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ABSTRACT

While unequal land ownership has a role to play in explaining historically high levels of income inequality, this paper asks what role agrarian structure plays in explaining contemporary trends of increasing income inequality. Using a Gini decomposition framework to structure the analysis and drawing on a variety of theoretical, historical and econometric evidence, the paper identifies four linkages or pathways between agrarian structure and income inequality. Panel data estimates of a mixed effects model of income inequality find significant evidence of the 'self-dampening level' and 'legacy effects' of agrarian structure on income inequality. Weaker but provocative evidence is found supporting the notion that agrarian structure conditions the income distribution consequences of contemporary growth through 'exclusionary agrarian growth' and 'unequal human capital accumulation' effects. The paper concludes by noting that, while agrarian asset redistribution is one implication of the paper's findings concerning the linkages between agrarian structure and inequality, another is that policy can attempt to redress the financial market imperfections which seem to underlie the linkages between agrarian structure and the evolution of income inequality.

I CAN AGRARIAN STRUCTURE EXPLAIN INCREASING INCOME INEQUALITY?

New data and the trends revealed by them have helped bring the economic analysis of income distribution in from the cold, to pinch Atkinson's (1997) phrase. Within development economics, the Kuznets (1955) inverted-U hypothesis, which had cooled and crystallized into a stylized fact of textbook orthodoxy, has been challenged anew. Among these newer studies, some show that there simply is no consistent relationship between inequality and growth, inverted-U shaped or otherwise (Li, Squire and Zhu, 1996; Lundberg and Squire, 1998). Others argue that the Kuznets relationship has been buried by a global trend of increasing, persistent, or excess inequality (Cornia, 1999; Lodoño and Székely, 1997). Understanding these new patterns is both an academic challenge, and a matter of policy import. As Lodoño and Székely (1997) stress, understanding the 'surprises' of contemporary income distribution dynamics is vital in economies where high inequality calls into question the economic desirability and political legitimacy of the liberal policy regimes of the last two decades.

If new policies are justified,[1] designing them requires a sharper understanding of the factors that underlie the contemporary trends in income inequality. Land ownership inequality (agrarian structure) is one factor that has been traditionally taken to explain high *levels* of income inequality (especially in the lower income economies of the 1950's and 1960's where the agricultural sector predominated). But does agrarian structure have any role in explaining contemporary *trends* in income inequality? An affirmative finding might seem to indicate the appropriateness of policies to redistribute land, as Deininger (forthcoming) advocates.

But it may also be that any contemporary impact of agrarian structure on income inequality takes place indirectly by conditioning the distributive consequences of economic growth, both agricultural and non-agricultural. This

[1] The literature on income inequality has unfortunately paid little attention to distinguishing destructive from productive inequality. As described by Sheehan and Iglesias (1998), productive inequality results from the desirable operation of a socially legitimate incentive system that, say, encourages people to forgo income now in order to invest in education. Destructive inequality, on the other hand, reflects the operation of an economy in which some people are excluded from the opportunity to invest and otherwise to participate in the benefits of growth. Whether contemporary income inequality increases are economically costly and warrant policy remediation would seem to depend critically on the extent to which trends in aggregate inequality reflect increases in destructive or productive inequality components.

paper conceptualizes and empirically explores two such indirect mechanisms: exclusionary agrarian transitions and household human capital accumulation failures. If it is through these indirect mechanisms that agrarian structure has its effect, then the array of new, ameliorative policy responses broadens beyond land redistribution to include measures that operate on these mechanisms.

Section 2 below begins the paper with a conventional income inequality accounting or Gini decomposition framework. Among other things, this decomposition provides a convenient vehicle to review the economic theory of the inverted-U, the assumptions under which it could be expected to hold and, by implication, the likely reasons for its failure to hold in the contemporary world. This framework also makes clear that the *direct* explanatory power of land ownership inequality should diminish with the reduction in the share of national income generated in the agricultural sector.[2] These direct effects of agrarian structure on income inequality should thus be diminishing rapidly over time in those countries of Asia and Latin America where the weight of the agricultural sector in the overall economy has fallen off dramatically.

Figure 1, however, suggests a more complicated scenario. Each of the four panels pools together by decade the observations from an augmented Deininger and Squire (1996) dataset for which initial (~1965) agrarian structure data are available. The lines that are drawn in each panel show the estimated OLS relationship between the Gini index for income inequality and the Gini index for land ownership concentration. The curves are non-parametric kernel estimates using cross-validation to select the optimum bandwidth.

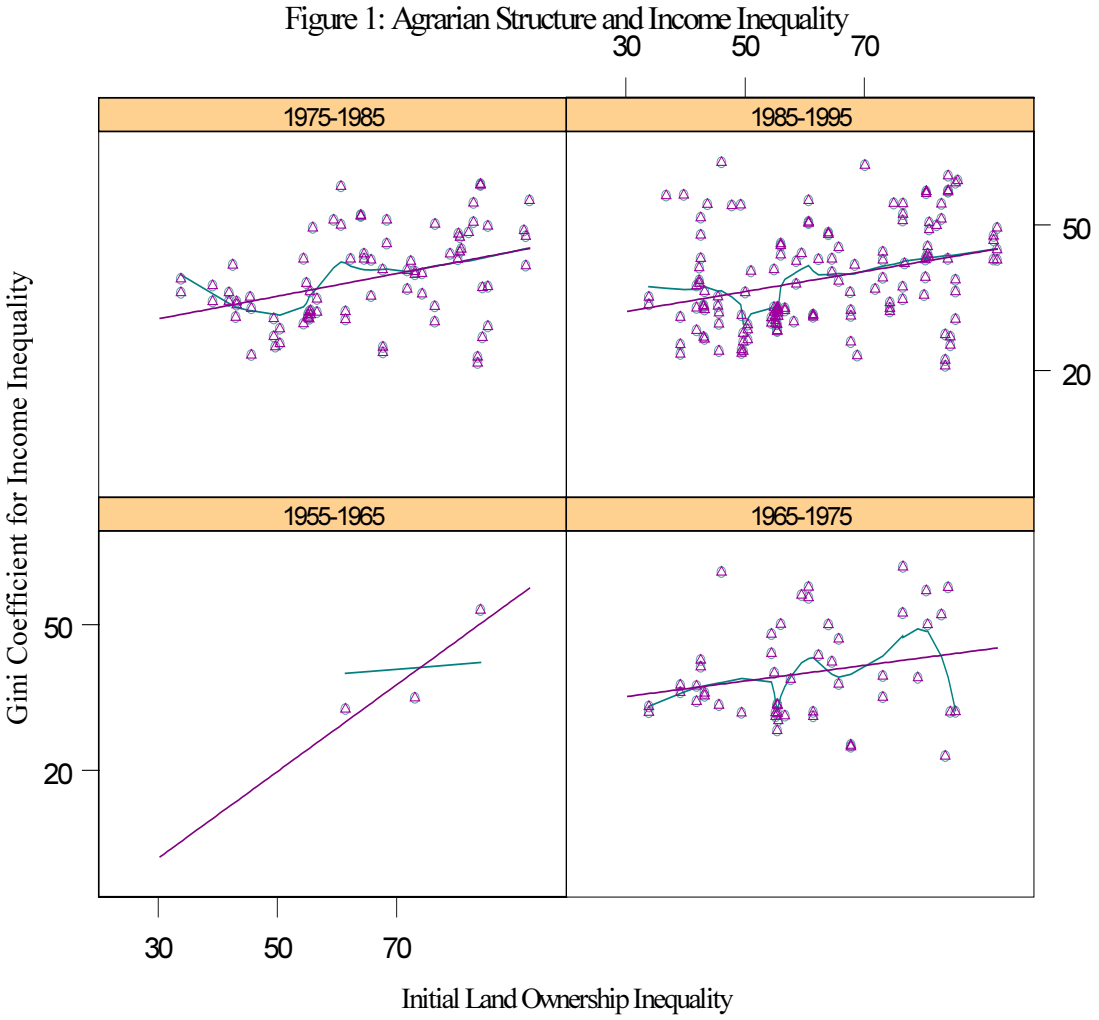
Surprisingly, the data for the last decade (1985-95) show almost exactly the same statistically significant relationship as that for the earlier time periods. While there could of course be a myriad of factors that underlie the observed association, the failure of agrarian structure to wither away as an explanatory variable is provocative.

The notion that agrarian structure has deeper effects on economic performance is supported by recent empirical work that finds that land ownership inequality retards the rate of economic growth. Deininger and Squire (1998) and Deininger and Olinto (1999) find that the same initial land ownership inequality measure used in Figure 1 statistically explains subsequent rates of economic growth, even when panel data methods are used to control for

[2] Agrarian structure could continue to exhibit a spurious statistical association with income inequality if it is correlated with inequality in the holding of industrial assets, as subsection 2.2 discusses.

country heterogeneity. These authors argue that land ownership inequality creates low and insecure incomes for the rural poor, thereby retarding human capital accumulation and growth. These same mechanisms could also buttress high and potentially increasing levels of income inequality over time, creating what Birdsall, Ross and Sabot (1995) call a vicious circle of growth and inequality.

FIGURE 1
AGRARIAN STRUCTURE AND INCOME INEQUALITY



Building on the Gini decomposition framework, Section 2 draws on empirical and theoretical work about the nature of agrarian growth and transformation in the contemporary world. This paper hypothesizes that land ownership inequality can have continuing and perhaps increasing effects on income inequality because it can create exclusionary patterns of growth that deepen inequality over time. At the same time, these income distribution consequences

of exclusionary growth are potentially magnified via their impacts on the accumulation of human and physical capital by the least well off members of society. The role of these secondary effects in the explanation of contemporary income distribution dynamics is of course an empirical question.

Section 3 develops an econometric approach for answering this empirical question. Flexible estimation methods based on random coefficients or mixed effects models are employed to test for the effect of agrarian structure on income inequality. Section 4 summarizes the paper by considering the implications for policy both inside and outside the agricultural sector.

II DECOMPOSING THE EFFECTS OF AGRARIAN STRUCTURE ON INCOME INEQUALITY

As a basis for discussion of household income distribution, consider the following disaggregation of total income for a household, *k*, in country, *i*, in period, *t*:

$$(1) \quad Y_{kit} = Y_{kit}^{A} + w_{it} L_{it} + s_{it} H_{kit} + r_{it} K_{kit},$$

where Y_{kit}^{A} is agricultural income and L_{kit}, H_{kit} and K_{kit} are stocks of non-agricultural factors of production (unskilled labour, skilled labour or human capital, and physical capital) that are rewarded with factor payments, w_{it}, s_{it} and r_{it}, respectively. While in practice it may be difficult to separate the returns from land and labour in agriculture, agricultural income can in principle be further disaggregated into returns from land and returns from labour:

$$(1') \quad Y_{kit} = [\tilde{p}_{kit} T_{kit} + \tilde{w}_{kit} F_{kit}] + w_{it} L_{it} + s_{it} H_{kit} + r_{it} K_{kit}$$

T_{kit} is the stock of land, $\tilde{p}_{kit}$ its rental price or shadow rate of return. F_{kit} is the stock of farmworkers, and $\tilde{w}_{kit}$ is the (shadow) value of agricultural labour, including labour which is self-employed on owner-operated production units.

The Gini coefficient[3] for income inequality in country, *i*, in period, *t*, can be decomposed as follows:

[3] The Gini coefficient has a number of well-known weaknesses as a measure of income inequality. It is used here because of the analytical convenience of its decomposability, as well as the empirical availability of Gini measures. Subsequent analysis should more

(2) $G_{it} = \phi_{it}^{A}\widetilde{G}_{it}^{A} + [\phi_{it}^{H}\widetilde{G}_{it}^{H} + \phi_{it}^{K}\widetilde{G}_{it}^{K} + \phi_{it}^{L}\widetilde{G}_{it}^{L}]$,

using expression (1) for household income, or as

(2′) $G_{it} = [\phi_{it}^{T}\widetilde{G}_{it}^{T} + \phi_{it}^{F}\widetilde{G}_{it}^{F}] + [\phi_{it}^{H}\widetilde{G}_{it}^{H} + \phi_{it}^{K}\widetilde{G}_{it}^{K} + \phi_{it}^{L}\widetilde{G}_{it}^{L}]$

using expression (1′). Terms of the form ϕ_{it}^{j} are the shares of income type *j* in total GDP, and the $\widetilde{G}_{it}^{j}$ are the pseudo-Gini coefficients for income type *j*.[4] Note further that the pseudo-Ginis can be rewritten as:

(3) $\widetilde{G}_{it}^{j} = \rho_{it}^{j} G_{it}^{j}$,

where G_{it}^{j} is the true Gini for income of type *j* and ρ_{it}^{j} is the rank order correlation between households' rank in the overall income distribution with their rank in the distribution of type *j* income. Note that the ϕ_{it}^{j} factor shares define the functional income distribution, while the pseudo-Ginis measure the endowment or asset inequality that is necessary to map functional income distribution into household income distribution.

As subsection 2.1 now explores, the Kuznets hypothesis of an inverted-U shaped relationship between income inequality and national income was largely rationalized in terms of a theory of the ϕ_{it}^{j}, the functional income distribution, while making rather strong assumptions on asset inequality, the G_{it}^{j}.

2.1 Asset inequality and the dual economy theory of income distribution dynamics

While earlier decades saw much debate concerning the merits of classical dual economy models (rooted in Lewis, 1953) versus neoclassical dual economy models (rooted in the work of Jorgenson, 1961), Taylor (1979) neatly demonstrates that basic models of both types have very similar income distribution implications. Both models predict that, in an initially poor rural economy, sustained capital accumulation and growth will bring a long period of

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carefully think through the appropriateness of the Gini measure for the questions being addressed here.

4 The pseudo-Gini for income of type *j* is the Gini index that results when the Lorenz curve for income type *j* is constructed by placing people in rank order according to their position in the overall income distribution, not their position in the distribution type *j* income (*e.g.*, see the discussion in Fields 1980).

constant or near-constant real wages for (unskilled) labour. In the classical models that assumed an institutionally fixed real wage, the reason for the trajectories of factor shares is obvious. In the neoclassical variants, which assumed an economically endogenous market-clearing wage, diminishing returns to capital would seem to imply that rapid capital accumulation would immediately shift income distribution in favour of labour. However, in the dual economy context, the shift from an agricultural to an industrial economy postpones the setting-in of diminishing returns to capital and generates increasing inequality in the factor distribution of income.

As a result of the constancy of the real wage in the face of economic growth, the income share of capital (ϕ_{it}^{K} in expression 2 above) and inequality in the functional income distribution (measured, say, as $\phi_{it}^{K}/\phi_{it}^{K}$) rise. Both models do eventually reach a turning point, after which the real wage rises and (assuming inelastic capital-labour substitution in industry) the capital share, ϕ_{it}^{K}, and functional income inequality fall, creating an inverted-U shaped dynamic in the *functional* income distribution.

However, moving from this dual economy theory of functional income distribution to a theory of household income distribution requires information about asset distributions (the $\widetilde{G}_{it}^{j}$ in expression 2 above).[5] Given the complexity of asset distributions and the intertemporal choices that underlie them, it is not surprising that the dual economy literature relied on highly simplified assumptions. With the exception of a few highly disaggregated CGE models, the dual economy literature assumed a simple polarized class structure persistent over the course of growth, whereby the few capitalist households own and mechanically accumulate all capital, while the numerically preponderant proletarian households[6] own only their labour such that:

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[5] Also underlying the dual economy literature is a number of stark assumptions about technology and trade. In this literature, production technologies are typically modeled as constant returns to scale, with inelastic factor substitution in the industrial sector. Consistent with growth theory of the era, technology was exogenous and unbiased. Kelly, Williamson and Cheetham (1973), for example, show that exogenous technological change biased against labour will, if too high, defeat the Kuznets curve.

In addition, the dual economy literature was largely a closed economy literature, and the returns to capital and labour were among those prices presumed to be set in the domestic economy. Factor shares were driven by domestic stocks of capital and labour, and the technological assumption of inelastic substitution between capital and labour in production (in at least one sector of the economy) meant that the returns to rapidly accumulated capital would eventually fall fast enough to shift functional income distribution.

[6] Note that these households are proletarian in the true meaning of the term as they serve the system only by bearing children-workers.

(4) $\widetilde{G}_{it}^{K} \approx 1 \forall t$, and,

(5) $\widetilde{G}_{it}^{L} \approx 0 \forall t$.

In his textbook analysis of income distribution in dual economy models, Taylor (1979) effectively assumes that agricultural income (labour and land rental) is distributed in an egalitarian fashion:

(6) $\widetilde{G}_{it}^{A} \approx 0 \forall t$.

More generally, at least implicit assumption in the literature seems to be the assumption that the land ownership distribution is static, such that:

(6′) $\widetilde{G}_{it}^{T} \approx \overline{G}^{T} \forall t$.

As discussed below, this assumption hides connections between land ownership distribution and factor use and shadow factor prices ($\widetilde{w}_{kit}$ and $\widetilde{p}_{kit}$) in agriculture.

While assumption (4) is at least a defensible simplification for physical capital, it makes little sense as an assumption about human capital (no slavery). While the classic dual economy literature ignored human capital (or, equivalently, subsumed it with physical capital), human capital does of course matter, and, importantly, its distributional dynamics cannot be adequately captured by a simple analogue assumption, either (4), or (5). Indeed, as the discussion in 2.3 below details, the dynamics of $\widetilde{G}_{it}^{h}$ are likely to be influenced by agrarian structure.

In addition, assumption (6) (or 6′) rules out a number of dynamic processes that are potentially relevant to the trajectory of income distribution. In classical and neoclassical models, the rural economy faithfully reproduces a stable reservation wage or living standard for the rest of the economy (that is, $w = \widetilde{w}$), generating what might be termed an 'inclusionary' agrarian transition. In the classical model, this result flows from the assumption of a socially embedded, pre-capitalist rural economy that guarantees all workers not demanded by the industrial economy a place and a subsistence standard of living. In the neoclassical model, the assumption of a simple Walrasian labour market (to use the language of Bowles, 1985) assures that all workers are absorbed by the rural sector pending expansion of urban-industrial labour demand. Assumed away in these models is any process of institutional instability (such as that

described by Collier *et al*., 1976, or Scott and Kerklievett, 1975), or intrinsically imperfect rural factor markets that make labour demand and the reservation living standard a function of agrarian structure and make agrarian structure itself subject to independent, economically relevant dynamics. Violation of either assumption creates the prospect for exclusionary transitions and additional avenues by which the land ownership distribution may shape income inequality.

However, before a discussion of ways in which agrarian structure may continue to shape the ongoing nature of agrarian growth (subsection 2.3) and human capital accumulation (2.4), the next section considers some direct impacts of agrarian structure on income inequality.

2.2 Level and legacy effects of agrarian structure on inequality in the industrializing economy

While the previous subsection discusses the income distribution implications of the dual economy literature, that literature's original *raison d'être* was to explore the transformation of a 'traditional' agricultural economy into a 'modern' industrial economy. On the empirical side, the work of Hollis Chenery (*e.g.*, Chenery and Syrquin, 1973) documented this transformation, including the statistically regular withering away of agriculture as the predominant economic sector.

As is apparent from expression (2) above, the collapse of ϕ_{it}^{A} toward zero will make the level of agricultural inequality irrelevant from the perspective of overall income inequality in the industrializing economy. While a highly unequal agrarian structure (high G_{it}^{T} and $\widetilde{G}_{it}^{A}$) will have a large effect in a predominately agrarian economy,[7] the direct inequality effect of a given level of agrarian inequality will eventually wither away with ϕ_{it}^{A}. In the following analysis, this direct impact of agrarian structure on the aggregate level of inequality will be called the *self-dampening level effect*.

While this direct level effect will wither away, a bivariate statistical association between agrarian structure and income inequality could remain as a legacy of agrarian inequality (as in Figure 1) if a highly unequal agrarian structure translates into a highly unequal initial distribution of industrial assets, $\widetilde{G}_{it}^{K}$. If new industrial assets were acquired in proportion to agricultural assets, then

[7] Note that, when ϕ_{it}^{A} approaches 1 and agricultural income comprises nearly all of national income, then by definition ρ_{it}^{A} will also approach 1.

such an outcome would be likely. Indeed, the correlation between $\widetilde{G}_{it}^{K}$ and G_{it}^{T} would be further strengthened if an existing agrarian oligarchy is able to maintain its political power and reserve for itself new opportunities in the growing industrial economy. The popular portrayal of the economies of Central American (*e.g.*, El Salvador and Nicaragua) as dominated by just a few oligarchic families (who control both agricultural and industrial wealth) illustrates this correlation.

In this case, any relationship between agrarian structure and income inequality that survived the withering away of the agricultural share of GDP would be a spurious reflection of the initial relationship between agrarian and industrial asset ownership. Agrarian structure may have mattered for initial industrial asset inequality, but further intervention in agrarian asset ownership would not undo the concentration of industrial asset ownership or otherwise ameliorate income inequality.

However, it is not logically apparent that there should be a strong correlation between agrarian and industrial asset inequality, or that any persistent relationship between agrarian structure and income inequality is spurious. A strong correlation between agrarian and industrial asset inequality would seem to require highly imperfect financial markets such that only those families with strong initial wealth conditions are able to successfully accumulate. Subsection 2.3 below in fact considers the operation of this mechanism in the context of human capital accumulation, arguing that initial agrarian inequality will map into low and unequally distributed human capital accumulation.

However, for physical capital, the requisite financial market imperfections seem much less likely to be important. Indeed, history abounds with counterexamples to the notion that a unified oligarchic interest creates a pathway between agrarian and industrial asset inequality. The most notable of these counterexamples is the 19th century UK debate over the Corn Laws that pitted the old agrarian elite against the new industrial interests.

Closer in time, the political theory of land reform in Latin America in the 1960s was pinned on the notion that agrarian industrial asset correlation was low, such that the new industrial elite could be enlisted as allies against the rural elite in the battle for land reform. Land reform advocate Peter Dorner's 1965 open letter to the Chilean agrarian elite captures this notion with its portrayal of a politically insurmountable peasant-capitalist alliance that can, out of self-interest, overcome agrarian elite opposition to land reform (Castillo and Lehman, 1983, quote Dorner's letter at length).

In the end, with the exception of a few, modestly industrialized economies, it seems hard to believe that land ownership inequality will persistently influence income inequality through the correlation between agrarian structure and inequality in the distribution of industrial assets. However, absent detailed country-specific historical inquiry and given the paucity of data on asset ownership, the statistical analysis later in this paper will remain subject to the caveat that its results are possibly a spurious reflection of the correlation between agrarian structure and industrial asset inequality.

2.3 Exclusionary agrarian growth and land ownership inequality

The historical experience of growth in Latin America's highly unequal agrarian economies contrasts with the dual economy portrayal of a stable rural sector that absorbs available labour at a constant real wage rate. In these economies, growth has often taken an exclusionary form, meaning that it has displaced peasants and tenants, prematurely mechanized the agrarian economy and reproduced or even deepened rural inequality (*e.g.*, see Williams 1985).

The term 'exclusionary growth' emerged in the empirical literature as a way to describe a growth process in which small-scale agricultural producers are displaced and the successor farm units respond to a different set of shadow factor prices such that the sector itself becomes labour-displacing. In terms of inequality decomposition in equation (2), exclusionary growth implies increasing inequality in the distribution of agricultural income, $\widetilde{G}_{it}^{A}$. This trend would offset at least in part the tendency for the agricultural income distribution to matter less for aggregate inequality as the agricultural share of GDP falls. The goal of this section is briefly to review some of the theoretical and empirical literature that suggests that exclusionary growth is (a) possible and (b) more likely in economies characterized by unequal land ownership.

A number of authors have attributed the history of exclusionary agrarian growth patterns to a pernicious political economy that subsidized capital for the rich and depressed prices for labour-intensive exportables (see especially de Janvry and Sadoulet 1993; Binswanger, Feder and Deininger, 1996). However, since the early 1980s, agricultural development policy has followed the general trend toward development liberalism, forcefully swinging toward *laissez faire* throughout the developing world, changing relative prices and opening up new markets and opportunities. Liberal policies have not always brought the increase in growth expected from them,[8] but, when they have spawned growth,

[8] The failure of agrarian liberalization to generate expected agricultural growth in some cases can be attributed to the failure of policies to generate stimulative market-level price

the question has often been raised of whether the newly induced growth is exclusionary, deepening existing inequality in undesirable and socially problematic ways.

De Janvry and Sadoulet (1993) argue that, while post-liberalization growth is at least potentially more inclusive of the poor so that growth will be relinked with poverty reduction (and diminished inequality), they also recognize that various constraints may prevent this happy outcome. In Latin America, countries that have vigorously and successfully pursued liberal, export-oriented agrarian growth strategies present a heterogeneous profile (Carter, Barham and Mesbah, 1996).[9] In some cases, growth has been broadly based and inclusive of small farmers and the rural resource poor. In others, the trajectory of growth has been narrow (based on a subset of wealthier producers), decidedly exclusionary, and socially problematic in the sense that it spills over through land and labour markets and negatively influences other individuals.

While sector-specific inequality data are scarce, the compilation of Eastwood and Lipton (2000) of the available measures reveals that rural inequality generally increased in the 1980s and 1990s in Asia, Latin America and perhaps Africa.[10] Additional evidence concerning the exclusionary nature of agrarian growth comes from a time-series econometric study by de Janvry and Sadoulet (1996). They find that agrarian growth in Latin America is historically associated with sharply increasing rural inequality and that the association between agrarian growth and increasing rural inequality has been even stronger during recent post-liberalization growth spells than it was during earlier periods of growth. The increase in inequality has not been so sharp as to increase rural poverty in the wake of agrarian growth, but it has clearly blunted the potentially positive impact of growth on rural poverty, as de Janvry and Sadoulet analyse in some detail.

Because the evidence of de Janvry and Sadoulet is on Latin America, it is hard to know whether the patterns they identify reflect on agrarian growth in general

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signals to producers (see Barrett and Carter, 1999) or to farm-level constraints *uniformly* blocking a positive supply response (Lipton, 1993).

9 Carter, Barham and Mesbah (1996) summarize the results of coordinated micro studies of agrarian growth booms in Chile, Guatemala and Paraguay. In two of the three cases (Chile and Paraguay), rapid growth brought increasing inequality in assets and probably in incomes. In Guatemala, the distributional outcome appears to have been much more favourable for low-wealth people.

10 Increasing rural inequality is one of the trends that Eastwood and Lipton hypothesize will offset the effect of diminished intersectoral inequality that liberalization can be expected to bring.

or on agrarian growth in environments of high land inequality. Evidence supporting the latter interpretation is found in a study by Ravallion and Datt (1995). In their analysis of income distribution and growth across Indian states, Ravallion and Datt find that agrarian growth in most states is more strongly associated with reduced poverty and inequality than is growth in other economic sectors. In other words, in most states agricultural growth appears to be inclusive of the poor. However, the exception to this pattern is the state of Bihar, the Indian state with the sharpest, near Latin American level of land inequality, where agrarian growth appears to be exclusionary relative to urban growth and is not associated with diminished inequality and poverty.

From a theoretical perspective there are reasons for thinking that the loose empirical association between exclusionary growth and land inequality is not accidental. Assuming that technology is constant in returns to scale, all producers great and small would pursue identical resource allocation and production strategies in a world of full and complete markets. Growth booms occasioned by new prices, technologies or markets would not be based on or biased against any particular wealth class of producers.

However, because of the spatially dispersed, biologically based and stochastic nature of agricultural production processes, information asymmetries are likely to be especially problematic in rural areas. Hired labour, for example, is likely to be costly to supervise, implying that the labour market may reach an unemployment equilibrium with a wage above the Walrasian market clearing level (the higher wage and the threat of unemployment create work incentives). Among other things, this sort of labour market equilibrium will imply that family labour will be economically cheaper than hired labour. In addition, the sorts of information costs which make rationing in credit markets likely (see earlier) apply with particular force to loans to small-scale farmers, especially in high risk environments (see Carter, 1988).

Finally, the difficulty of distinguishing the effects of bad luck (*e.g.*, localized weather disaster or bird damage) from the effects of sloppy effort and management would make insurance contracts costly to enforce.[11] In the actually existing world of asymmetric information and intrinsically imperfect

[11] Of course events such as generalized flooding or drought would be easy to observe for an insurance provider. However, the fact that there are generalized (or covariate) risks means that farmers form a bad and costly group for insurance purposes, rather like a group of individuals seeking cancer insurance when it is known that all group members will contract the disease at the same time. Binswanger and Rosenzweig (1986), for example, catalogue the impact of these information problems on the systematic imperfections and absence of numerous key markets in rural economies.

and missing markets, a producer's specific endowment of family labour, savings and risk-bearing capacity is likely to shape and distort economic behaviour. The more unequally distributed these endowments are, the more likely it becomes that growth will be exclusionary, with different groupings or classes of producers responding differently to apparently identical market or technological opportunities.

Systematic analysis of agrarian economic performance in the context of actually existing market imperfections highlights numerous issues about the growth and income distribution impacts of agricultural liberalization. In basically egalitarian economies (for example, much of sub-Saharan Africa), economic liberalization may have modest growth effects if price liberalization magnifies price variability even as it improves average farmgate prices. As analysed by Barrett (1996) and Barrett and Carter (1999), the mixed (across countries and sectors) and often disappointing record of agricultural liberalization in Africa may reflect the microeconomic naivete of a policy regime designed around the presumptions that markets are full and complete. Improved agricultural growth will likely require a mix of ancillary, activist policies to complement the putatively stimulative signals induced by market liberalization and exchange rate realignment. It may be that evidence on increased rural inequality in Africa reflects a reality in which only a small subset of producers have actually been able to respond at all to agricultural liberalization.

In inegalitarian economies (for instance, those of Latin America and parts of southern Africa), liberalization may be more likely to spawn rapid growth, but there are two fundamental breakdowns that may distort the income distribution consequences. First, production behaviour is likely to vary systematically across wealth-based classes of producers, with low-wealth producers behaving like prototypical peasants (pursuing labour-intensive, conservative and non-commercial production strategies) and high-wealth producers behaving like entrepreneurial capitalists (see Eswaran and Kotwal, 1986; Carter and Zimmerman, forthcoming). In this circumstance, new economic opportunities may become differentially stimulative across classes, making possible the sorts of class-based growth booms referenced earlier.

Second, in addition to this sort of static differentiation in production behaviour, dynamic land and asset accumulation strategies can also systematically differ across classes in actually existing market economies. When producer classes pursue distinct production strategies they are likely to value land and other assets differentially and exhibit differential competitiveness in asset markets. To the extent that land markets are well integrated, those producers positioned

competitively to accumulate land will generate upward pressure on asset prices which spills over and affects the land access of less competitive producers.[12] Microeconometric analyses of recent export booms in Guatemala and Paraguay indicate that differential production strategies have spilled over into distinctive class-based patterns of land accumulation. In addition, the decisions about how much to save and how to allocate savings across risky (land) and less risky (grain stores) assets become class-differentiated to the extent that the market economy has less than the full suite of Arrow-Debreu contingency markets. Thus, for example, low-wealth agents may find it entirely rational to devote their modest savings to low-return assets (*e.g.*, grain stores which yield a negative rate of return) even as their current production is sharply capital-constrained and their land base meagre (for example, see the theoretical analysis in Zimmerman and Carter, 1999).

Together, the various possibilities of differentiated production and accumulation strategies suggest that the process of agrarian growth and transformation in actually existing market economies can be an unsteady one and one in which initial levels of inequality are reproduced and deepened by a growth process. Such possibilities introduce the question of the degree to which the trajectory of agrarian growth itself becomes a function of the initial asset distribution in the agrarian economy. Can the relatively egalitarian growth paths of East Asian economies be understood as partially the result of their relatively equal initial distribution of land, as opposed to the continuing reproduction of inequality which has characterized agrarian growth throughout much of Latin America?

Another question concerns the breadth of asset inequality that is required to generate differentiated behaviour. Hence, while the range of agrarian asset inequality in much of West Africa appears narrow, econometric work suggests that, in these non-irrigated environments, the degree of risk faced by producers across that seemingly narrow range is broad enough that it could motivate sharply different production and accumulation strategies in a world of imperfect markets (Carter, 1997).

In summary, while the level effect of unequal agrarian structure on income inequality is indeed self-dampening, it cannot be concluded that agrarian inequality is directly irrelevant to contemporary trends of increasing income inequality. Exclusionary agricultural growth—a prospect overlooked in the

[12] Lachmann's (1987) analysis of the English enclosure identifies increasing land rents as a key factor which displaced and proletarianized the small farm class which was ill positioned to participate in the more remunerative activities which were driving the land price increase.

classic dual economy literature—will work to offset the dampening effect of a diminished agricultural share of GDP in the industrializing economies of Asia and Latin America. In the more highly agricultural economies of sub-Saharan Africa, Central America and parts of Asia, exclusionary growth implies that the agricultural sector will become an increasingly important part of overall income inequality.

2.4 Agrarian structure and unequal human capital accumulation

A number of microtheoretic studies have begun to explore the proposition that intertemporal borrowing constraints and other capital market imperfections can create a link between the initial distribution of wealth and the level and distribution of the human capital that is subsequently accumulated (see for example Lunqvist, 1994; Chiu, 1998; Checchi, 2000). This section summarizes the two-period model developed by Carter, Yao and Deininger (2000) to highlight the investment and portfolio problems that confront rural households. The model explicitly establishes linkages between agrarian structure and the dynamics of growth, human capital accumulation and income distribution.

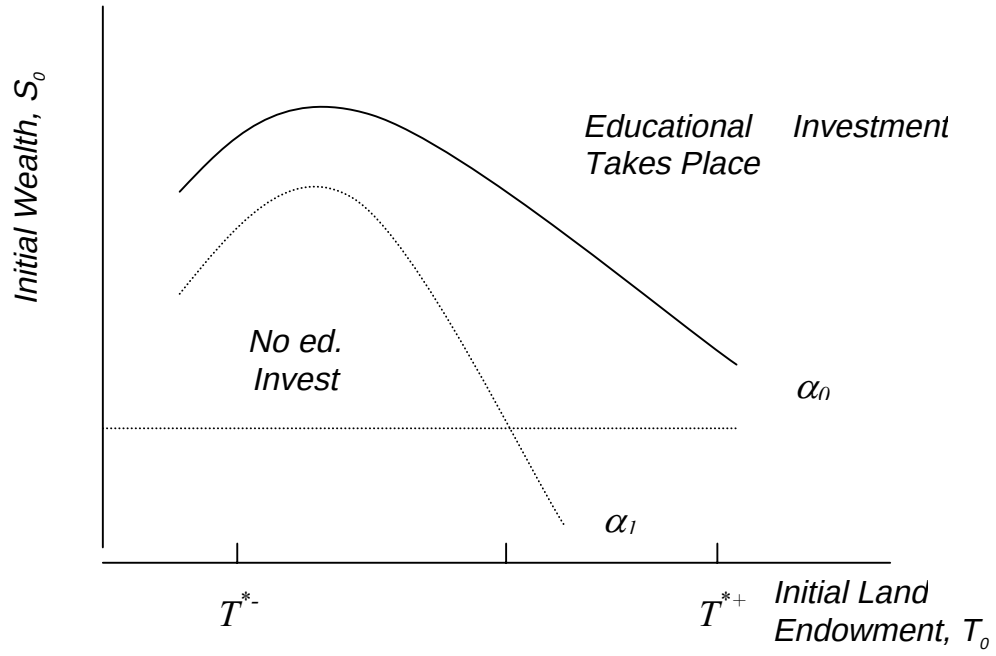
Rural households in the Carter, Yao and Deininger model are endowed with different amounts of land, financial wealth and family labour. In the first period of this model, households use their resources to generate income in the agrarian economy and must then decide how to allocate that income among consumption, precautionary savings, investment in education and investment in agricultural capital. Returns to education occur in the second period and are uncertain. Educational investment has a fixed cost component, and both agricultural and educational investments are irreversible and cannot be sold or cashed in during the second period.

As they make these first period choices, households know that they face the risk of a second period 'marginal utility shock' in the form of increased consumption needs (or decreased work capacity). Financial markets are assumed to be imperfect. Households face intertemporal borrowing constraints (*i.e.*, they cannot use second period earnings to finance first period investments). They also do not have access to insurance and must be prepared to deal autarchically with adverse shocks.

In summary, as households contemplate investment in agriculture versus investment in education, they must not only be able to finance investment costs up front, they must also maintain a savings-investment portfolio that will permit them to manage shocks and survive if the educational investment does not pay off.

Because a household's initial endowments of land and financial wealth impinge on both its self-finance and its self-insurance capacities, a household's decision whether to invest in education will vary systematically over the space of these initial endowments. Assuming decreasing absolute risk aversion, the initial land-money endowment space (T_0, S_0) can be partitioned as shown in Figure 2 into endowment combinations where households optimally choose to invest in education and those where they do not.

FIGURE 2
ENDOWMENT SPACE AND HUMAN CAPITAL INVESTMENT UNDER RISK AND INTERTEMPORAL BORROWING CONSTRAINTS



The solid line in Figure 2 shows, for an initial level of agricultural productivity (α_0), the locus of initial endowments for which the household would be exactly indifferent whether to invest in education or not to invest in education.[13] Households with endowment positions above that locus will invest in education; those below it will not.

As drawn, the indifference locus will initially slope upward because, as household land endowment increases from zero, it creates a competing demand

[13] For Figure 2, other endowments are held at some constant level, and all households are assumed to face an identical risk distribution, technologies, etc.

for funds to invest in agriculture, and a greater amount of liquidity is needed before educational investment will occur.[14] At the same time, as land endowment increases, first period income will increase, creating a larger pool of liquidity to allocate between consumption and the various savings and investment opportunities. In addition, as land endowment increases, second period income and self-insurance capacity rises. Beyond some critical land endowment level, the indifference locus will begin to slope downward as shown.

The dashed line in Figure 2 portrays the shift in the educational investment indifference locus as agricultural productivity increases from α_0 to α_1. The increase in agricultural productivity will in general decrease the amount of financial wealth needed for a household to engage in education, as shown. The decrease and the shift in the indifference locus are relatively larger for households with larger amounts of land.

We are now in a position to discuss the impact of agrarian structure on educational investment in this model.

Land ownership inequality ($\widetilde{G}_{it}^{T}$) will thus have several critical effects on the nature of the relationship among growth, human capital accumulation and income distribution. To keep matters simple, assume that all households have the same initial endowment of education, that they all have an initial money endowment of S^* (shown in Figure 2), and that the per-capita land stock, T^*, is distributed in an egalitarian fashion (*i.e.*, all households would have an initial land endowment of T^*). Under this egalitarian scenario, as exogenous agricultural growth pushes agricultural total factor productivity to α_1, all households would invest in human capital. Inequality in human capital asset distribution ($\widetilde{G}_{it}^{H}$) would remain unchanged, and there would be no change in overall income inequality.

In contrast to this egalitarian scenario, growth will have unequalizing effects when there is inequality in the initial land ownership distribution. First, note that land ownership inequality means that some households will find themselves with endowments above T^* (say between T^* and T^{*+}), and others below that amount (between T^{*-} and T^*). Following agricultural productivity growth to α_1, wealthier households will accumulate human capital and experience relatively large income growth driven by both their larger, now

[14] Note that because of the fixed costs of educational investment, small amounts of educational investment will never be chosen.

more productive land holdings and their ability to reap the high returns to human capital. In contrast to the egalitarian scenario, both human capital asset inequality and income inequality increase with growth. Note further that aggregate human capital accumulation is suppressed, suggesting that the returns to the unequally held human capital remain high.[15] Finally, note that non-agricultural growth that boosts returns to human capital may also result in unequal human capital accumulation that deepens inequality and affects human capital decisions. As in the latter case, agrarian structure will condition the income distribution consequences of growth.

In summary, we see that in a world of imperfect financial (capital and insurance) markets, the distribution of land may indirectly influence the distribution of income by conditioning the inequality in the distribution of human capital, as well as the amounts and scarcity price of human capital. The reach of agrarian structure can thus extend well beyond the agricultural sector itself.

While there has been little direct empirical examination of this proposition, its implications are entirely consistent with the corpus of work assembled by Nancy Birdsall (*e.g.*, Birdsall, Ross and Sabot, 1995) that emphasizes the consistently low and unequal rates of human capital accumulation in Brazil (where agrarian structure is highly unequal) versus East Asian countries like Korea and Taiwan that grew from an egalitarian agrarian structure along a growth-with-equity path marked by extremely high rates of human capital accumulation.

III ECONOMETRIC ANALYSIS OF THE IMPACT OF AGRARIAN STRUCTURE ON THE INCOME DISTRIBUTION CONSEQUENCES OF GROWTH

The analysis in the previous section hypothesizes four linkages between land ownership inequality and income inequality:

1. *Conventional, but self-dampening level effect*
   A given level of land ownership inequality will have an effect on the initial level of income inequality. However, this direct level effect is dampened over time as the share of agricultural income in GDP falls.

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[15] Bourguignon (1998) emphasizes the importance of this general equilibrium quantity effect in his analysis of inequality in Taiwan.

2. *Persistent but spurious legacy effect*
   To the extent that a high level of agrarian inequality spills over and creates an unequal distribution of industrial assets that persists over time, the statistical relationship between income inequality and agrarian structure may continue. While such a persistent effect seems unlikely, it would be a spurious reflection of this past relationship between agrarian structure and initial industrial asset distribution rather than an indication of a direct agrarian structure effect that could be exploited to impact current income inequality.

3. *Exclusionary agrarian growth effect*
   There is historical, empirical and theoretical evidence that land ownership distribution can become less equal as growth occurs. Again, while the evidence is still tentative, such exclusionary effects seem most likely to emerge in environments of high initial asset inequality. Less equal land ownership distributions are themselves more likely to result in reduced labour absorption and hence a lower reservation wage/living standard floor for the entire economy. Together, these considerations suggest that high levels of initial land ownership inequality may translate into agrarian growth that deepens income inequality over what it otherwise would be. While the aggregate inequality effects of a given level of agricultural inequality will diminish over time, this exclusionary growth hypothesis suggests that this dampening effect is offset by increasing agricultural inequality.

4. *Unequal human capital accumulation effect*
   At high levels of land ownership inequality, both agricultural and non-agricultural growth may result in unequal human capital accumulation that deepens inequality in the distribution of human capital and overall income inequality. As with the second hypothesis, the impact of growth on income distribution is conditioned by agrarian structure. By conditioning the income distribution consequences of non-agricultural growth, agrarian structure may have real and durable effects on aggregate income inequality.

While each of these hypotheses could potentially be explored with direct structural models, the approach here will be to specify a simple, reduced form framework that permits us to identify the conditioning effect of land ownership inequality on inequality trends. Because effects 3 and 4 are hypothesized to operate through the growth-generating process, interactions between agrarian structure and rates of agricultural and overall economic growth will be used to

try to separate these effects from the level effects. Estimation will be carried out using flexible 'mixed effects' methods that recognize both the panel structure of the data and the possibility that an identical treatment (*e.g.*, economic growth) may have heterogeneous effects at different points in a country's economic history.

3.1 Panel data on income and agrarian inequality

Table 1 displays descriptive statistics from the available data, which are comprised of 210 observations from 64 countries. The primary constraint to

TABLE 1
DESCRIPTIVE STATISTICS FOR VARIABLES USED IN ANALYSIS

	Africa	Asia	Latin America	Eastern Europe	OECD + others
Income Gini					
Minimum Value	33.0	28.3	39.2	32.0	23.1
Median	42.5	37.7	50.0	40.8	31.9
Maximum Value	62.9	62.3	60.0	44.0	56.0
Initial GDP per capita (1965)					
Minimum Value	147.6	104.6	365.2	246.6	285.8
Median	235.8	299.8	568.2	329.6	1997.0
Maximum Value	390.2	693.0	1854.4	683.6	3156.0
Ag Share (%)					
Minimum Value	19.1	4.7	2.4	7.0	1.2
Median	31.7	27.7	11.9	15.3	4.3
Maximum Value	56.7	59.0	26.0	30.1	41.1
GDP Growth					
Minimum Value	-0.5	-2.4	-4.6	-3.1	-0.5
Median	2.7	4.9	4.3	4.0	3.0
Maximum Value	7.1	10.9	9.5	12.9	11.1
Ag GDP Growth					
Minimum Value	-1.3	-2.8	-30.9	0.1	-8.9
Median	2.9	3.8	1.7	5.9	0.3
Maximum Value	6.1	10.1	8.4	10.1	8.8
Initial land inequality (1965)					
Minimum Value	39.7	36.8	60.7	54.9	33.8
Median	49.3	56.0	82.1	64.6	55.2
Maximum Value	80.4	76.5	92.3	67.6	85.3
Number of countries	10	14	16	4	20
Total observations	15	55	49	9	82

Source: derived from data from Deininger and Olinto (1999).

expanding the data coverage has been the shortage of information on agrarian structure or land ownership inequality. Deininger and Olinto (1999) describe in more detail the creation of this land ownership inequality information drawn primarily from FAO sources. The income inequality data have been taken from the Deininger-Squire (1996) dataset, and the growth rates and other data have been taken from the Penn World Tables and World Bank sources. While the expanded WIDER *World Inequality Database* offers income inequality measures beyond those found in the Deininger-Squire dataset, its additional information does not make more observations available for the analysis because of the limited amount of land ownership information.

As can be seen in Table 1, the data display significant variation along all dimensions. Income Ginis range from a low of 23 to a high of 63. The agricultural share of GDP in the sample ranges from 59% down to 1%, while agrarian inequality (measured by the Gini coefficient for the land ownership distribution) ranges from 37 to 92. The dataset's biggest weakness is that African and Eastern European economies are poorly represented. Data are available for only 10 African countries (with less than two observations per country) and only nine Eastern European countries (two observations per country). In contrast there are observations for some 15 to 20 countries for each of Latin America, Asia and the OECD, with an average of four observations per-country.

3.2 Mixed effects or random coefficients estimation

The essence of the argument put forward here is that land ownership inequality may condition the impact of growth on income inequality. Mixed effects models (see Laird and Ware, 1982, and the estimation techniques put forward by Pinheiro and Bates, 1995) provide an empirically open and flexible way to approach this issue. Let us begin with the following 'Kuznets' model of the relationship between growth and income inequality:

$$(7) \quad G_{it} = \beta_{0i} + \beta_{1i}\dot{y}_{it} + \varepsilon_{it},$$

where $\dot{y}_{it}$ is the annualized rates of growth for GDP over the five years leading up to time, *t*, in country, *i*. Note that the coefficients are subscripted, indicating that they potentially differ for each country depending on observed and unobserved factors. As a first window on the heterogeneous regression process, we can consider each coefficient to be comprised of an average population effect and a random component:

(8) $G_{it} = [\beta_{00} + \beta_{01} y_{i0} + \beta_{01} y_{i0}^2 + \upsilon_{i0}] + [\beta_{10} + \beta_{11} y_{i0} + \upsilon_{i1}] \dot{y}_{it} + \varepsilon_{it}$,

where y_{io} is the log of the country *i*'s initial level of GDP, and the β_{m0} ($m=0,1$) are comprised of a conditional mean effect (for instance, $\beta_{10} + \beta_{11} y_{i0}$), plus a random, country-specific deviations-from-the-average effect (the υ_{im}). Regression (7) and (8) is a Kuznets relationship in the sense that it permits an inverted-U shaped relationship, since the intercept is hypothesized to shift with initial GDP, and the impact of growth on inequality can also change with the level of initial GDP. Note that this model is more general than the classic cross-sectional inequality analysis (*e.g.*, Ahluwalia, 1976), as it exploits the panel data to estimate the impact of growth on inequality, controlling for the initial level of inequality which may itself be influenced by initial income levels.

We assume that the υ_{im} are distributed with mean zero and covariance matrix Ω. Another way to express this model is as a random coefficients formulation:

(9a) $\beta_{0i} \sim ([\beta_{00} + \beta_{01} y_{i0} + \beta_{01} y_{i0}^2], \upsilon_{i0})$

(9b) $\beta_{1i} \sim ([\beta_{10} + \beta_{11} y_{i0}], \omega_1)$,

where ω_m is the *m-th* diagonal element of Ω. Among other things, the degree of variation in the υ_{im} will give us a measure of the degree of heterogeneity in the regression. The challenge is to see how much of the heterogeneity in this basic Kuznets regression can be explained by agrarian structure and land ownership inequality.

The first column of Table 2 presents the results of the mixed effects estimation of the 'Kuznets' model. Interestingly, the expected value of the intercept follows a significant Kuznets inverted-U pattern, first increasing and then decreasing with initial income levels. However, consistent with the more recent literature that has seen the Kuznets relationship dissipate in the face of repeated observations on individual countries, the coefficient relating the impact of economic growth to income inequality is not significant. More surprisingly, the standard deviation of the random component of this term is also small. A large value of this term would indicate the presence of heterogeneous, but strong country-specific relationships between growth and income inequality.

We now ask whether the pattern of income inequality can be better explained by bringing in variables that capture the hypothesized linkages between agrarian structure and income inequality. We do this in two stages. First, we

introduce variables that capture the level effect of agrarian structure on inequality, generalizing (8) as follows:

TABLE 2
MIXED EFFECT ESTIMATES

	Kuznets Model	Agrarian Level Effects Model	Exclusionary Growth Model
Level of Inequality			
population average effect	-72	-23	-29
	[62]	[66]	[66]
std dev of random effect, υ_i	8.6	8.1	8.0
initial log GDP	41.3 **	21	22
	[19]	[21]	[21]
(initial log GDP)^2	-3.6 **	-2.0	2.1
	1.5	[1.6]	[1.6]
initial land inequality, G_0^T	--	0.17 **	0.20 **
		[0.08]	[0.08]
dampening effect, $\phi^A G_0^T$	--	0.002 *	0.002 **
		[0.001]	[0.001]
GDP Growth, $\dot{y}$			
population average effect	-0.82	-0.01	0.65
	[1.1]	[1.1]	[1.2]
std dev of random effect, υ_i	0.02	0.013	0.014
initial GDP (log)	0.18	0.05	0.04
	[0.17]	[0.17]	[0.17]
initial land inequality, G_0^T	--		-0.01
			[0.01]
Weighted Ag Output Growth, $\phi^A \dot{y}^A$			
population average effect		-0.004	-0.01
		[0.005]	[0.02]
std dev of random effect, υ_i		0.008	0.01
initial land inequality, G_0^T	--		0.0002
			[0.0003]
Likelihood Ratio Test	14.4 **		21.2 **
(p-value)	(0.02)		(0.00003)

Figures in square brackets are estimated standard errors. '*' and '**' indicate statistical significance at the 10% and 5% levels, respectively.

Source: derived from data from Deininger and Olinto (1999).

$$
\begin{aligned}
G_{it} = & [\beta_{00} + \beta_{01} y_{0i} + \beta_{02} y_{oi}^2 + \beta_{31} G_{i0}^T + \beta_4 \phi_{it}^A G_i^T + \upsilon_{i0}] + \\
& [\beta_{10} + \beta_{11} y_{0i} + \upsilon_{i1}] \dot{y}_{it} + \\
& [\beta_{20} + \upsilon_{i2}] \phi_{it}^A \dot{y}_{it}^A + \varepsilon_{it}
\end{aligned} \tag{10}
$$

In addition to introducing the terms representing the potentially self-dampening level effect in the constant term, we also introduce a new variable, the (share-weighted) lagged rate of growth of agricultural output ($\phi^A \dot{y}^A$) as another factor that may independently influence the level of income inequality. This term should pick up any intrinsically unequalizing (or equalizing) effects of agricultural growth. Equation (10) will be called the *agrarian level effects model*.

The second generalization of (8) is found by specifying the growth coefficients as functions of the initial level of land ownership inequality:

$$
\begin{aligned}
G_{it} = & [\beta_{00} + \beta_{01} y_{0i} + \beta_{02} y_{oi}^2 + \beta_{31} G_{i0}^T + \beta_4 \phi_{it}^A G_i^T + \upsilon_{i0}] + \\
& [\beta_{10} + \beta_{11} y_{0i} + \beta_{21} G_{i0}^T + \upsilon_{i1}] \dot{y}_{it} + \\
& [\beta_{20} + \beta_{21} G_{i0}^T + \upsilon_{i2}] \phi_{it}^A \dot{y}_{it}^A + \varepsilon_{it}
\end{aligned} \tag{11}
$$

where the level of initial land ownership inequality is represented as before. The term $\beta_{12} G_{i0}^T$ captures the human capital inequality effect of land ownership inequality that makes general economic growth less equalizing. The term $\beta_{21} G_{i0}^T$ captures the hypothesis that agricultural growth will itself be less equalizing if land ownership inequality is high. Equation (11) will be called the *exclusionary growth model*.

Table 2 also presents the estimation results for the *agrarian level effects* and *exclusionary growth* models. Several interesting results emerge from the *level effects* model. First, the agrarian structure level effects variables are relatively large and statistically significant. The variables are scaled such that an agrarian economy (ϕ_{it}^A *=50%*) with Latin American levels of agrarian inequality (G_{i0}^T = *80*) will have its Gini boosted by 21 points compared to a completely egalitarian agrarian economy. As the agricultural economy wanes in importance and ϕ_{it}^A falls to zero, the agrarian inequality effect dampens down to 13.5 points, a still surprisingly strong number. This persistent effect suggests either a spurious relationship induced by a link between agrarian and initial industrial asset inequality, or a relationship between agrarian structure and other factors excluded from (10). Somewhat unexpectedly, the presence of the agrarian structure level variables in (10) halves the size and eliminates the statistical significance of the initial GDP variables.

A final noteworthy feature of the estimated *agrarian level effects model* is the coefficient of the weighted lagged agricultural growth term. While the average population level for this coefficient is not significantly different from zero, its

point estimate is of a size such that a heavily agricultural economy ($\phi_{it}^{A}=50\%$) that has sustained rapid agricultural growth for five years (5%) would experience a 2 point drop in the income inequality Gini coefficient. While this result is not significant, the standard deviation of the estimated random component of this coefficient is twice the size of the underlying population average effect. The same agricultural country with a coefficient one standard deviation above the average would experience a 6 point drop in its income Gini, while a country one standard deviation above would have a 2 point *rise* in its Gini following five years of rapid growth.

The *exclusionary growth model* lets us see whether any of this variation in the estimated coefficient of the agricultural growth variable and other features of the *level effects model* are influenced by the inclusion of agrarian structure as a factor that shifts the mean coefficients of the growth variables. Unfortunately, as examination of Table 2 shows, none of these new factors are individually statistically significant. The level effects coefficients remain significant, but otherwise it proves impossible to gauge precisely any effect of agrarian structure on the income distribution consequences of agricultural or overall economic growth. The results remain provocative. The likelihood ratio test statistics reported at the bottom of Table 2 show that it is impossible to accept the parameter restrictions implied by moving from the *exclusionary growth model* to the *level effects model* (the test has a p-value below 0.001), and (less surprisingly) it is impossible to accept the restrictions implied by moving from the *level effects model* to the *Kuznets model* (the test has a p-value of 0.02). The implication is that the significant explanatory power has been added by conditioning the growth effects on agrarian inequality. However, given limitations in the data (and perhaps in the modelling techniques), it proves impossible to identify what those effects are.

IV POLICY IMPLICATIONS INSIDE AND OUTSIDE AGRICULTURE

While unequal land ownership has a role to play in explaining historically high levels of income inequality, this paper begins by asking whether agrarian structure plays any role in explaining contemporary trends in increasing income inequality. Using a Gini decomposition framework to structure the analysis and drawing on a variety of theoretical, historical and econometric evidence, this paper identifies four linkages or pathways between agrarian structure and income inequality:

1. the conventional level effect;
2. the legacy effect;
3. the exclusionary agrarian growth effect;
4. the unequal human capital accumulation effect.

The first of these effects is shown to be self-dampening, and, unless unequal agrarian structure leaves behind a durable legacy of unequally distributed industrial capital assets (effect 2), the statistical relationship between agrarian structure and income inequality should disappear in the industrializing economy. Using panel data to estimate a mixed effects model of income inequality, this paper finds significant evidence of both the self-dampening level and legacy effects. However, the policy implications of these findings are modest. The first of these effects supports the notion that a major agrarian asset redistribution in largely agrarian economies could have a major impact on the level of income inequality, reducing the Gini by an estimated 8 points. However, no such impacts would be expected in more industrialized economies. While the econometric estimates indicate a large, persistent legacy effect in these economies, this effect likely represents the crystallization of past agrarian inequality into industrial inequality. Contemporary manipulation of the agricultural economy would do nothing to erase that legacy.

While neither of these first two effects is likely to have anything to do with contemporary trends in income distribution, the second two effects are intrinsically dynamic. They both speak to ways in which agrarian structure conditions the income distribution consequences of both agricultural and non-agricultural growth and thus potentially have a role to play in explaining current income distribution trends. While there is some theoretical and empirical evidence in support of these effects, this paper's econometric analysis has been unable to identify precisely the dynamic impacts of agrarian structure on trends in income inequality. Likelihood ratio tests do indicate that the variables meant to capture these effects add significantly to the explanatory power of the income inequality model. However, none of the individual effects are statistically significant.

While precise identification of these effects and their quantitative significance will have to depend on future research efforts, the available theoretical evidence offers insights on the policy implications of these effects. From a theoretical perspective, both the exclusionary agrarian growth effect and the unequal human capital accumulation effect are rooted in missing financial markets. Put differently, agrarian structure can condition the income distribution consequences of growth because missing financial markets create a

linkage between the assets that a household already has and the new investments that it can undertake.

Policy-makers interested in modifying the income distribution consequences of agrarian structure thus have two choices:

1. modify the existing agrarian asset distribution,
2. modify the conditions that make the asset distribution matter.

The first of these policy approaches corresponds to the conventional set of land reform ideas, though the motivation suggested here may be as much to enhance the human capital accumulation of rural households as to influence directly the distribution of agricultural income.

Interestingly, the second policy approach may have nothing to do agriculture at all. If agrarian structure has its deepest effects if landless and near-landless rural households cannot afford to finance educational investment given the costs of education and imperfections in financial markets, then policy that subsidizes education or makes financial markets function for the rural poor could actually break the linkage between agrarian structure and income distribution. If this were done, agrarian asset redistribution would be of minor consequence at least in terms of its conditioning of the effects of non-agricultural growth.

Finally, it is worth noting that in some ways these two policy approaches are less far apart than the preceding discussion makes them seem. Current calls to achieve agrarian asset redistribution through market-based methods (*e.g.*, see Deininger, forthcoming) are likely to work only if the financial market access problems of the rural poor are resolved (see Carter and Barham, 1996). While it would be nice to have firmer evidence about the payoffs to such policies, there seems little doubt that a policy priority must be to make markets work better for the less well off in rural areas so that they can position both themselves and their children to participate in the benefits of future economic growth.

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