhibit or even segment the land market. However, before turning to look at evidence on the nature and operation of land market the next section uses production data to construct alternative estimates of the class competitiveness regime. Aside from concerns about the reliability of hypothetical reservation prices used for the analysis in this section, the self-reported estimates cannot be decomposed to identify the sources of differential competitiveness, nor ultimately to judge the adequacy of alternative policy measures designed to alter the small farm competitiveness for the sake of broadly based growth.

4.2 Deconstructing Competitiveness Regime--Econometric Estimates of the Optimum Value Function for Family Income

Table 3 presents partial switching regression estimates for the following polynomial approximation to the optimum value function for family income given in equation (2):

$$E(\pi_i) = \beta_1(M_i) + \beta_2(G_i) + \beta_3(L_i) + \beta_4(K_i) + \beta_5(K_i^2) + \beta_6(K_i)(T_i) + \beta_7(K_i^2)(T_i) +$$
$$DC_i[\beta_{C0} + \beta_{C1}(T_i) + \beta_{C2}(T_i)^2] +$$
$$DM_i[\beta_{M0} + \beta_{M1}(T_i) + \beta_{M2}(T_i)^2] +$$
$$DF_i[\beta_{F0} + \beta_{F1}(T_i) + \beta_{F2}(T_i)^2], \quad (4)$$

where π_i, M_i, L_i, T_i and K_i are as defined before, and G_i is the value of livestock on farm unit "i". DC_i, DM_i and DF_i are regional dummy variables. T_i is measured as the operational farm size, and K_i is measured as total formal and informal credit utilized by the production unit. While imperfect as a measure of total working capital, the credit measure would be expected to downwardly bias the actual shadow value of capital. [9] The first column of table 3 gives the estimates of the parameter in (4). The precise specification of higher order terms in (4) resulted from an *ad hoc* effort to find a parametric specification which seemed to capture the data.

Using the Table 3 parameter estimates, Figure 2 draws the level curves (for the colonization region) for family income, π, in land-capital space. From any given asset position in land-capital space, the alternative shadow price measures (3a-3d) can be calculated by using the gradient encountered by stepping in the appropriate direction.

The *ceterius paribus* shadow price of land (Δ in 3a in which marginal leverage is assumed to be zero) represents the slope of the family income surface calculated in a strictly eastwardly direction, such as that in a strictly eastward direction from point "A" in Figure 2. The level curves for this shadow price, mapped in Figure 3, show that the shadow price increases as available working capital increases. As would be expected, for a given total amount of working capital, the shadow price Δ decreases with farm size.

The alternative shadow price of land measures discussed above can be similarly conceptualized as gradients in Figure 2. The counterfactual, perfect capital markets shadow price (Δ^*) can be measured as the increase in family income which results from a movement along a vector which describes an optimal capital to land ratio. In Figure 2, this movement is portrayed as movement in the northeast direction from point "A" along

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[9] If each farm had similar proportions of own wealth to utilize as working capital, than variation in loans would be a constant multiple of variations in total working capital and estimated marginal impacts would be correct. If farms differ widely in terms of their self-financed working capital, and if variations in loans reflect variation in need or demand for funds to supplement own wealth, then one would expect the estimated marginal impact of loans on net income to be nil.

the vector which assumes that marginal leverage is 100,000 guaranies/hectare. The reservation prices calculated on the basis of the gradient along this vector would yield the counterfactual competitiveness regime which would result in a world of identical, non-size sensitive capital access. Section 5 below discusses this regime.

The second alternative leverage assumption calculates the slope of $\pi(\tilde{\Delta})$ along the actual "leverage curve" which describes the extant pattern of (perhaps) size-sensitive capital access. If the *hypothetical* leverage curve in Figure 2 described the extant pattern of capital access, then the appropriate direction in which to calculate the slope of the family income function would vary with farm sizes. From a point such as "D," the leverage curve indicates zero marginal leverage and a shadow price calculated in a nearly eastward direction. From a point such as "D'," the extant capital access regime would imply a northeastward movement along the marginal leverage curve.

An appeal to the econometrics of omitted variable estimators suggests a simple way to approximate $\tilde{\Delta}$, the shadow value of land calculated under the extant capital access regime. Note that omission of the capital variables from regression function (4) will lead to set of omitted variable parameter estimates whose expected values are given by the following expression:

$$E(\tilde{\beta}) = \beta_I + \beta_K(\Theta) \qquad (5)$$

where the $\tilde{\beta}$ are the omitted variable estimates, β_I is the vector of structural coefficients (from 4) for the variables included in the omitted variable regressions, the β_K are the structural coefficients for the excluded capital variables, and the Θ_I is the vector of auxiliary regression coefficients relating the excluded capital variables to the included variables. Note that the Θ exactly represents the marginal "leverage" value of the included resource in question. Use of the estimated $\tilde{\beta}$ vector to calculate the marginal value of land will yield an estimate of the total derivative given in expression (3b) above and a shadow price calculation which reflects the extant regime of capital access.

The second column of Table 2 gives the omitted variable estimates for the family income function using the partial switching polynomial regression specification in equation (4). Figures 4 and 5 present the shadow value of land (under the actual capital access regime) implied by these omitted variable estimates. The estimated regression function is almost identical for the colonization and minifundia regions, and results for only the former

are presented in Figure 4. The upward slope of the estimated shadow value of land in the Frontier region in Figure 5 stands in marked contrast to the downward sloping relationship shown in the other two regions.

Capitalization of the short run shadow values shown in Figures 4 and 5 into a reservation price for land as a long lived asset requires estimation of an appropriate scarcity value of capital to discount a stream of Δ income increments, as shown in (1) above. Using expression (3d), gradients of the family income surface in the northly direction can be used to construct measures of the shadow price of capital (see Figure 2). Combining the Table 2 parameter estimates with the equation (3d) expression for the shadow price of capital yields a sequence of shadow price estimates for each observation as a function of its land and credit variables. To describe the average scarcity value of capital for each farm size class under the extant capital access regime, the observation specific measures were regressed on farm size variables using a regional switching regressions specification.

The results of this descriptive, shadow price of capital regression, shown in the third column of Table 2, were used to construct the estimated regression functions relating average shadow price to farm size shown in Figures 4 and 5. In the Minifundia and Colonization regions (Figure 4), the real shadow price of capital rises with farm size, from about 60% for the smallest units to over 90% for the larger units. In the Frontier region, the pattern is again distinctive. Capital access improves, and the shadow price of capital falls off rapidly toward market interest rate levels, for farms over 50 hectares in size. As with the estimates of the shadow price of land, peasant farms are largely homogenous across regions, operating at a margin where an additional unit of capital would yield a 60% real rate of return. Large farms are heterogenous across regions, with the large farm sector in the frontier region much better capitalized (and economically more competitive) than the large farm sector in the other region.

Linking the information on shadow prices of land and capital into a willingness to pay measure for land yields the class competitiveness regimes shown as solid lines in Figures 4 and 5. In constructing these reservation price estimates, problems of tenure insecurity were ignored and it was assumed that farms of all sizes use an infinite time horizon. Like the Figure 1 estimates based on self-reported reservation prices, the regimes in Figures 4 and 5 reflect class competitiveness given the extant rules under which capital, labor and other markets operate. Unlike those estimates, the information underlying the Figure 4 and 5 estimates can be used to generate counterfactual competitiveness regimes.

These estimated regimes are broadly similar to the pattern of self-reported reservation prices shown in Figure 1 above.[10] In the Minifundia and Colonization regions, there appear to be large incentives for sale of land from larger to smaller farms. In the Frontier region, the class competitiveness regime signals incentives for structural change in precisely the opposite direction. Before turning to estimation of the evolving pattern of structural change, the next section examines operation of the land market for evidence of the transaction costs and segmentation which may dampen induced structural change.

4.3 Land Prices and Land Market Segmentation

The retrospective longitudinal land accumulation data from the 300 farm survey report nearly 1100 permanent and temporary land transfers stretching back in time to 1921. In an effort to gauge the evolving price of land and the presence of transactions costs which shape the way the land market functions, the subset of 203 relatively unencumbered and straightforward sales or purchases were selected for analysis.[11] To control for inflation, these nominal prices were inflated to 1991 price levels using the consumer price index.

Table 4 presents ordinary least squares estimates of the evolution of the real price of farm land across the three regions. Controlling for the size of the lot purchased, the percent of the land covered in forest and legal status, the regression estimates separate time trends for real land price appreciation in the three regions. Both lot size and tenure security have large and statistically significant effects on land price. The premium paid for legally titled land points toward important problems of horizon truncation under insecure tenure forms (see the discussion in section 2.2 above). Also, controlling for other factors, the per-hectare land price is much higher for smaller lots. As discussed in section 2.2, such strongly size-differentiated prices signal either segmentation, or fixed transactions costs. Either one could block the sorts of inter-class transactions for which the competitiveness

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[10] The reservation price estimates shown in Figures 4 and 5 used nominal discount rates, and thus too heavily discount the future.

[11] Excluded transactions included rental arrangements, inheritances and sales transactions in which the legal status of the land was unclear (e.g., the sale of *mejoras* on land improvements by squatters), as well as transactions in which the assumption of a debt made it difficult to distill the actual land value from the reported sale price. Because the consumer price index (CPI) is unavailable prior to 1950, transactions before that date had to be eliminated from the analysis.

regime estimates suggest there are plenty of incentives, and suggests some role for land market reform, a topic to which section 5 below will return.

Figure 6 graphs the evolution of the real price of land using the Table 4 estimates. The curves displayed in Figure 6 further clarify the different regional price appreciation patterns. While the economic crisis of the 1980's slowed the rate of appreciation in all zones, land prices again began to climb by the mid-1980's in the Frontier Zone. In the other zones, real land prices followed a rapid depreciation over the course of the decade.

These estimated land appreciation patterns match well with Galeano's structural change hypotheses reviewed in Section 3 above. The take-off in real land prices in the Frontier Zone is estimated to begin in the mid-1960's. Shortly thereafter, perhaps under the dual pressure of population growth and labor displacement in the Frontier Zone, real land prices begin to rise sharply in the Minifundia and Colonization areas. In an effort to investigate how this tightening of the land market has affected the ability of *campesino* households to access sufficient land the next section uses the 300 household agrarian history data to estimate lifecycle land access trajectories.

4.4 The Land Market and the Evolving Land Access of the Rural Resource Poor

Using the agrarian history data, the following panel data specification was estimated for the amount of land cultivated by individual farm unit "i" in year "t":

$$T_{it} = \beta_{i0} + (\beta_1 + \delta_1 P_{it})A_{it} + (\beta_2 + \delta_2 P_{it})A^2_{it} + \epsilon_{it} \qquad (6)$$

where A_{it} is the lifecycle age of the production unit (defined as the number of years since the farm unit operator began independent operation of a farm unit), and P_{it} is the region-specific real price of farm land in year "t." A time series of observations is available for each farm unit from the year of its inception through 1991, yielding an uneven panel data set. The age terms permit the land accumulation trajectory to reflect a core Chayanovian or lifecycle pattern of land accumulation. Even absent a pattern of agrarian structure change, it would be expected that farms might increase holding size in the early to middle parts of their lifecycle followed by a period of decumulation. The price terms in equation (6) are included to test for patterns of structural change induced by growth which spills over into increased land market pressure. If growth spawns a process of structural change, non-competitive farm units would be expected to have their lifecycle trajectories flattened by rising prices, while

competitive units would be expected to increase their rate of land accumulation as prices rise (i.e., be on the demand side of the land market). The fixed effect term β_{i0} corrects for heterogeneity bias which could be induced if, for example, initial farm size is correlated with the length of the completed life cycle.

Given that the competitiveness regimes estimated showed distinct regional and farm size patterns, the parameters of equation (3) were specified to switch with each of the four farm size classes and the three regions, implying a total of 12 accumulation trajectories. In an effort to make intelligible the mass of information contained in Table 5, Figures 7 and 8 display estimated land accumulation trajectories under both high and low prices for the Colonization and frontier regions. A 1960 price was used for the low price in each region, while the high prices are the estimated peak prices seen in Figure 6. In the Colonization region (as in the Minifundia region), the takeoff in land prices which occurred in the 1970's uniformly depressed land access trajectories across farm size classes. That is, there is no evidence of a class bias associated with increasing land scarcity. As shown, in the Colonization region, there is some persistent tendency for larger farms to shed land across the lifecyle, reflecting the relative non-competitiveness of these producers. While these farms do not dramatically decrease in size, their shrinkage matches the class competitiveness regime incentives.

The pattern of growth in the Frontier region is strikingly different. As can be seen in Figure 8, the land market spillover of a class-based growth process is evident in the fact that the land accumulation trajectory of large units shifts up as prices rise, while that of small units is squeezed downwards. [12] Again the results conform with the implications of the estimated competitiveness regimes.

To summarize, despite evidence indicating the presence of significant transaction costs in land markets, in the frontier region the competitive advantage of large scale farms appears to express itself in inter-strata transactions. That is, in this region, structural change seems to intertemporally amplify an exclusionary growth process. By contrast, in the Minifundia and Colonization regions, small farm competitive advantage is not

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[12] These results may tend to understate the "proletarianization" of smallholders because the sampling frame which generated the data was based on current land holders in the region. Only farm units which had survived until 1991 were thus eligible for inclusion in the sample. However, a few individuals included in the samples in the other regions actually reported a history of selling out farms in the frontier regions. The relevant part of their histories were used in the frontier regressions.

reflected in the sorts of structure-reshaping transactions one might expect. As the next section explores the role for distinct, and distinctly sequenced, policies in the different regions.

5. Capital and Land Market Reforms and the Class Competitiveness Regime

The preceding section identified strong differential cross-class competitiveness, as well as evidence of significant variation in land price depending on the lot size purchased. As discussed earlier, such price variation signals either the presence of fixed transactions costs and, or segmentation in the land market. The land accumulation estimates indicated that in the frontier region at least, these factors nonetheless seemed to reverberate into a pattern of induced structural change and exclusionary growth. After briefly laying out the logic of land and capital market reforms, this section uses the prior econometric estimates to gauge the ability of such policies to broaden the base of growth in contemporary Paraguay.

5.1 Land Market Reform--Options and Effectiveness

The policies grouped here under the rubric of "land market reform" share the characteristic that they do not alter core economic competitiveness (the shadow price of land, Δ in expression (1)). Rather, they operate on either how individuals capitalize an income stream into a reservation price of land (by altering the time horizon "H" or the discount rate "r" in (1)), or the operate on how the land market itself works by breaking down transaction costs barriers to fluid (inter-class) land market operation. While a relatively activist policy in microeconomic terms, land market reform is in practice fairly simple because it does not affect the core competitiveness factors (access to technology, capital, labor etc.) which determine productive returns to land.

The menu of land market reform measures include [13]:

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[13] In addition to those three policy instruments, land taxation is sometimes argued to be a useful policy. Taxation with progressively higher rates as size of ownership holding increases has been argued to provide large landowners with the incentive to sell part of their land in order to escape the higher tax rates (Strasma el al., 1987). However, the economics of land taxation are more complex than this simple argument admits. As a fixed cost, land taxes impinge on the farm's working capital constraint. The economic cost of a additional unit of tax will thus vary with the tightness of a farm's capital constraint. In addition, as Hoff (1993) notes, the fixity of land taxes also presents a risk burden whose economic cost will be directly related to the farm unit's ability to risk-bearing capacity. Together, these two financial considerations make it unlikely that even a progressive tax rate scheme will lead to land redistribution.

(1) *Land Titling and Registration*: The descriptive statistics in Table 1 show that large numbers of Paraguayan small holders access land under informal arrangements which lack clear legal status. To the extent that informal arrangements are insecure in the sense that the informal owner may find him or herself subject to ownership disputes or displaced at a later date, time horizons will be truncated and individuals will be willing to pay less for land the weaker is their political power. Titling and registration programs are meant to legally clarify land ownership status in a way which breaks any relationship between willingness to pay for land and extra-economic (political) competitiveness.
Note that titling also makes individual tenure security marketable and transferrable. This will enhance the collateral value of land and may have the effect of improving capital access. It may also increase the fluidity of the land market by making secure tenure available to "outsiders" who would not have enjoyed the *de facto* secure (informal) property rights which a member of a traditional community may have enjoyed.

(2) *Land Banks*: Because transactions costs may make large owners reluctant to subdivide their property into the small lots appropriate for purchase by small holders, mortgage banks supplying credit for land purchases may be ineffective. Land banks, on the other hand, purchase large estates which they then subdivide into family-sized farm units and resell to landless and land-poor families. By assuming the transaction costs involved in the break up of large holdings into small units that the poor could purchase, land banks may improve the latter's access to these lands.

(3) *Mortgage Banks*: The majority of the landless and the land poor do not have the savings nor access to the financial resources necessary to convert an economic desire to own land into effective demand. Modelled on successful farmland mortgage systems in industrialized countries, mortgage banks make loans to individual peasants, or groups of peasants, to finance the purchase of land. By providing the landless and land-poor with the long-term loans required for farmland purchases, these land-financing systems are expected to increase their participation in the land market and enhance their bargaining position.

The expectation that these land market reform policies can reverse the observed pattern of land market transactions and shift land to the resource poor relies on the presumption that the resource poor do not suffer a fundamental competitive disadvantage in the sphere of production which affects their potential for participating in the land market. If such a large "competitiveness gap" exists, then neither politically feasible progressive land taxation, nor putting the resource poor on an equal transaction costs or mortgage capital basis with the better off, will achieve the desired redistributive effect. They will still be unable to earn sufficient returns to justify paying the market price for the land.

According to the class competitiveness regime estimates, peasant farms in the Minifundia and Colonization zones would be economically able to use the land market to improve their land access. In these zones, land market reform policies which secure small holder land rights and enhance the ability of small scale producers to purchase land from larger holdings appear promising. The full arsenal of titling, mortgage banks and land banks would appear to have a positive role to play in broadening the base of growth in these regions under the current competitiveness environment.

Figure 9 simulates the impact of land market reform on the class competitiveness regime in the Colonization Zone. For reference purposes, the actual competitiveness regime curve from Figure 4 is shown. Note that the actual competitiveness regime was calculated using equal (infinite) time horizon for all farms. That is, that and the other policy regimes analyzed here presume equal tenure security benefit of land tilting and registration. The impact of a mortgage bank is simulated by assuming that all farms can access long term land purchase loans at 15%--i.e., the farm size specific estimates of Δ are discounted at a 15% rate. The curve labelled "Land Market Reform" in Figure 9 shows the resulting competitiveness regime. If a land bank existed to reduce transaction costs and, or breakdown barriers to inter-class land transfers, then a single market price would apply to all farm units (say 800 thousand guaranies), and the potential for market-mediated land reform would be quite strong in the colonization and minifundia zones.

The situation in the Frontier region is more complex. Both the self-reported reservation prices, as well as those derived from cross-sectional production data, indicate that small farms are not competitive in the regional land market. Figure 10 simulates the impact of a mortgage bank facility on small farm competitiveness in this region. The land market reform curve is constructed as described in the preceding paragraph. As can be seen in Figure 10, even with the full suite of land market reform policies, small farms would not be competitive, even at a unified market price of 1200 thousand guaranies per hectare. Unlike the other regions, land market would not suffice to redistribute land and broaden the base of growth. Moreover, to the extent that land market reform enhanced the overall efficiency of the land market (by making tenure security fully transferrable across classes), its effect on broadly based growth could actually be perverse. While elements of land market reform (legal security) may be vital for the long term health of the agricultural sector, this observation suggests that more fundamental competitiveness reforms may have to precede (and market reforms if such pervisity is to be avoided).

5.2 Closing the Competitiveness Gap with Capital Market Reform

In the Frontier region, the disadvantaged access of these small farms to capital appears as one factor which, if rectified, might render them competitive. Moreover, while small farms appear to currently competitive in the Colonization and Minifundia regions, they too exhibit high shadow prices of capital. That is, small farm

competitiveness in these regions exists despite their limited access to capital which leaves them with shadow prices in excess of 60%. Their competitiveness in this situation ultimately says as much about the debility of the large farm competition in those regions as it does about the competitive strength of the small farms. Small farm competitiveness in those regions might be vulnerable over time to a pattern of increased commercialization in which the large farms sectors successfully use (unreformed) capital markets to achieve the degree of capital access enjoyed by large farms in the Frontier Zone.

Unfortunately, mechanisms to reform the capital market are complex. There is an abundance of reasons why even a competitive financial system may leave small farms tightly capital constrained. The developing world is littered with capital reform policies better remembered for causing financial disintermediation than for improving intermediation of capital to small holders (see Adams and Graham). None the less, the positive experience of the Grameen Bank has motivated a resurgence of interest in locating incentive compatible mechanisms for overcoming the information problems which underlie small farm capital access problems. Credit cooperatives are one such mechanisms (see Barham *et al.*), as are groups which work on group liability lending principles (Wenner 1994 and Hauge forthcoming). Ultimately this important issue of the design of capital market reform is beyond the scope of this paper which is dedicated to showing its import for the nature of growth and social transformation.

Leaving aside the issues of institutional design, Figures 9 and 10 simulate the competitiveness impacts of a capital market reform which gives all farms equal access to capital. In terms of Figure 2, this capital market simulation calculates the shadow price of land for farms of different sizes in the northeastwardly direction along the along an optimal capital-land vector. Figures 9 and 10 process those shadow prices of land in two different ways. First, the dotted curve labelled "Capital Market Reform" discounts the resulting equal access shadow prices into a reservation price using the size differentiated shadow prices shown in Figures 4 and 5. That is, those curves presume farms remain tightly constrained in their access to long term capital. Second, the "Capital and Land Market Reform": curves presume that the capital market reform is matched by a mortgage bank which equalizes access to long term finance. As can be seen, in the Frontier region, this capital and land market reform policy mix boosts small farm willingness to pay for land to over 2000 thousand guaranies per-hectare. Current land prices in the region stand at about 1200 guaranies. Moreover, this mixed policy makes the peasant sector

competitive with farms up to 200 hectares in size. Capital market reform by itself has a similar, but less pronounced effect on small farm competitiveness.

In the Colonization and Minifundia regions, the capital market reform policy packages push small farm economic ability to pay towards levels of similar absolute magnitude. As already noted, land prices in those regions are currently well below those in the Frontier region. But, as noted earlier, such a strong competitive position would become necessary for broadly based growth in those regions if the large farm sectors were to begin to capitalize and grow more aggressively.

6. Conditional Policy Orderings for Broadly Based Growth

The "class competitiveness regime" which links operational farm size class to the economic ability to pay for land is a key determinant of the nature of agrarian growth and transformation. Regimes in which small farms are non-competitive are likely to reflect a reality in which peasant producers cannot participate directly as producers in a booming or growing sector. Moreover, their lack of participation leaves them vulnerable to increasing land prices which squeeze their access to land. If, in addition, labor absorption is inversely related to farm size, diminished small farm land access spill overs into diminished sectoral labor absorption as well. In effect, an unfavorable class competitiveness regimes signals a new kind of double development squeeze of the peasant sector.

Conceptually, there is no reason for the class competitiveness regime to be invariant across time or space. As a reflection of interacting, multiple market failures, the extant competitiveness regime at any point in time will reflect the relative prices and technologies which valorize those market failures. [14] Within the contemporary Paraguay, the variability of competitiveness regimes is seen in the sharply differentiated regimes which characterize the Frontier versus other regions of the country. In the former, small farms are estimated to be unable and unwilling to pay the going market price for land that large farms can and do pay. Estimates of lifecycle trajectories of land access suggest that this competitive differential has been reflected in diminished small farm land access as the land market has tightened with agourian growth and large farm expansion.

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[14] See the discussion in Barham, Carter and Sigelko (forthcoming) about the changing nature of small farm competitiveness in the Guatemalan export boom, as the valuation of different market failure changes.

In the Colonization and Minifundia regions, the small farm sector appears competitive, willing to pay a price for land which exceeds the large farm reservation price. Yet in these regions, there is little evidence of a corroborating improvement in small farm land access. Analysis of land prices does signal a wedge between the per-hectare price paid for small lots versus large lots of land. This wedge could signal the presence of either fixed transaction costs, and or size-segmentation in the land market. Either might block the sorts of induced structural change which the competitiveness regime in this area would lead one to anticipate.

Two key policy implications thus flow from this work. The first is the idea of *policy orderings*. Land market reform policies (e.g., land titling and other programs designed to facilitate the workings of the land market) may have to be preceded by fundamental competitiveness polices (e.g. capital market reform) if broadly based agrarian growth is to be supported. As analysis of the Paraguayan Frontier region shows, land market reform policies are insufficient by themselves to shift the direction of induced structural change in that region. Indeed, to the extent that they make small farm land more marketable, such policies could have perverse effects by speeding small farm displacement. [15]

The second policy implication concerns the *conditionality* of policy orderings over time and space. In contemporary Paraguay, a policy ordering which places land market reform temporally first on the agenda may enhance broadly based growth in the Colonization and Minifundia zones. The optimal policy ordering in either region could shift over time as the underlying competitiveness regime evolves. In the final analysis, the message of this paper is that the microeconomic reality of the agrarian sector is complex and contested terrain. [16] While the call for conditional policy orderings for broadly based growth belies any simple, "one size fits all" liberalization schema, it does have the beneficial and quite sensible result of prioritizing detailed sectoral knowledge as the basis for policy design.

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[15] The rapid concentration of land in Chile's Central Valley, where land title and registration are very clear and secure, illustrates this possibility (see Echenique and Rolardo (1992) and Carter *et al* (1994)). Ironically, in highland Guatemala, where land holdings are fragmented and formal land titles and registration are weak, small farms have been able to successfully participate in an export boom despite their economically conservative production patterns (see von Braun *et al*. (1989) and Barham, Carter and Sijelko (forthcoming)).

[16] Timmer (1988) notes that policy which is mindful of the sorts of multiple market imperfections stressed here becomes analytically complex and demanding relative to those which flow from "get price right" perspective.

References

Barham, B.S., S. Boucher and M.R. Carter (1984). "Credit Constraints, Credit Union and Small Scale Producers in Guatemala," mimeo, University of Wisconsin-Madison.

Barham, B., M.R. Carter and W. Sigelko (forthcoming). "Agro-Export Production and Peasant Land Access: Examining the Dynamic Between Adoption and Accumulation," Journal of Development Economics.

Carter, M.R., B. Barham and D. Mesbah. "Agro-Export Booms and the Rural Resource Poor in Chile, Guatemala and Paraguay," mimeo, University of Wisconsin-Madison.

Carter, Michael R. y John Kalfayan (1989). "A General Equilibrium Exploration of the Agrarian Question," University of Wisconsin-Madison Agricultural Economics Staff Paper 279 (revised).

Carter, Michael R. y Dina Mesbah (1993). "Can Land Market Reform Mitigate the Exclusionary Aspects of Rapid Agro-Export Growth?" *World Development* (July).

Carter, Michael R., Karen A. Luz y Luis Galeano (1992). Land Markets and Campesino Agriculture in Paraguay: Changing Patterns of Land Access and Ownership in a Period of Rapid Agricultural Growth.

Dorner, Peter. 1992. Latin American Land Reforms in Theory and Practice. Madison, WI: The University of Wisconsin Press.

Fogel, Ramón B. 1986. "Movimientos campesinos y transición democrática en el Paraguay." Revista Paraguaya de Sociología, Asunción, Año 23, No. 67 (Sept.-Dec.):175-196.

-----. 1989. La Cuestión Agraria en el Paraguay: Apuntes para su Estudio. Asunción: Centro de Estudios Rurales de Itapúa.

Galeano, Luis A. 1982. "La diferenciación socio-económica en el campo y las migraciones. Paraguay: 1950-1975." En Estado, Campesinos, y Modernización Agrícola , D. Rivarola, ed., 165-218. Asunción: CPES.

-----. 1990. "Modernización agraria, diferenciación campesina y escenarios políticos." En Procesos Agrarios y Democracia en Paraguay y América Latina, L. Galeano, ed., 19-42. Asunción: CPES.

-----. 1992. "Perfiles y tendencias recientes de la estructura agraria." Manuscrito. Asunción: CPES.

-----, Ramón Fogel, and Tomas Palau. 1981. "El desarraigo y la asalarización de los campesinos en el Alto Paraná, Paraguay." In Economía Campesina y Empleo, 265-286. Santiago de Chile: Oficina Internacional de Trabajo, PREALC.

-----, Domingo Rivarola, Federico Barrios, Dionisio Borda and Miguel Verdecchia. N.D. "La economía campesina y las políticas agrarias en el Paraguay." Manuscrito. Asunción: CPES.

Hatzmann, Karin. 1985. "Estructura y procesos de desarrollo espacial en la agricultura campesina de Itapúa (S.E. Paraguay) bajo la influencia de la producción mecanizada de soja." Revista Paraguaya de Sociología, Asunción, Año 22, No. 64 (Sept.-Dec.):139-160.

Hoff, Karla (1993). "If Land Taxes Are Such A Good Idea, Why Are They So Unpopular," in Braverman, A., J. Stiglitz and K. Hoff (eds.), The Theory of Rural Organization (Oxford University Press).

Kleinpenning, J.M.G. 1984. "Rural development policy in Paraguay since 1960." Tijdschrift voor Economische en Sociale Geografie 75, No. 3:164-176.

Lehman, David (1986). "Two paths of agrarian capitalism: A critique of Chayanovian Marxism," Comparative Studies in Society and History , 28, No. 3:601-627.

-----. 1987. Man and Land in Paraguay. Amsterdam: CEDLA.

Nagel, Beverly Y. 1991. "Socioeconomic differentiation among small cultivators on Paraguay's eastern frontier". Latin American Research Review, Vol. 26, No. 2:103-132.

Palau Viladesau, Tomás y María Victoria Heikel. 1987. Los campesinos, el estado, y las empresas en la frontera agrícola. Asunción: BASE/PISPAL.

Rivarola, Domingo M. 1990. "Proceso agrario, decentralización estatal y participación campesina." Revista Paraguaya de Sociología. Asunción, Año 27, No. 78 (May-Aug.):127-142.

1982. "Estado, modernización agrícola y deferenciación campesina en el Paraguay." En Estado, Campesinos, y Modernizacion Agricola , D. Rivarola, ed. Asuncion: CPES.

Rosenzweig, Mark and Hans Binswanger (1993). "," Economic Journal .

Scott, Christopher (1985). "El Ascenso de la Mediana Produccion en la Agricultura Latinoamericano," Rome: FAO, Taller sobre el ascenso de la Mediana Produccion en la agricultura latinoamericano.

Strasma, John, Jim Alm, Eric Shearer and Andrew Waldstein (1987). "The Impact of agricultural land revenue systems on agricultural land usage in developing countries." Mimeo (Burlington, VT: Associates in Rural Development)."

von Braun, Joachim, David Hotchkiss, and Maarten Immink, (1989). "Nontraditional Export Crops in Guatemala: Effects on Production, Income, and Nutrition," Research Report 73, International Food Policy Research Institute in collaboration with the Institute of Nutrition of Central America and Panama, Washington, D.C.

Van Buul, Frans y Ylse Peralta Resquin. N.D. "Propietarios de tierra: Los grandes establecimientos en la frontera agrícola de Paraguay Oriental." Manuscrito.

Wilson, John F., James Diego Hay, y Maxine L. Margolis. 1989. "The bi-national frontier of Eastern Paraguay." En The Human Ecology of Tropical Land Settlement in Latin America, Debra A. Schumann and William L. Partridge, eds. Boulder: Westview Press.

Zarza, Olga Maria. 1988. "Las ocupaciones de tierras en Paraguay. El lado oscuro de la propiedad privada." Revista Paraguaya de Sociología, Asunción, Año 25, No. 71 (Jan.-Apr.):81-95.

Zoomers, E.B. 1988. Rural Development and Survival Strategies in Central Paraguay. Amsterdam: CEDLA.
----- and J.M.G. Kleinpenning. 1989. "Farm size, land tenure and rural prosperity: Effects of rural development policy on the struggle for land in Central Paraguay." In The Struggle for Land World-Wide, G. Peperkamp and C.H.W. Remie, eds. Ft. Lauderdale: Verlag Breitenback Publishers.

Wenner, Mark (1989). "Signaling of Creditworthiness in Rural Credit Markets: An Analysis of Group Lending in Costa Rica."

Williams, Robert (1986). Export Agriculture and the Crisis in Central America. (University of North Carolina Press).

TABLE 1. SAMPLE CHARACTERISTICS.

Region and Class	Obser-vations	Farm Size	% Informal Tenure*	Labor per Ha	Credit per Ha	Income per Ha	Willingness to Pay for Land
Colonization	**89**	**14.3**	**51.4**	**110.6**	**44.6**	**438.6**	605.4
0-5	19	3.7	80.0	179.6	34.6	527.7	615.6
5-10	30	8.8	50.0	124.7	67.4	400.4	740.6
10-25	26	16.6	34.4	70.1	35.6	448.7	
> 25	9	48.7	44.4	50.8	15.4	348.7	225
Frontier	**123**	**58.9**	**28.0**	**118.4**	**40.5**	**397.8**	1,092.6
0-5	24	3.0	49.5	313.5	9.6	890.1	936.8
5-10	33	8.5	23.9	137.6	28.3	447.5	911.9
10-25	21	18.2	26.3	64.8	26.0	290.8	
> 25	45	144.5	20.3	47.1	72.8	148.7	1,519
Minifundia	**93**	**16.2**	**40.7**	**159.4**	**7.9**	**463.4**	780.9
0-5	38	2.8	65.3	297.7	10.8	713.3	804.4
5-10	19	7.7	30.7	87.5	3.4	360.9	968.4
10-25	22	16.3	21.6	65.8	11.0	197.0	
> 25	14	63.8	17.8	45.3	1.1	163.6	1,033
Total	**300**	**33.2**	**38.5**	**128.9**	**37.5**	**42.2**	

Notes

* Formal tenure means the owner has, or is in the process of applying for, legal title.

** All monetary values reported in thousands of guaranies. At the time of data collection, approximately 1300 guaranies traded for 1$US.

TABLE 2. ESTIMATED RESERVATION PRICE REGRESSION FUNCTIONS.

	Dependent Variable, Logarithm of:	
Explanatory Variables	Reservation Sale Price	Reservation Purchase Price
Colonization		
Constant	6.34*	5.7*
Farm Size	-0.09*	-0.07*
(Farm Size)^2	0.003*	0.002**
(Farm Size)^3	-0.00002*	-0.00001
Age Farmer	0.02*	0.02*
Minifundia		
Constant	6.45*	6.2*
Farm Size	-0.03*	-0.02
(Farm Size)^2	0.004**	0.0003
(Farm Size)^3	-0.00001	-0.000001
Age Farmer	0.004	-0.004
Frontier		
Constant	6.8*	6.2*
Farm Size	-0.03*	0.02*
(Farm Size)^2	0.00008**	-0.0002*
(Farm Size)^3	0.0**	0.000001
(Farm Size)^4	-0.0	0.0*
Age Farmer	0.0001	-0.002
Observations	287	295
R^2	0.28	0.32

* Statistically significant at the 5% level.
** Statistically significant at the 10% level.

TABLE 3. FAMILY INCOME AND SHADOW PRICE OF CAPITAL REGRESSION FUNCTION.

Explanatory Variables	Dependent Variable		
	Family Income	Omitted Variable Family Income	Shadow Price of Capital
Fixed Factors			
Implements	-0.036*	-0.062*	
Cattle	0.197*	0.078	
Family Labor Stock	166	374**	
Credit			
Credit	0.777*		
Credit^2	-0.00001*		
Credit x Farm Size	0.004*		
Credit ^{2} Farm Size	-0.00001*		
Farm Size			
Colonization			
Constant	1092	478	0.773*
Farm Size	155**	213*	0.004
FS^2	-0.903	-1.471	-0.000001
Frontier			
Constant	704	1171	0.714*
Farm Size	256*	146*	0.009*
Farm Size^2	-3.957*	-0.614*	-0.0007*
Farm Size^3	0.020*	0.005*	0.000000*
Fare Size^4	-0.00003*	-0.000009*	
Minifundia			
Constant	-7.966*	-443	0.775*
Farm Size	198*	212*	0.004*
Farm Size^2	-1.037*	-1.02*	-0.00001**
R^2	0.718	0.623	0.683

* Statistically significant at the 5% level.
** Statistically significant at the 10% level.

TABLE 4. REAL LAND PRICE REGRESSION FUNCTION.

Explanatory Variables	Dependent Variables Real Land Price
Common Parameters	
Lot Size	-0.021*
(Lot Size)^2	0.00006*
Title	0.76*
% Forest	-0.65*
Minifundia	
Constant	
Time	7.9*
(Time)^2	-0.52*
(Time)^3	0.026*
	-0.0004*
Colonization	
Constant	
Time	7.9*
(Time)^2	-0.25*
(Time)^3	0.026*
	-0.0004*
Frontier	
Constant	
Time	6.31*
(Time)^2	-0.42
(Time)^3	0.04
(Time)^4	-0.0012
	0.00001
R^2	0.385

* Statistically significant at the 5% level.
** Statistically significant at the 10% level.

TABLE 5. LAND ACCESS TRAJECTORIES (FIXED EFFECT Panel Estimates).

Region and Class	Explanatory Variables				
	Lifecycle Age	(Lifecycle Age)^2	Age x Land Price	Age^2 x Land Price	R^{2***}
Colonization					
0-5	0.81*	-0.01*	-0.008*	0.00002*	0.31
5-10	0.06	0.002	-0.0008*	0.00004*	0.61
10-25	0.13	-0.002	0.0005**	-0.00002*	0.08
> 25	-0.014	-0.003	-0.002*	0.00004*	0.24
Frontier					
0-5	0.51*	0.005	0.00007	-0.00001*	0.25
5-10	0.05	0.02	0.0008**	-0.00003*	0.35
10-25	1.99*	-0.04*	-0.002*	0.00004*	0.17
> 25	7.68**	-0.29*	0.003	0.0001	0.23
Minifundia					
0-5	0.37*	0.0004*	-0.0002	0.000003	0.15
5-10	0.07	0.0005	0.00006	-0.00002	0.09
10-25	0.08	0.002	-0.0007	0.00003	0.25
> 25	2.37**	-0.10*	-0.009*	0.0004*	0.10

Note: * Statistically significant at the 5% level.
** Statistically significant at the 10% level.
*** The R^2 is calculated as the percentage of within farm variation which is explained by the repression.