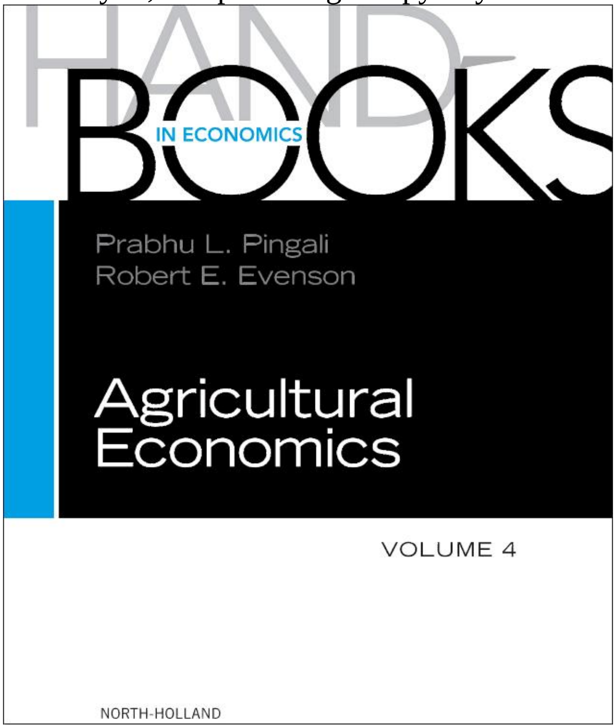

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CHAPTER 65

Farm Size

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Contents

Abstract

What patterns can be discerned in the distribution of farm sizes across countries and over time? How does the behavior of individual economic agents interact with the natural environment and general economic development to affect farm size? How has concerted human intervention, understood as national and supranational policy actions, altered these outcomes? We find that operated farm size rises with economic development, especially in the 20th century, with marked exceptions: large farms in Latin America and Southern Africa; small farms in parts of Northwest Europe; diminishing farm size in South Asia. Despite increased scale, in many advanced countries the family remains the main source of farm labor. Hired labor supervision costs tend to favor family farming as the equilibrium institution. Theory suggests that the family farm will typically become larger with economic development, but its efficiency advantage over the agroindustrial enterprise will decline.

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Sufficiently land-augmenting technical advances can upset the relationship between development and equilibrium scale, as in the Green Revolution. Concerted intervention can also cause departures from such equilibria. Colonial land grabs have led to inefficiently large farms, with market forces and land reform subsequently reducing average size after decolonization. Greater land rights have thereby raised the rural poor's income, status, and power, but farmland collectivizations, and much farm tenancy reform, have largely failed to achieve this goal. However, classic land reforms, and some decollectivizations, have proved more incentive-compatible and have distributed large land areas among many small family-managed units. Farm size is, in principle, also affected by net taxes on farm production (mostly negative in OECD, mostly positive in developing countries, though reduced), but such effects remain empirically elusive. Globalization and liberalization—effects via relative prices aside—have induced institutional changes that are not neutral with respect to farm size. These include supermarkets' increased role in the supply chain.
JEL classifications: O130, Q130, Q150

Keywords

farm size
land reform
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family farms

1. INTRODUCTION

This chapter addresses three questions: (1) What patterns can be discerned in the distribution of farm sizes across countries and across time? (2) How does the behavior of individual economic agents interact with the natural environment and general economic development to affect farm size? (3) How has concerted human intervention, understood as national and supranational policy actions, altered these outcomes?

Under Question 1 (Section 2), operated farm size rises with the level of economic development, especially in the 20th century, but there are marked exceptions (large farms in Latin America and Southern Africa; small farms in parts of Northwest Europe; diminishing farm size in South Asia, despite economic growth). Although there is a broad association between smallness and family management, in many advanced countries the family remains the main source of farm labor.

Under Question 2, we begin by asking under what assumptions we would expect agriculture to be dominated by family farming. Transaction costs, especially supervision costs, associated with hired labor are central to the family farm theory. Will family farms get larger as development proceeds? Suppose that development brings a rise in the price of labor and a fall in the price of capital. Theory suggests that the first of these will tend to make family farms bigger, whereas the effect of the second is ambiguous. Will development tend to lead to displacement of the family farm by agroindustrial enterprises? Theory suggests that this could happen, since a rising capital/labor ratio must diminish the relative importance of hired labor supervision costs relative to capital transactions costs, thus eroding the economic rationale for family farming. In sum, the changes in factor prices that accompany development can explain a tendency for a concomitant rise in farm size, whether or not family farming remains the dominant mode of production. Some exceptions to this tendency (e.g., declining farm sizes in South Asia following the Green Revolution) can be traced to the effects of technological progress or to the unwinding of past distortions. Finally, in this section, we consider evidence relating to the assumptions on which the family farm theory is based: Crucial is that scale diseconomies associated with labor use (because of transactions costs associated with *hired* labor) should be more important than scale economies that might arise from production, the use of capital inputs, and the processing and marketing of output. The well-established inverse relationship between farm size and land productivity, to the extent that it reflects a relatively low shadow price of labor on small farms, is an important piece of supporting evidence.

Under Question 3, we distinguish concerted interventions that are aimed directly at changing farm size (colonial land grab and land reform) from those for which farm size effects arise as a byproduct (taxes, subsidies, and trade interventions). In the case of colonial land grab, we ask why it happened where it did (much of Latin America and Southern Africa) and why the resulting highly unequal distribution of land persisted. In the case of land reform we document the effects of the classic Land Authority model of reform as well as alternatives, such as titling, tenancy reforms, and the privatization and decollectivization of state farms. We show that output taxes (subsidies) in a simple family farm model should raise (lower) farm size; though there is evidence that farming has been generally taxed in developing countries and subsidized in advanced countries, we have not found direct evidence of the expected farm size effects. Turning to trade interventions, theory would suggest that liberalization and globalization would in developing countries turn the domestic terms of trade in favor of agriculture and therefore act, like a subsidy, to reduce equilibrium farm size. We end the chapter by assessing the view that liberalization and globalization might have the contrary effect because of institutional aspects, *viz.* the growing role of supermarkets, grades and standards, and export horticulture.

2. PATTERNS OF FARM SIZE ACROSS COUNTRIES AND TIME

This section provides international evidence on the distribution of farm size, its long-term evolution, and the extent to which farmers rely on family labor through the process of economic development. The main sources of information are the FAO Agricultural Censuses of 1960–2000.[1] Countries with higher per capita GDP tend to have larger average farm size and fewer small farms. Also, as GDP per capita grew through the latter part of the 20th century, farms tended to become larger in the advanced countries but smaller in Asia and, perhaps, Africa. Thus mean farm size has diverged internationally. The share of family workers in total farm labor does not vary systematically with GDP per capita; indeed, in many advanced countries the family is still the main source of farm labor. However, in the few low-income African countries with FAO data, little hired labor is recorded. The great international diversity in its record of use may partly reflect issues of measurement. Section 2.1 describes longer-term trends in farm size; Section 2.2 concentrates on its pattern and recent change. Section 2.3 reviews evidence on the balance between family and hired farm labor.

2.1 Longer-term trends in farm size

We first note, but then sidestep, the issue of what measure best summarizes the scale of an agricultural operation. There are many possible dimensions, including land area, value added, output value, output volume, and labor input. There are further subtleties, mostly about quality adjustments. However, discussions of empirical facts are driven by the available comparative data. In the FAO farm censuses, land area of holdings is available for most countries, but no other potential measure of scale is widely available.

FAO data suggest several possible measures of central tendency as well as alternative indicators of the size distribution of farms. Table 1, representing a wide range of continents and income levels, shows that alternative summary statistics on farm size since about 1990 all tend to vary similarly across countries. We shall analyze mainly

Table 1 International correlations among measures of farm size, 1990s

	1.	2.	3.	4.	5.	6.	7.
1. Ln mean	1	0.73	0.70	–0.92	–0.82	–0.91	–0.83
2. Median by holding		1	0.69	–0.74	–0.45	–0.56	–0.46
3. Median by area			1	–0.34	–0.32	–0.54	–0.43
4. Proportion of holdings <2 hectares				1	0.88	0.95	0.84
5. Share of area in holdings <2 hectares					1	0.73	0.89
6. Proportion of holdings <5 hectares						1	0.85
7. Share of area in holdings <5 hectares							1

Note: All coefficients above 0.50 in magnitude are statistically significant at the 1% level.
Source: FAO Statistics division at www.fao.org/es/ess/index_en.asp. The data are all taken from the 1990 round of Agricultural Censuses. Sample sizes vary between 40 and 60, depending on data availability. For a full listing of the countries, see Appendix Table 1.

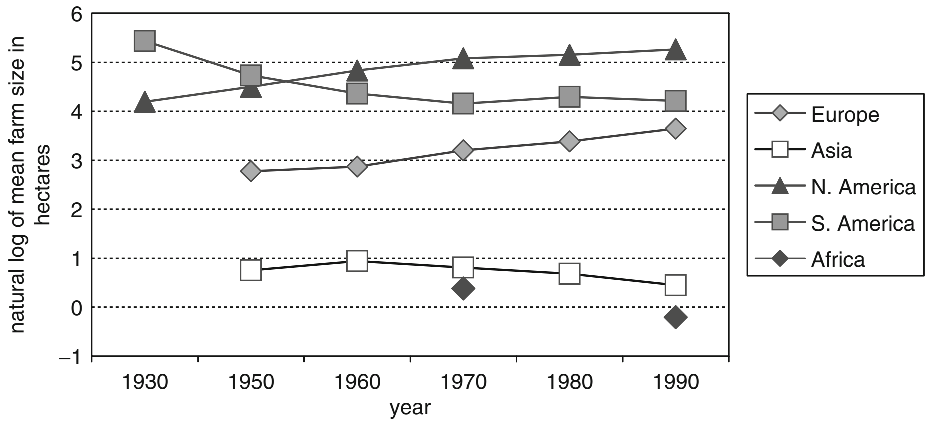

Figure 1 Mean farm size by continent, 1930s–1990s. Source: FAOSTAT at www.fao.org/es/ess/index_en.asp.

(the natural log of) national mean farm size, which is available for more countries than any other measure. It is strongly correlated with other measures, e.g., (negatively) with the proportion of farms below 2 hectares and the share of total agricultural land in such farms (Row 1 of Table 1).[2]

Figure 1 shows the path of average farm size in a sample of countries grouped into continents from 1930 to 1990. In Europe and North America farm sizes have been increasing on average since 1950. In Africa[3] and Asia, by contrast, farm sizes seem to have declined in the 20th century. In South America[4] there is no clear long-run trend.

There seems to be little evidence of farm size growth in the advanced countries before the 20th century. In Western Europe, it is hard to see much general movement between the pre-19th century and the late 19th century (Table 2). The U.S. evidence for 1850–1997 (Figure 2) is that, after the sharp decline following the Homestead Act of 1862 (Sokoloff and Engermann, 2002), average farm size was fairly stable until 1910. It thereafter grew at a rising rate, especially after 1950. Average farm size also rose steadily throughout the 20th century in Canada and, more gradually, in England and Wales.[5] Most advanced countries felt the forces that reshaped agriculture in the Northern United States: mechanical and biological innovations in agriculture, the growth of nonfarm wages, the transportation and communication revolutions (Olmstead and Rhode, 2000: 693–4), and the rise of synthetic substitutes.

We find no evidence of long-term trends in farm size in the Asian historical record. Here are two examples. Figure 3 shows mean cultivated area per rural household in China during periods of private ownership of land from 2 AD to 1600 AD. No trend is

Table 2 Historical data on farm size in Western Europe

	Percentage of holdings less than:					
	1 ha	1.5 ha	2 ha	3 ha	5 ha	20 ha
Pre-19th century						
E. England, c. 1280				32.7		
Savoy, 16th c.	52.4				87.1	
Sainte-Croix, France, 16th c.					38.8	
Bohemia, early 18th c.		35.7			56.7[1]	
Hochberg Germany, 1788	45.0[2]				94.6[2]	
19th century						
Ireland, 1845			23.6			
Norway, 1850					80.0	
England and Wales, 1851						41.5
Germany, 1882			58.0		76.6	94.2
Sweden, 1890			22.5			88.8
France, 1892	39.2				71.3	
Late 20th century						
France, 1989			27.4		38.4	54.8
Germany, 1995			31.6		46.4	64.1
Ireland, 1991			2.6		11.2	53.7
Norway, 1989			13.7		37.3	87.9
Spain, 1989			44.2		65.3	88.0
United Kingdom, 1993			5.6		14.5	41.7

[1]For Bohemia the upper limit is 4.5 hectares.
[2]For Hochberg, the limits are 0.7 and 5.8 hectares, respectively.
Source: For pre-19th century and 19th century data, Grigg (1992), Tables 8.3 and 8.4, pp. 97–99. For late 20th century data, FAOSTAT Statistics division at www.fao.org/es/ess/index_en.asp.

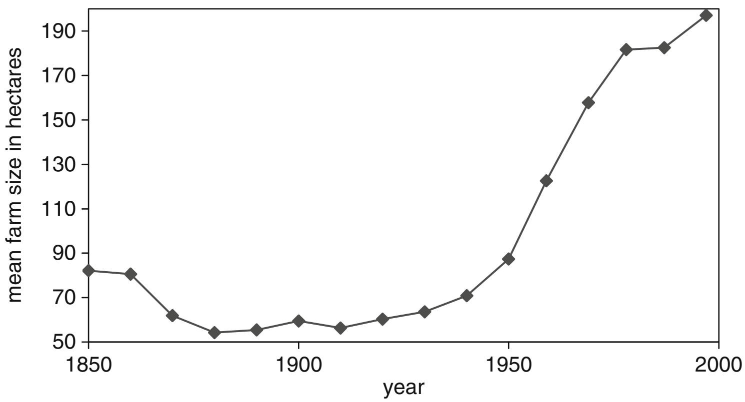

Figure 2 Mean size of holding in the United States since 1850. Source: U.S. Department of Commerce (1975, 2000).

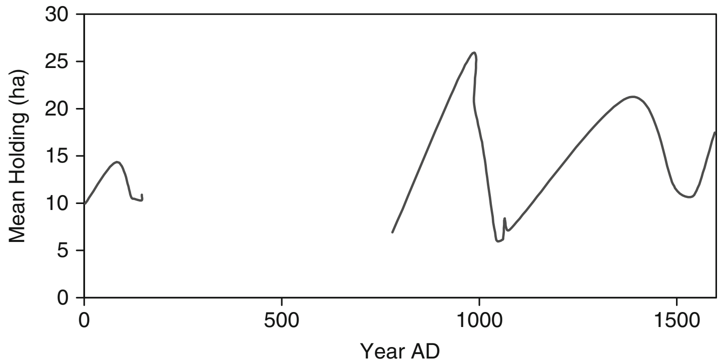

Figure 3 Mean cultivated land per rural household, China, 2–1600 AD. Source: Lee (1921, 436). For much of the period from the Tsin Dynasty to the Yang Yen (Tang), 280–780 AD, there was public land distribution (Lee, 1921).

visible, but there is great variation, for which Lee (1921) offers two important explanations: the effect of wars on population size and the impact of tax regimes on participation in censuses. For India, Fukazawa (1983, 201) offers some fragments of evidence from village surveys in Western India that suggest large falls in average size of land holdings during the 19th century in Maharashtra and gradual falls in average land holdings from the early 20th century to the end of the colonial regime. (Section 4.2.1 gives supporting evidence on farm size inequality trends.)

2.2 Economic development and farm size in the late 20th century

Appendix Table 1 gives a range of measures of farm size distribution from the FAO farm surveys, summarized by continent in Table 3. We begin this subsection by drawing out two major stylized facts. First, average farm size is very small in parts of sub-Saharan Africa and South, Southeast and East Asia, e.g., Bangladesh, China, Democratic Republic of the Congo,[6] Egypt, Indonesia, India, and Korea. In these countries the great majority of farms are less than 2 hectares. Contrast this with, for instance, Western European countries, where the median holding is mostly well above 10 hectares. Second, average farm size and measures of farm size inequality are related. For instance, (log) mean farm size and the Gini coefficient are positively correlated across countries (correlation coefficient = 0.48). This is illustrated in Figure 4.[7]

Why do we find such variation across countries? Economic and technological factors matter (Section 3), but so do exogenous agroecological conditions, partly reflected in the share of land devoted to pasture. The 48 countries with data show a strong correlation[8] between log farm size and the proportion of land devoted to pasture (Figure 5). Many developing countries, especially in South and Central America, Central Asia, North

Table 3 Continental average farm size and dispersion measures, 1990s

Continent		Mean	Gini	% Permanent Pasture	% Holdings < 2 ha.	% Area < 2 ha.
Sub-Saharan Africa	Mean	2.4	0.49	9.0	69.2	32.0
	N	15	11	1	12	8
	SD	1.4	0.1	.	23.1	27.7
Central America and the Caribbean	Mean	10.7	0.75	38.0	62.8	12.4
	N	11	10	9	9	9
	SD	10.2	0.1	27.9	27.0	11.0
South America	Mean	111.6	0.90	74.6	35.7	0.87
	N	10	9	8	4	3
	SD	149.5	0.05	14.5	17.3	1.0
South Asia	Mean	1.4	0.54		77.8	40.1
	N	4	4		3	3
	SD	1.2	1.1		19.1	26.9
East Asia	Mean	1.0	0.50		92.2	59.2
	N	3	2		3	3
	SD	0.3	0.2		3.7	11.9
Southeast Asia	Mean	1.8	0.60	1.4	57.1	23.6
	N	6	6	3	4	4
	SD	1.0	0.1	0.3	16.8	14.5
West Asia and North Africa	Mean	4.9	0.70	7.1	65.0	24.7
	N	11	10	5	9	8
	SD	4.6	0.1	7.1	27.3	23.3
Europe	Mean	32.3	0.60	35.9	29.9	3.8
	N	21	20	18	18	17
	SD	25.7	0.2	21.2	24.6	4.9
Canada		273.4		96.1	6.8	
United States		178.4	0.78	47.9	4.2	0.0
Australia		3601.7	..	96.1	..	..
New Zealand		222.6			6.8	

Source: FAOSTAT at www.fao.org/es/ess/index_en.asp.

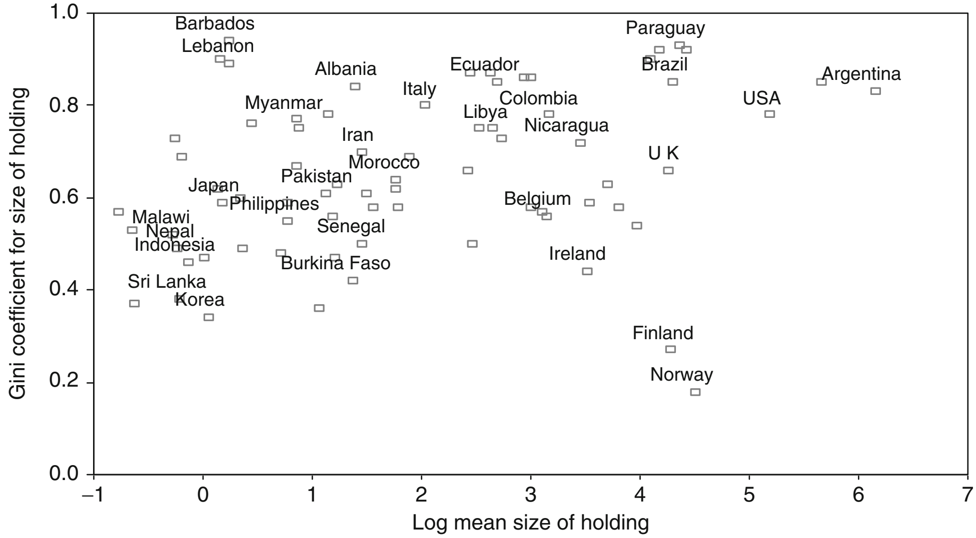

Figure 4 Mean farm size and land inequality, 1990s. Source: FAOSTAT at www.fao.org/es/ess/index_en.asp.

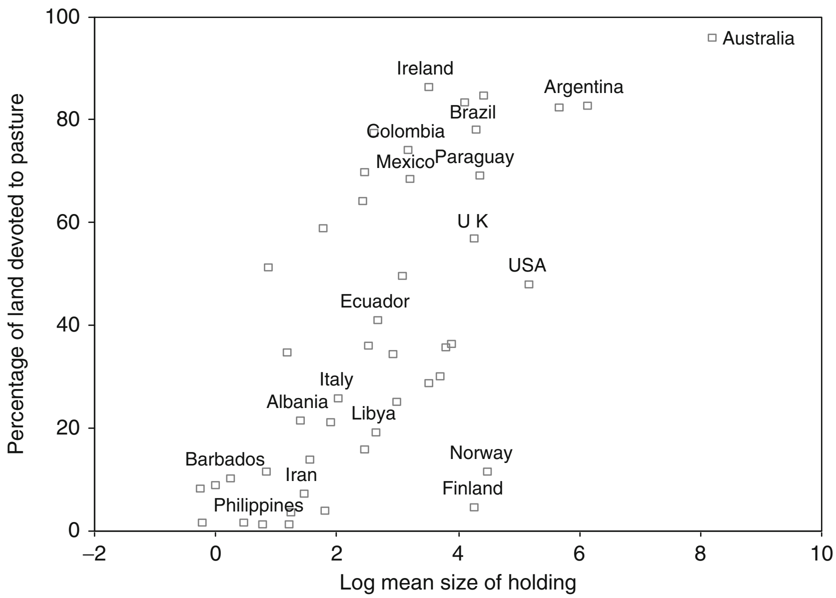

Figure 5 Mean farm size and the pastoral-arable mix of farms, 1990s. Source: FAOSTAT at www.fao.org/es/ess/index_en.asp.

Africa, and the Middle East, have unusually large areas of low-quality land, usable only for grazing, and farmed in large units (see, for instance, the data for Iran, Libya, Morocco, Pakistan, and Turkey). Among advanced countries, we observe large areas of lower-quality, arid land devoted to livestock ranches in Australasia and North America, alongside much higher mean farm sizes than in Europe. An inverse relationship between land quality and equilibrium farm size is consistent with the theory discussed in Section 3. In Section 4 we discuss the impact of concerted human interventions on farm size distributions, including the diverse legacy of colonialism. In much of Asia and West and Central Africa, colonists did not seize a lot of farmland, and plantations remain a small proportion of farm area. In contrast, in much of Latin America, the Caribbean, and Southern and East Africa, colonialism has left a legacy of unequally distributed farms, some very large.

We now turn to the statistical association between farm size and economic development. Figure 6 reveals (for 1990) a broadly positive association between mean farm size and GDP, much but not all of it between continents. Table 4 presents this association in regression form, showing an estimated elasticity of unity. The residuals suggests that temperate countries have larger farms, controlling for GDP *per capita*. This is likely to be related to the global distribution of land quality and climate discussed earlier.

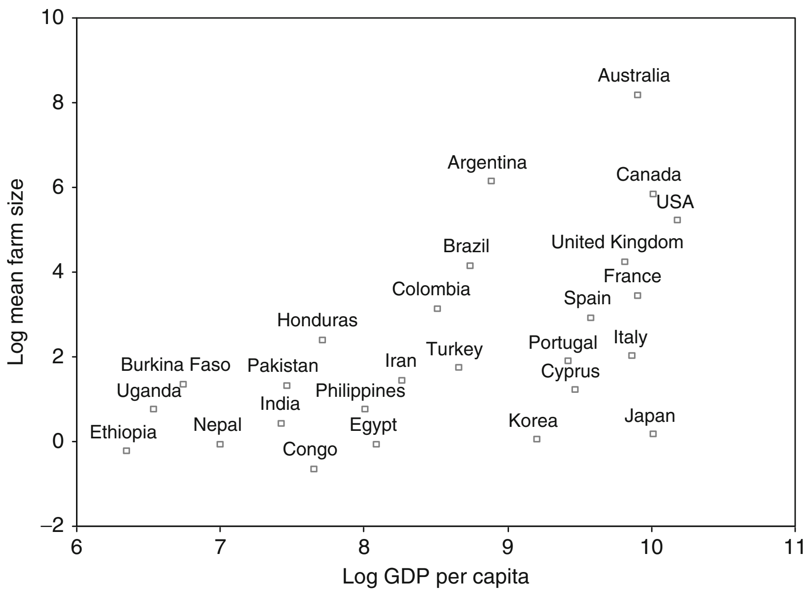

Figure 6 Mean farm size and GDP per capita, selected countries, 1990s. Source: Mean farm size: FAOSTAT at www.fao.org/es/ess/index_en.asp. GDP per capital: Penn World table version 6.1, variable rgdpl: real GDP *per capita* (Laspeyres index), 1990, in 1985 U.S. dollars.

Table 4 The international distribution of farm size

Dependent Variable	ln Mean Farm Size
Ln GDP per capita	1.00(4.7)
R^2	0.37
Adjusted R^2	0.35
Sample	50

Note: Weighted least squares regression is weighted by square root of population. Absolute *t*-ratio in parentheses. Results are very similar if continental dummy variables are included. Mean farm size from the *1990 Round of FAO Agricultural Censuses*. GDP per capita from Penn Word Tables, v. 6.1.

Cross-section correlations suggest, but do not imply, corresponding intertemporal correlations for single countries. Using data from countries that have a sequence of FAO surveys, we next investigate whether *changes* in GDP are associated with *changes* in farm size. The divergent trends across continents (Figure 1) do not foreshadow a strong correlation; indeed, changes in GDP per capita are only weakly associated with changes in farm size over the approximately decade-long gaps between surveys (Table 5, Column 1).

Table 5 International changes in mean farm size, 1970–1990

	coef (*t*-ratio)	coef (*t*-ratio)
Constant	–0.01 (1.6)	0.02 (4.2)
Annual average change in ln GDP per capita	0.25 (1.8)	0.20 (2.2)
Annual average population growth rate		–1.41 (8.7)
R^2	0.06	0.60
Adjusted R^2	0.04	0.58
Sample	59	59

Note: Dependent variable is the annual average change in ln mean farm size. Weighted least squares regression is weighted by square root of population. Absolute *t*-ratios in parentheses. Farm size data from the 1970, 1980, and 1990 FAO rounds. Other data are from Penn World Tables, v 6.1. Countries included are as follows: Africa: Ethiopia, Lesotho. Asia: Cyprus, Indonesia, India, Israel, Japan, Korea, Nepal, Pakistan, the Philippines, Thailand, and Turkey. Rest of the world: Austria, Belgium, Brazil, Denmark, Fiji, Finland, France, Germany Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Panama, Paraguay, Peru, Portugal, Puerto Rico, Spain, Switzerland, the United Kingdom, and the United States.

In Column 2, annual average population growth is added to the regression, and its estimated coefficient is negative, large, and significant. Why? It might seem obvious that more people crowded into the same land area must mean smaller farms, but a simple interpretation along these lines is inadequate, e.g., because of the growth of nonfarm activity (see Section 3.1 for a fuller discussion). Note also that this regression cannot establish cause from population growth to farm size decline. For example, population growth is negatively associated with GDP/capita and may therefore proxy some other factor that depresses mean farm size (Figure 6), e.g., perhaps, the Green Revolution, as we discuss later.

2.3 The mix of family and hired workers and development

Is it true, either over time or across countries, that larger mean farm size is associated with a lower weight of family labor in total farm labor? Data are scarce, but there is some support for the proposition in Table 6, if we exclude the tiny Central American

Table 6 Ratio of permanent hired labor to family labor, circa 1990

Country	Ratio of Permanent Hired Labor to Family Labor	Mean Farm Size in Hectares
Africa		
Egypt	0.02	1.0
Guinea	0.01	2.0
Morocco	0.04	5.8
Central America		
Grenada	0.29	0.8
Guadeloupe	0.59	3.2
Martinique	1.44	2.4
South America		
Brazil	0.32	64.6
French Guiana	0.60	4.6
Paraguay	0.09	77.5
Asia		
Myanmar	0.06	2.4
Pakistan	0.03	3.8
Thailand	0.03	3.4
Europe		
Austria	0.10	26.4
Luxembourg	0.07	33.2
Norway	0.51	10.0
Spain	0.21	18.8

Note: See Section 3 for a discussion of permanent versus temporary hired labor.
Source: FAOSTAT at www.fao.org/es/ess/index_en.asp.

plantation economies. We see more hired labor in the European and Latin American economies than in the African and Asian ones. The FAO surveys do not report employment status data for many countries; for poorer countries, and African countries in particular, data for hired labor are rarely collected.[9]

As for North America, a high share of family labor in the farm workforce may have persisted despite large and growing farm size, in part because of labor-displacing capital accumulation and technical progress (mechanization, crop spraying). From 1900 until the 1970s at least, families provided about three quarters of agricultural labor in the United States (U.S. Department of Commerce, 1975, 467). The Canadian data tell a similar story. Thus the North American answer seems to be, on average, that the importance of the family in agriculture survives to the present.

Data from the International Labor Office (Figure 7) give no clear indication that hired workers loom larger in farming in higher-income countries.[10] However, the five poorest countries shown have very low shares of employees in employment in agriculture, so perhaps if data for more poor countries were available, a positive relationship would emerge.

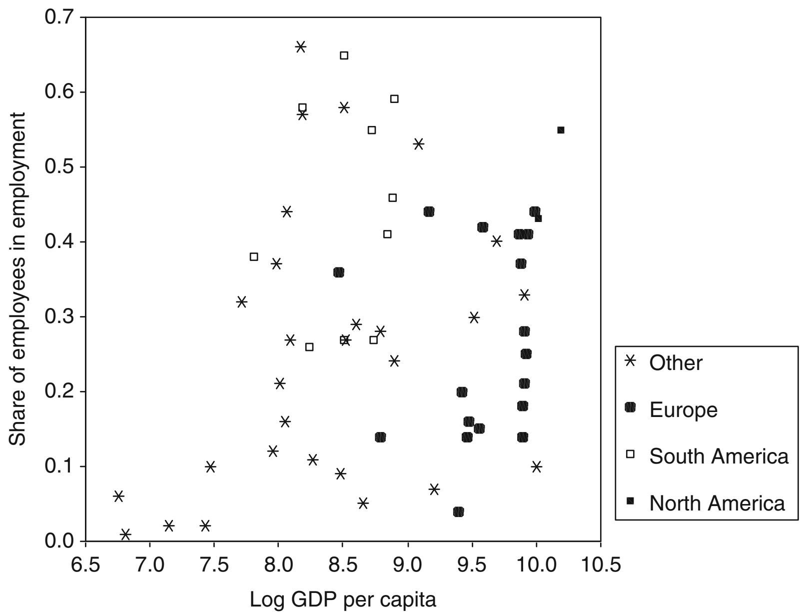

Figure 7 Farm employees as a share of farm workforce, various countries, circa 1990. Sources: Share of hired labor: http://laborsta.ilo.org. GDP per capita. Penn World table version 6.1, variable rgdpl: real GDP per capita (Laspeyres index), 1990, in 1985 U.S. dollars.

Two continental groups stand out. First, European countries tend to have unexpectedly high shares of family labor in total farm labor, given their mean GDP.[11] Second, countries in South America have somewhat higher proportions of employees than most other countries at similar mean GDP levels. These differences are explored in Section 4.

3. SOME ECONOMICS OF FARM SIZE

3.1 The theory of farm size

Section 2 reviewed what is known about variation in the size distribution of farms across time and space. To explain the observed variation, we may appeal to two sorts of influences: those that entail concerted human intervention and the rest.

Two categories of concerted human intervention may perhaps be identified. In the first, one group, typically an invader, establishes a system of discrimination based on some exogenous human characteristic, such as race. In the colonial period in Kenya, for example, the best land (in the "White Highlands") was reserved exclusively for European farmers, and a system of laws and taxes was put in place that gave European farmers further advantages over African farmers (Deininger and Binswanger, 1995). Caribbean sugar plantations in the 19th century, worked first by African slaves and then by indentured Indian labor, are another case in this first category. In the second category we place policy regimes that, although not involving arbitrary discrimination among persons, nevertheless change agrarian structures. Examples in this category are the prohibition or discouragement of land tenancy in some Indian states, land reform schemes, and the EU's Common Agricultural Policy. The distinction between these two types of concerted intervention is not hard and fast, since a policy might appear nondiscriminatory while being discriminatory in practice. For instance, it might be that a law against tenancy has the effect (and, perhaps, the intention) of preventing members of a particular caste from obtaining or retaining all their rights to land.

If we abstract from concerted human intervention (hereafter, *intervention*), we are led to the theory of agricultural development represented by Boserup (1965), Binswanger and Rosenzweig (1986), and Binswanger and McIntyre (1987). In this theory, *population pressure* is a key *exogenous* determinant of changes in agrarian production relations. Starting from an original position of land abundance and forest-fallow agriculture, population growth generates increasing intensification of land use, through bush-fallow and settled agriculture to multicrop intensive farming, and—*pari passu*—an increasing pressure for security of land tenure. According to this theory, transaction costs—especially those associated with the supervision of hired labor—are sufficiently important in relation to (production) scale economies that the optimal production unit is the family farm, and Binswanger and Rosenzweig argue in some detail (see the following discussion) that in the absence of tenancy restrictions (and other interventions), and provided that the *operation* as opposed to the *ownership* of farmland does not confer local political power to a significant degree, even a skewed land *ownership* structure will not prevent the family-*operated* farm from coming to dominate in equilibrium. Size, crop choice, and factor use in the equilibrium farm will be determined by a set of material and economic elements: soil type and agroclimatic conditions; relative factor prices; prices of intermediate inputs; farm-gate output prices; and technology.[12] Note that this theory requires in some circumstances that long-term tenancy is feasible. This applies if (1) efficient operation requires that the land itself, or fixed capital such as irrigation equipment, or trees in the case of long-gestation tree crops, needs significant maintenance, and (2) it is costly to ensure that short-term tenants will undertake such maintenance.

The *family farm theory* of agrarian production relations therefore derives from the view that it is transactions costs, especially the supervision costs of hired labor, rather than technical scale economies that, in the absence of intervention, determine how the "agricultural firm" is organized (Roumasset, 1995). Although the term *family farm* is widespread in the literature, we have not been able to find a precise definition. It is not straightforward to decide who is to count as a family member, and after that is resolved one must specify just how much hired labor (per unit of family labor) is consistent with family farming and whether for these purposes temporary labor (at harvest time, for instance) is to be counted. Whether family members are full-time on the farm may also be relevant because this bears on the amount of labor supervision that they are undertaking. We take it for the purposes of this chapter that *family farming* means that at least a third of permanent labor input is provided by family members.[13] To define transactions costs, we think of there being a *marketplace* in which factors are available, and goods sellable, at given prices: Then transactions costs are any costs associated with the use of factors from, and delivery of goods to, that marketplace.[14] Transactions costs thus defined may be divided into *transport* costs and *information* costs. Information costs are often thought of as the same as *agency* costs, but this is imprecise: Information costs associated with labor arise from search, screening, training, and supervision, only the last of which is of necessity a cost of agency.

Hired labor supervision costs plus constant technical returns to scale in farming by no means lead us to the family farm theory, still less to a simple relation between economic development and "equilibrium" farm size; to the contrary, such assumptions in general tend to imply an agrarian structure in which heterogeneity in household endowments leads to heterogeneity in farm organization and farm size for a given level of development (measured, say, by a constellation of market prices for outputs and inputs plus a given technology). Thus Eswaran and Kotwal (1986), in a model with perfect rental markets in labor and land but household-specific capital endowments (including owned land), together with convex supervision costs for nonfamily labor, show how agriculture will differentiate into four classes according to capital endowments. *Laborer-cultivators*, the least well endowed, employ some land for self-cultivation and also work for others; *self-cultivators*, with more capital, find it optimal to employ more land and to work only for themselves; *small capitalists* employ yet more land and spend part of their time supervising hired workers; *large capitalists* specialize in supervision of hired labor. The exogenous distribution of capital thus generates an equilibrium distribution of operated land and an "inverse relationship" between farm size and land productivity; the land distribution will evolve in the course of development as a result of both capital accumulation and policy interventions, such as land reform.

Suppose, contrary to Eswaran and Kotwal, that heterogeneities in household endowments of land and capital are, given the magnitude of transactions costs in markets for credit and the sale and rental of land, not sufficient to prevent the family farm from emerging as *the* equilibrium institution. Can we then identify a relationship between development and equilibrium farm size? In an idealized case, with homogeneous land and fixed labor input per family (and neglecting seasonality in labor demand), this is equivalent to asking how economic development affects the equilibrium land/labor ratio in farming, a question amenable to attack via standard production theory. Suppose that economic development raises the reservation utility of families, makes capital relatively cheap, and is accompanied by technological progress in agriculture. We now show that higher reservation utility raises farm size, whereas the effects of technological progress and cheaper capital are ambiguous.

Assume, initially:

A1. Production is in family farms, which face no transaction costs; each family provides a fixed and identical amount of labor; hired labor is zero.

A2. Output, *Y*, depends on land and labor input only and exhibits constant returns to scale and diminishing returns to individual factors.

A3. Land is homogeneous and in fixed supply to farming.

A4. Families are in perfectly elastic supply at reservation utility *U* in terms of output.

Supposing competitive behavior in the land market, it follows that equilibrium farm size, *N*, will be such as to maximize rent/hectare, denoted *R*. Denoting output per hectare by F(N), *N* must maximize:

$$R = (F(N) - U)/N \tag{1}$$

differentiation of which gives the first-order condition determining equilibrium farm size, N*:

$$N^{*}.F'(N^{*}) = F(N^{*}) - U \tag{2}$$

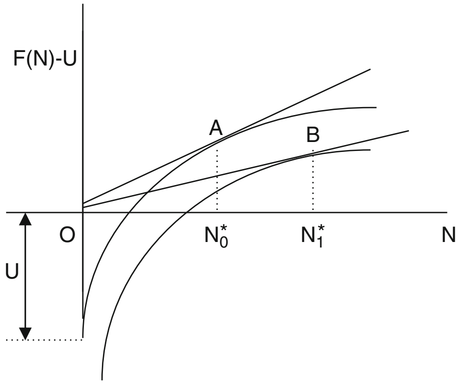

Figure 8 The determination of equilibrium farm size

Figure 8 illustrates how *N* is determined: maximized rent is given by the slope of OA, and $ON_0{}^*$ is the equilibrium farm size.

Total differentiation of Eq. (2) shows that $dN^* / dU > 0$. So, if development raises the reservation utility of families, as one expects, it both lowers land rents—the demand from families to rent land is reduced because they have better off-farm opportunities—and raises equilibrium farm size, as illustrated by the shift from A to B in the figure. Development, by raising U, has simply shifted the curve down. We can extend the model to examine other development effects such as technological advance in the agricultural sector and change in the cost of capital. The effects of technological change turn out to depend on its nature; we can distinguish three pure types:

1. Neutral technical advance is represented by a production function $Y = \gamma F(N)$, where γ is a technology parameter that grows through time; the effects of a rise in the relative price of agricultural goods, or an output subsidy, have effects equivalent to this type of advance.
2. Labor-augmenting technological advance is represented by a production function $Y = \beta F(N/\beta)$: This represents a case where, as time passes, farm size can rise in proportion to β with no loss in output per hectare (in effect, the amount of "effective" labor possessed by the family is growing).
3. Land-augmenting technological advance is represented by a production function $Y = F(\alpha N)$, where α is the technology parameter: αN is the amount of "effective land." As time passes a family can extract the same output from progressively smaller amounts of land.

It can readily be shown that:

1. (a) Neutral technical advance raises land rent and reduces farm size. (b) An advance that is matched by an equiproportional rise in reservation utility leaves farm size unchanged.

2. (a) Labor-augmenting technological advance raises land rent and raises (lowers) farm size if the elasticity of substitution between land and labor is lower (higher) than the share of land in output. (b) An advance that is matched by an equiproportional rise in reservation utility raises farm size.

3. Land-augmenting technological advance, by attracting more families to farm a fixed total land area, raises land rent and reduces farm size (at the same time raising population density on the land).[15]

Now consider the extension of the model to allow for a third factor of production—capital—first neglecting (as we have with land) the possibility of transaction costs so that the amount of capital as well as the amount of land that a "family" employs will be determined by the usual marginal productivity conditions. The interesting question is: what happens to equilibrium farm size if the (rental) price of capital falls? *A priori*, we cannot tell; the answer depends on factor substitution elasticities. To understand this ambiguity, note that (with the "family" as the unit of labor), farm size equals labor productivity divided by land productivity. Therefore, a given exogenous change will raise equilibrium farm size if labor productivity rises proportionately more than land productivity and will lower it in the opposite case.

Either outcome is a possible consequence of a fall in the price of capital. For example, cheaper capital could make the introduction of combine harvesters profitable, allowing a family to farm a much larger area, but without much effect on output/hectare. Labor productivity rises by much more than land productivity and equilibrium farm size rises. However, the introduction of confined animal-feeding units to livestock farming could have the opposite effect: Land productivity rises, but labor productivity could rise by less or even fall.[16] In sum, we can assume that capital becomes relatively abundant and thus relatively cheap as development proceeds, but we cannot be sure of the effect on the size of the family farm; capital that is complementary to land will tend to raise farm size, and capital that substitutes for land will tend to lower it.[17]

Thus the family farm theory predicts that the rise in the reservation utility of "families" that accompanies development will raise equilibrium farm size but that the effects of both cheaper capital and technological advances can go either way. We must recognize as well that development may undermine the family farm theory itself (see the following discussion).[18] So, should we expect to find a simple relationship between growth in GDP/capita and growth in farm size, as investigated in Section 2? Not necessarily, for two reasons.

First, growth in GDP/capita is a highly imperfect proxy for growth in *marginal* family reservation utility. With population rising rapidly in a predominantly agrarian economy, growth in GDP/head can well coexist with rising population pressure on the land and thus with lower reservation utility and smaller farms.[19] Some sub-

Saharan African countries might fit this case, especially where there is significant land degradation; we have earlier noted declining mean farm size in Lesotho and Malawi. Second, the ambiguities associated with technology and capital cannot be neglected; for example, technological advances in agriculture may in some cases have been fast and land-augmenting enough to account for declining farm size in spite of growing GDP/capita, as with several Asian countries during rapid technological change associated with high-yielding varieties of rice, more fertilizers, and modern irrigation techniques. As noted previously, land-augmenting technological change, with unchanged reservation utility, reduces farm size and raises rents. These effects will be offset if nonfarm labor demand is rising faster than workforce growth so that wages (i.e., reservation utility) are rising. If the offset is partial, we have general economic advance, with *rising* wages accompanying a *rise* in the labor-to-land ratio and a *fall* in farm size.

We now consider relaxing assumptions A3 and A4. Assumption A4, that the supply of "families" is perfectly elastic, is unduly strong and, in fact, unnecessarily so. Since the preceding analysis implies, for fixed total land, a downward-sloping demand curve for families as a function of reservation utility (low reservation utility, *ceteris paribus*, means high rent, thus a high number of intensively worked farms), an upward-sloping supply of families—which shifts left as development proceeds—will link development to increasing farm size. In some cases, this would mischaracterize development. The case of a land frontier, as in the United States in the 19th century, might be thought of as one in which total land is fixed but the supply of families is inelastic, though shifting to the right over time; this leads to cheap land and large farms at the outset, with pressures for rents to rise and farm size to fall as immigration proceeds. Subsequent rises in reservation utility associated with nonagricultural growth would then be expected to raise equilibrium farm size again. This appears consistent with Figure 8.

We may relax assumption A3 to allow for heterogeneous land. Then a cross-section application of preceding results 1–3 suggests that good-quality land will earn a high rent and will be farmed in units the relative size of which depends on the nature of land quality differences. A Ricardian "margin of cultivation" is also created. Then exogenous changes (those associated with development, or in taxes or subsidies; see Section 4) will affect the observed distribution of (family) farm sizes through shifts in the margin as well as in the labor/land ratio on farms that remain in operation. Most simply, rises in U, *ceteris paribus*, will reduce total area farmed as equilibrium rent on marginal lands goes to zero.

Spatial heterogeneity raises complex questions, since both input and output farm-gate prices will depend on remoteness, with diverse effects. If farms are trading, adverse farm-gate prices for outputs and, say, fertilizer inputs will create "price scissors," causing rents to be low and farms large. With increasing remoteness, though, the "scissors" could create a limit at which production for sale generates no economic surplus: Beyond this limit farms will be autarkic and small. Further complexities, pulling in different directions, arise if we take into account the following: (1) variations in household reservation utilities (disadvantaged groups could be driven into remote areas; see Section 4.2.1.), (2) price scissors effects vary across outputs,[20] and (3) "remoteness" is not exogenous and might be associated with low land quality, perhaps related to poor access to water. Some recent evidence from Madagascar and Nepal suggests that remoteness raises farm (or plot) size (Stifel, Minten, and Dorosh, 2004; Fafchamps and Stilpi, 2003).

Instead of assuming the family farm theory, is it possible to obtain it formally from a model in which farm size is chosen to minimize unit transactions costs? The literature does not contain any such model, for good reason: for given factor proportions, total (factor) transaction costs will combine (*inter alia*) a presumably concave capital component with a labor component that is locally convex, where labor input starts to include some hired labor and that might or might not be globally convex (Eswaran and Kotwal, ibid: 496). The possibility of multiple local minima of transaction costs per unit land (one being self-cultivation), though making general results unavailable, does imply that the global minimum *may* jump sharply from self-cultivation to much larger-scale operation using hired labor as the capital/labor ratio in farming rises with development—in effect, because labor transactions costs are becoming less important relative to capital transaction costs.

How is the family farm theory to be assessed empirically? If we could identify a group of countries that had experienced minimal "intervention," it would be expected that agrarian systems in those countries would be dominated by family farming and that operated farm size and crop choice variations within them could be plausibly attributed to exogenous variation in, for instance, rainfall, toposequence, soil type, and market access. Inequality in operational land holdings would be expected to be low.

It is difficult to identify countries that have not experienced significant interventions, but those in East Asia could be closest to the ideal type of the theory, conforming to Otsuka et. al.'s assertion that ". . . family farms, either owner or tenant operated, have continued to be a more dominant mode of agricultural production organization than large-scale farm firms or plantations based on hired labor" (Otsuka et al., 1992; here large-scale means 10–15 ha and upward). Basing their argument mainly on Asian experience, they find further support for the transaction cost theory in a contrast between East Asia and South Asia, where large farms with attached labor are more common, by tracing this difference to the inhibition of land tenancy in South Asia, especially India (ibid., p. 2003).[21]

For countries where significant "intervention" has led to highly skewed distributions of owned and operated land, proponents of the family farm theory have sought to trace the way interventions have led to the widespread departures from this model that we observe in practice, especially, as far as the developing world is concerned, the prevalence of large commercial farms in Latin America and Eastern and Southern Africa and of plantations in the Caribbean and Sri Lanka. The general argument, surveyed in great detail by Binswanger, Deininger, and Feder (1995, henceforth BDF), is that large farms, even though inefficient, can generate large surpluses for their owners, provided that the reservation utilities of laborers on these farms can be artificially depressed, so that, in particular, these laborers cannot profitably exit to set up family farms of their own. Transportation of labor is a particularly effective way of lowering reservation utility, and—whether or not there exist any plantation crops for which economies of scale are sufficient to nullify the family farm theory—it might be possible to account for the emergence of slave- and indentured-labor plantations in the Caribbean (and, especially, in Sri Lanka, where indentured Indian labor was employed *instead of* available Sri Lankan labor) in these terms.[22]

It should be noted that interventions of the "land reform" type have generally been undertaken to reverse the effects of earlier interventions that have concentrated land. Assessment of the family farm theory might also use evidence from land reforms, in particular to ask whether the more equal agrarian structures thereby created have proved stable. The theory would be called into question if there were evidence of reconcentration of land following reform. The evidence is mixed (Carter, 1987; Carter and Alvarez, 1989; Zevallos, 1989). Reconcentration might be explained by distress selling in the presence of imperfect credit and risk markets. Historically, this "played a major role in the accumulation of land" in China, Japan, Latin America, and the Punjab (BDF, 2709).

The analysis of links from interventions to agrarian relations and structure forms the subject of Section 4. In this section we concentrate on assessing the assumptions of the family farm theory, which are that (1) technical economies of scale, though (perhaps, for some crops or ecosystems) present at very small farm sizes, are generally exhausted before a size incompatible with family farming is reached, and (2) transaction cost relations in factor and output markets are such as to favor the family farm: In particular, unit transaction costs decline for capital as capital use rises and rise for labor as labor use rises.

3.2 Farm size and efficiency

Before embarking on a discussion of the relation between farm size and "efficiency," we must note two caveats. First, in the presence of transactions costs, efficient farm size is not independent of household endowments of labor and capital. If labor supervision costs are sufficiently important that "labor autarky" is optimal, efficient farm size increases with the number of family members of working age. Likewise, in an

Eswaran-Kotwal world, efficient farm size is dependent on the household's working capital endowment. So, strictly speaking, the following discussion is from the point of view of an idealized household with no capital endowment. Second, except where stated, we think of efficiency in terms of the maximum *expected* return to the household, thus neglecting exogenous risk.

The efficient scale of farm operation depends both on narrowly defined scale economies in production (essentially a matter of lumpiness of inputs and specialization of labor) and on scale-related transaction costs in input and output markets, including both information costs and scale economies in transport and marketing. Empirical assessment of scale economies in production is normally approached via the fitting of production functions to farm-level data so as to measure differences in total factor productivity between large and small farms, as reviewed by Mundlak in an earlier volume of this handbook (Mundlak, 2001). According to BDF (p. 2701), proper empirical assessment of efficient scale ideally requires a measure of "profits net of the cost of family labor, per unit of capital invested."[23] Such a measure not only allows for transaction costs and scale economies, it also allows for the possibility that optimal factor proportions vary with scale (which would in general imply that narrowly defined scale economies would vary according to the factor-proportions "ray" along which they were being measured).

3.2.1 Lumpy inputs

Lumpy inputs give rise to economies of scale, so it could be that the mechanization of farming that results from a rise in the price of labor relative to capital would lead to such a large increase in the minimum efficient scale that the family farm would become obsolete. Studies of the United Kingdom and the United States quoted by BDF suggest that the average cost-minimizing scale might be about 50 ha in British mixed farms or as much as 250 ha in cash-grain farms in Illinois, but as is pointed out there, such large-scale farms "are still managed largely by family labor" (p. 2697). Whether lumpy inputs will have a substantial influence on optimal scale in a given case depends on whether a rental market exists in those inputs, which is itself dependent partly on whether processes are, for example, because of climatic homogeneity, synchronized across farms.

In the United States, for instance, there is an active rental market in combine harvesters, which follow the seasons across the country. Transaction costs associated with the care, maintenance, and transport of lumpy inputs may be such as to inhibit renting, with a potential impact not only on optimal scale but also on mode of organization of farming, which could be essentially driven by the accumulation of wealth in the form of these inputs. For example, it has been argued that when conditions have led to the development of land rental markets, it will be families that own draught animals that will rent and operate farmland (Binswanger and Rosenzweig, 1986).[24] Similarly, in a study of rice farming in one area of Andhra Pradesh (Frisvold, 1994) it was suggested that the ownership of "lumpy" irrigation equipment was determining farm size at a level above that of the family farm (there were about six hired workers per family worker on the average farm). An extra element in this case was that the farms were almost all owner-operated, suggesting the absence of secure long-term land rental contracts that might allow tenants to amortize investments in *immobile* lumpy equipment. Yet it could be that choice of technique rather than mode of production will adjust. Examples are the emergence of hand and treadle pumps in Bangladesh and of bamboo tube wells in India, where the initially introduced tubewell and pump technologies had favored larger scale (Howes, 1982; Singh, 2002).

Management skill is another lumpy input that can account for scale economies. Moreover, good farm managers are more likely than poor managers to find it optimal to manage larger farms. To the extent that the availability of new seeds, fertilizers, and pesticides, together with the possibility of obtaining credit to pay for them, has increased, one expects the returns to scarce managerial skill to have risen, which is lent support by evidence that the impact of schooling on agricultural productivity is substantially higher in such modernizing environments than in traditional ones (Haddad et al., 1991). Where this has in fact induced the acquisition of greater skills, one would expect optimal scale to have risen. Against this, some technological advance might favor local knowledge sufficiently that efficiency demands more intensive managerial input, leading to smaller scale.

3.2.2 Specialization of labor

Economies of scale can arise from this source, but the sequential nature of tasks associated with the annual cycle of production limit such economies in agriculture relative to industry (Smith, 1776; van Zyl et al., 1995). The implication is that once scale economies of the lumpy input type have been exhausted, productive efficiency provides few reasons for an increase in farming scale.

3.2.3 Scale economies in processing and marketing

In principle, scale economies in off-farm processing or transportation have no necessary implication, on their own, for the optimal scale of farming.[25] Efficient use of milling machinery implies that it be used year round in the case of storable crops; whether wheat or rice is brought to market by small or large producers makes little difference. For certain plantation crops, such as bananas, rubber, tea, and sugar cane, perishability or specific delivery requirements, together with economies of scale in processing or transport, create a particularly severe coordination problem between harvesting and processing/transport (Binswanger and Rosenzweig, 1986). Whether there is any implication for efficient farm size depends on how the associated contracting costs depend on scale. If such scale dependence is not too great, there might be little to prevent production by small farmers, tenants or otherwise; indeed, according to BDF, this structure is widespread for sugar cane in India and Thailand. In the

1970s the Kenya Tea Development Authority also stimulated factories' provision of competitive leaf-purchasing services to small growers. Bananas for export present an extra difficulty, since they are a long-gestation crop. So, even though in principle contract farming could work in this case, the transaction costs are more severe than for sugar cane in that long-term tenancy is needed unless the distribution of owned land is relatively even. Processing and transport aside, the spread of supermarkets and the related shift in demand toward products meeting stringent grades and standards have potential implications for efficient farm size that are taken up in Section 5 of this chapter.

3.2.4 Capital-related transaction costs

In principle, one expects that both farm size and the value of collateralizable assets possessed by the farmer will influence the terms under which credit is available. A farm size effect will arise in the presence of fixed transaction costs per loan contract (evaluation of the borrower's creditworthiness by the lender, for instance) and on the presumption that larger farms will demand larger loan contracts than small farms. More collateral reduces transaction costs by reducing deadweight costs of default (a formal account is to be found in Romer, 1986, Ch. 8).

Fixed per-loan transaction costs favor a *large-scale operation*, irrespective of the pattern of ownership and could—if large enough—threaten the conclusion that family farming is efficient. In contrast, collateral-related transaction costs favor *owner operation*, when land is the form in which wealth is predominantly held. If land is unequally distributed, the efficiency of family farming is again put in doubt. However, there could be institutional mechanisms that enable the disadvantages of small scale or low wealth to be sidestepped, notably the interlinking of markets. Thus Binswanger and Rosenzweig (ibid.) argue that unequal ownership of land need not prevent an equal distribution of operated land emerging, since large landowners can obtain capital cheaply and pass it on to tenants without incurring substantial transaction costs; there is already a contractual relationship between landlord and tenant and their continuing interdependence is likely to inhibit voluntary default. Moreover, to the extent that equilibrium land prices contain a collateral-value component, would-be family farmers cannot profitably buy land on mortgage, so tenancy rather than land purchase is the equilibrium outcome. A countervailing effect, however, is that (long-term) investment *demand* by tenants could be lower than that of owners if tenancy contracts are relatively short term (see the earlier discussion of Andhra Pradesh rice farming). Landlord/tenant relations aside, there could also be interlinking of credit and output markets, whereby merchants advance credit to farmers with whom they already have trading relationships, obtaining security via the threat of retaining (and causing other merchants to retain) output market receipts and reducing the transaction costs of small farmers (Bell, Srinivasan, and Udry, 1997).[26]

We now consider the empirical literature on the distribution of agricultural credit in developing countries. Generally, big farms borrow formally from lenders whose many branches reduce covariate risk; small farmers borrow informally from local lenders, whose lower costs of credit supervision (reducing adverse selection and moral hazard) and of repayment enforcement are more important, in dealing with poor customers, than is low risk covariance. A key problem for research has been the separation of credit demand and supply; it is well known that small producers are less likely than large producers to obtain formal sector credit, but this could reflect low demand or supply. Thus in a study based on Indian data, Kochar (1997) finds using a univariate probit that 81% of rural households do not obtain formal loans, with both land area and quantity of irrigated land being significantly associated with the loan probability. When demand and supply are separated, the estimated probability of rationing falls to 40%. Moreover, the principal factors determining rationing are regional rather than individual: Regional grain yield, *total* regional bank credit, and length of concrete road matter, whereas the household landholding variables are not significant. In contrast, Barham, Boucher, and Carter (1996) *do* find, in a study of Guatemalan households in which credit demand is measured using a questionnaire (allowing the identification of those who do not apply for credit because they anticipate rejection) that lower household wealth raises the probability of a household being constrained by credit supply. Similarly, Sial and Carter (1996), in a relatively homogeneous sample of peasant grain producers in Pakistan, find that the estimated shadow value of capital is higher for less wealthy households.

Carter and Olinto (2003) consider the interplay of two potential effects of land ownership on investment. As noted earlier, land ownership can increase investment demand at the same time as net land wealth relaxes credit supply constraints because of collateralization. In a panel of 284 Paraguayan farms, in a subset of which title (in effect) was acquired between the two survey dates, these two effects are separated via a distinction between attached and movable capital. Up to 5 ha, the credit supply constraint is biting so that titling causes a *shift* from movable to attached capital; above about 8 ha, titling raises movable capital (along with attached capital) rather than lowering it.[27] It is concluded that below 5 ha, titling does not relax the credit supply constraint (although it does alter the type of investment), whereas above 8 ha the credit constraint is relaxed. The implication of these results for the Binswanger/Rosenzweig view that ownership as such does not matter are therefore mixed for farms under 5 ha; ownership does not affect total credit supply, but it does alter the type of investment, enabling farmers (efficiently, one supposes) to take a longer view.

3.2.5 Labor-related transaction costs

Labor supervision costs in agriculture differ fundamentally from those in industry (van Zyl et al., 1995). Machinery in industry is stationary and so accordingly is the labor that operates it; in agriculture, both machinery and labor move, raising supervision and management costs. Such costs are therefore likely to be particularly significant in agriculture, favoring a structure of family farming in which, for the most part, labor is hired temporarily to meet seasonal bulges in labor demand. If hired labor, when imperfectly supervised, is less productive than family labor and if supervision is in fact optimally imperfect, it might be possible to infer the presence of supervision costs from separate treatment of family labor and hired labor in the production function. Early studies (Bardhan, 1973; Deolalikar/Vijverberg, 1983, 1987) suggested that, if anything, hired labor was *more* productive than family labor, but it is argued by Frisvold (1994, ibid.) that such results may be attributable either to quality differences between hired and family labor (hired labor could, for example, be predominantly female) or to endogeneity (e.g., a farm with a bumper harvest is likely to need to hire more labor at harvest time). Frisvold's own research (1) uses a panel of plot-level ICRISAT rice-farming data, together with time and household dummies (among others), (2) considers only pre-harvest labor inputs, and (3) estimates supervision time directly as family labor employed on the same plot and task simultaneously with hired labor. He finds a significantly positive but small effect of supervision on effective labor input: At sample means, the estimated elasticity of effective labor input to supervision time is 0.07. In spite of this low elasticity, output losses associated with imperfect supervision are estimated to exceed 10% on more than 40% of plots; the level of hired labor is high, for reasons noted earlier, and supervision costs can account for the estimated output losses.[28]

One way of investigating labor transaction costs is via *recursiveness* (Sadoulet et al., 1988). If the opportunity cost of labor to the household is the market wage, it is possible in the absence of other market failures to solve the household problem recursively: production behavior first, and consumption behavior afterward. So, for instance, production behavior should then be found to be independent of household demographic variables such as the number of working-age adults. Labor transaction costs that open up a gap between shadow wages for labor sale and purchase should not destroy recursiveness, provided that sellers and buyers are grouped separately. In an advance on earlier studies that had tested for (and usually rejected) recursiveness globally, Sadoulet et al. split their sample of Mexican *ejidatario* corn producers into labor sellers, labor buyers, and labor nontraders and found that recursiveness held except for the nontraders. For nontraders, on average, the labor transaction costs were found to be very important. For instance, a typical household with three irrigated-equivalent hectares of land would not hire labor unless its number of unskilled male equivalents fell below two, yet would not sell labor unless this number rose to six (ibid., Figure 2). By allowing the shadow wage gap to vary across districts, the authors could also identify some determinants of labor transactions costs, such as the density of organizations for infrastructure, input acquisition, credit, and marketing.

3.2.6 Risk and efficient scale

The extent to which risk affects the behavior of a risk-averse farmer depends both on constraints on consumption smoothing across time and on imperfections in insurance markets. If both are present, farmer decisions will depend not only on expected profit but also its variance (and higher moments in general). Rosenzweig and Binswanger (1993) demonstrate a link from weather risk (especially spatially covariant, so hard to diversify) to portfolio choice in a sample of Indian farmers by showing that (1) household consumption is particularly sensitive to weather shocks and (2) the estimated marginal effects on the mean and variance of profit of increasing the quantity of a given asset are positively correlated. In other words, weather risk is transmitted into consumption risk and, as a result, marginal expected returns on different assets are not equalized. Moreover, weather risk causes poor farmers to favor safe low-return assets, raising the possibility that, as a result, wealth inequality might rise through time: however, this effect is found to act as no more than a partial offset—even at high levels of weather risk—to a strong negative relationship between the rate of return on wealth and wealth itself. Asset choice aside, poor farmers may also mitigate risk exposure by diversifying crops or household labor allocation. To the extent that this raises off-farm work by household members, this effect will tend to lower the size of the family farm.

In sum, spatially covariant risk and wealth can both have important effects in practice on farmer portfolio choice and crop choice as well as on household labor allocation. Wealth will matter either if risk aversion varies with wealth or if access to credit and insurance markets is wealth dependent. Whether there is an implication for equilibrium scale then depends, just as discussed under capital-related transactions costs, on whether contractual arrangements between tenant farmers and landlords and merchants are such as to allow efficient risk spreading.

3.2.7 Accumulation, adoption of new technology, and the dynamics of farm size distribution

Discussions of "the" efficient scale of farming in a particular context must take account of the inconvenient fact that farm size is normally far from equalized within countries. The family farming theory predicts that variation in equilibrium farm size (for given market prices, technology, and household reservation utility) will arise from variations in household size, agroecology, transport costs, and—if land or capital markets are imperfect—household endowments of these factors. Agroecological variation will have its effect partly through choice of crop. So, in advanced countries, where imperfections in land and capital markets as well as transport costs are relatively low—and where, as noted earlier, family farming does for the most part still predominate—much farm size variation could be attributable to agroecological factors, often working through crop choice (large wheat farms in one area and smaller strawberry farms in another, for instance).

In developing countries, however, there is evidence of enduring heterogeneity across households, especially that arising from the endowment of working capital as in Eswaran-Kotwal, that will generate a corresponding heterogeneity in farm size and dynamics that depend, in that case, on the pattern of capital accumulation. Technology represents another potential source of heterogeneity in developing countries if adoption of new technology is scale dependent. This is likely if information acquisition, credit markets, or willingness to take risk exhibit-scale dependence or if, in the case of export crops especially, there are scale economies in processing and marketing. Whether there will be equalization or unequalization of the operated land distribution over time will depend (via feedback from profits to land acquisition and disposal) on the strength of any scale effects together with the effectiveness of institutional mechanisms that might emerge to circumvent them.

The evidence on the uptake of high-yielding varieties of rice in Asia suggests longer lags in uptake by smaller farmers but eventual scale neutrality (Hazell and Ramasamy, 1991).[29] The history of agroexport booms in Central and Latin America suggests, however, that these have been associated in the past with a pattern of adoption and accumulation that has entrenched a dualistic structure.[30] Labor-intensive nontraditional (NT) exports thus present a particularly interesting case, which has been studied using a 1991 agrarian history survey of highland farmers in Guatemala by Barham et al. (1995). This paper finds, on one hand, that small farms had a high probability of participating in NT (73% of farms of 1–2 ha planted some) but also that there was, among small farmers, evidence of a ceiling on the area planted to NT for farms in the range 2–4 ha. This would be consistent with a financial constraint affecting these farmers (rather than a labor supervision constraint, since for farms above 4 ha area planted to NT began to increase with farm size). The authors conclude that "the ability of the Latin American peasantry to participate in agroexport expansion is quite fragile," since "of the various factors likely to favor different operations in the adoption process, only labor supervision diseconomies cut clearly in the direction of small farms" (ibid., p. 106).

3.2.8 Evidence on scale economies and the "inverse relationship"

Here we consider the empirical evidence on production scale economies as well as the inverse relationship (IR) between size and land productivity (and the labor/land ratio) that has been found in many studies of developing countries. What stands out in Mundlak's survey (ibid.) of the cross-farm microeconometric literature on production scale economies is the pervasive difficulty presented by unobserved heterogeneity, especially cross-farm variation in the quality of management. If farmers better endowed with management skills both run a farm of a given size more efficiently than the less well endowed and (as is reasonable, on the transaction cost view) find it optimal to choose to operate larger farms, then cross-farm regressions relating a measure of profit or output to size and other inputs will overstate returns to scale. Such unobserved heterogeneity does not appear to be confined to management skill: In a study of 3000 U.S. districts, the introduction of regional dummies was found to reduce the estimate of the returns to scale parameter from 1.167 to 1.05 (Kislev, 1966, cited in Mundlak ibid.). The suggestion from cross-country studies that in developing countries the returns to scale parameter might be well in excess of 1.0 has been proved vulnerable in just the same way.

Cross-farm studies in developing countries include work on India by Yotopoulos and Lau (1973) and Carter (1984). Neither study can reject constant returns to scale in production overall, but when farms are disaggregated by size in Carter's study, small farms (those of less than 10 acres) are found to be about 15% less efficient than the remainder (based on data for the Punjab for 1969–1971); Carter suggests that the gap could reflect relatively slow take-up of HYV technology on small farms, in line with the evidence cited earlier.

For developing countries and with the exception of plantation crops (sugar cane production in Brazil), a strong "inverse relationship" has been found in the studies just cited and in many others.[31] For example, in a study of the Muda river area of Indonesia, Berry and Cline (1979, Table 4.48) find a sharp decline in the value of farm output/unit of land from the smallest farms (less than 1.5 relong, equivalent to about 0.4 ha) upward, with this measure 2.4 times higher for the smallest farms than for those in the largest group (6–12 ha).

How robust is the IR? It has been suggested that could in part be a spurious artifact of the omission of land quality from regressions of yield on farm size, since better-quality land might tend to be farmed in smaller parcels. Bhalla and Roy (1988) found in a study of Indian agriculture that the IR was weakened by geographical disaggregation, consistent with the idea of a bias arising from cross-district land-quality variation. Such tests are, however, rather indirect, and the use of even more disaggregation (village-level dummies in Carter, 1984, and household-level dummies in Heltberg, 1998) suggests that the IR is immune to the land-quality objection.[32] A recent Uganda study by Nkonya et al. (2004) finds a strong negative effect of *farm* size on *plot* output value after controlling for plot size, labor input, equipment, and a wide range of other factors, including land-quality proxies, suggesting that not only land productivity but also total factor productivity is higher in plots belonging to smaller farms.

Such findings are consistent with the Eswaran-Kotwal analysis discussed earlier, the effect of which is that labor supervision costs are low, both on average and at the margin, on farms with a relatively high ratio of family labor to land—that is, on small farms. Supervision costs are not the only route by which a wedge can be driven between the opportunity costs of family and hired labor. It might be that family labor is more or less "captive" because the probability of off-farm employment is low due to high unemployment rates or because off-farm labor markets do not exist for some categories of labor (Kutcher and Scandizzo, 1981). In this case, however, an inverse relationship for land productivity but not total factor productivity would be expected. Estimates of the "wedge" can be large: Carter (1984) estimates that the shadow wage on small farms is some 35% below the market wage and the estimates of Kutcher and Scandizzo for Northeast Brazil, comparing family and nonfamily farms, are of similar magnitude (ibid., Table 4.6). Clearly, these results are important indirect evidence for the central plank of the family-farm theory, namely the economic distinctness of hired and family labor.

What are the implications of the IR for socially efficient scale? This question is hard to address in the abstract, not only because it will depend on what shadow price is chosen for labor, but also since what is (socially or privately) efficient will depend on what transactions costs have to be borne and that could depend, for instance, on the distribution of ownership. In other words, we cannot separate efficiency from equity in general. Nevertheless, we can put that difficulty to one side and try to estimate social profits per hectare at different scales of operation, using specific assumptions on the shadow price of labor. Berry and Cline's work on Brazil (ibid., Ch. 4.1) estimates "social factor productivity" by taking gross receipts divided by a measure of aggregate input,[33] finding that this is mostly maximized for the second smallest size class (10–50 ha). Rosenzweig and Binswanger (1993), using the ICRISAT panel, find that their measure of profit per unit area is highest in the smaller size groups.

Further support for the proposition that higher scale does not confer efficiency advantages can be found in a study of late 18th century enclosures in England by Allen (1982), using data on 231 farms originally collected by Arthur Young. Allen finds that the enclosure process had little effect on arable husbandry or yields but amounted to an expropriation of farmers' surpluses by landlords, essentially via expropriation of common grazing rights. This partly explains why, in the simple cross-section of enclosed and open farms, rents are *not* higher on the enclosed farms, as one might have expected on an "expropriation" view (the rest of the explanation is that land quality on enclosed farms in the sample was worse than on open farms). As Allen remarks: ". . . the enclosure movement might be regarded as the first state-sponsored land reform. Like so many since it was justified with efficiency arguments, while its main effect (according to the data analyzed here) was to redistribute income to rich landowners" (ibid., pp. 950–1).

It should be noted that the enclosed and open farms in Allen's sample are of similar average size (about 120 ha); despite this, enclosure is clearly interpretable as a rise in scale of operation.

4. DOES CONCERTED HUMAN ACTION ACCOUNT FOR FARM SIZE?

4.1 The argument of this section

We have argued that equilibrium farm size tends to rise with development. Yet big proportions of land remain in small farms in some developed countries (Europe) and in large farms in some developing countries (Latin America, Southern Africa). In addition, farms in Asia have got smaller during development. Are such anomalies due to concerted human action? Two such actions, colonial land grab (Section 4.2) and land reform (Section 4.3), are intended to affect farm size, and do so via both laws and incentives to avoid laws. Farm size may also be affected by policy interventions *not* mainly intended to change it. Farm production functions are changed by agricultural research and other policies affecting technical progress; impacts on farm size were explored theoretically in Section 3. In Section 4.4, we first demonstrate analogous effects on farm size from policies affecting farm input and output prices—taxes, subsidies, and foreign trade intervention—and then sketch relevant evidence from OECD farm subsidies and developing-country farm taxes.

4.2 Colonial land grab

Some developing countries have very high farmland Ginis (Table 2.3); much land in “underfarmed” giant holdings; yet big impoverished rural populations crowded into “overfarmed” tiny farms. Does these countries’ history of enforced colonial land seizure explain these phenomena? This breaks down into several subquestions.

4.2.1 Where did colonial land grabs happen?

In most of West and Central Africa, colonists saw little gain in seizing and farming often low-grade land. In most of Asia, land quality was higher, but land grab would have implied high costs in acquiring and securing formal land rights from, and then controlling or reconciling, farm populations that were often densely settled and with formal land rights. Nor, in these areas, did colonists’ efforts to suborn local clients, *compradors* or tax farmers, lead to land grants that greatly raised farm scale; claims that this happened rest partly on a mythology of pre-colonial equality. In particular, British colonialism in India probably had little ultimate effect on land inequality (see, e.g., Kumar, 1983; Stokes, 1983). In these regions, colonial and other plantations typically occupied below 5% of farm area. Today, Ginis of operated land are modest, around 0.3–0.6. Most land is operated in small farms (Table 2.3), compatible with efficient supervision of labor-intensive operations.

In much of Latin America, the Caribbean, and Southern and Eastern Africa and in a few areas of Southeast Asia and India, colonists took over large proportions of land, mainly for commercial farming.[34] Despite their protestations that such land had previously been empty (the pseudo-frontier), usually it had been long used by indigenous people, sometimes via cyclic bush fallowing, hunting/gathering, or grazing. By expelling them, often into tiny holdings on remote, hilly, and inferior marginal land, colonizers of better land created a highly unequal, possibly inefficient large-farm system that survives today.

4.2.2 In such areas, why did colonizers tend to farm large, unequal holdings?

Colonizing nations might have seen land seizures as creating farm options for many of their poor people, affected, perhaps, by domestic population growth or land exhaustion. This would have suggested small-scale, labor-intensive farm colonization, as implied in writing on emigration in 19th century Britain. However, there is no example of such "small-scale egalitarian colonization" in the classical colonial period. Even in our own time, "internal colonialism" (except for Chinese land policies in Tibet in the 1990s) appears soon to have involved highly unequal settlement, for example, on some lands seized by Mengistu's government in Ethiopia and Mugabe's in Zimbabwe.

Why does forced farmland seizure by a colonizing state and its army tend to create large ownership holdings for a few conquerors? First, raising and leading armies is expensive and risky, attracting people with resources and risk-bearing capacity, who will hazard them only in expectation of large rewards. Second, even if it is later colonial arrivals who are the initial farmers, breaking and managing unfamiliar land involve high risks and often long gestation periods. These are likeliest to be accepted by better-off people, perhaps with experience of substantial entrepreneurship.

An exception is the appropriation, for owner-farming, of Native American and Inuit lands in North America. Only in the Southern United States did this conform in some respects (large farms, great land inequality, agrestic servitude) to the Latin American model. Elsewhere, relatively small, not-very-unequal, owner-operated family farms were normal, as the United States absorbed Native American areas soon after Independence—well before codification in the 1862 Homestead Act, which granted newly farmed land in fairly equal and, given land quality and productivity, small homestead units (Barrington Moore, 1996; Sokoloff and Engerman, 2002).

4.2.3 Soon after colonial land seizures, why were operated farms often large?

The spread of large ownership holdings of farmland is easier where there is an extensive margin, land frontier, or pseudo-frontier. This avoids land marketing costs (although perhaps by renewed colonization or theft at the pseudo-frontier). However, even far from a land frontier, one can reconcile large *ownership* holdings with small, efficient *operated* farms. Leasing, sharecropping, or labor tenancy developed in Southern Africa (often illegally), Latin America, and the Southern United States after post-Emancipation land reform was aborted (Herring, 2003). Yet huge, owner-operated farms cover most cropland and private grazing in much of Latin America and Southern Africa. Why? Given the advantages of small-scale farms in early development, if large landowners can internalize some of the gains by selling or leasing land into smaller farms, would agency costs in land or other markets prevent this for long?

The advantages of small farming were muted for some decades after colonization, which often brought brutal consequences—widespread deaths from disease or war (Diamond, 1999) or expulsions—for indigenous peoples, sharply cutting labor/land ratios. Settlers to take their place were initially much fewer. Settler expansion into thinly populated, traditionally farmed areas was enforceable. Also, labor-linked transaction costs could be cut where labor could be denied mobility: enslaved or coerced into agrestic servitude, sometimes with the help of a head tax (Arrighi and Saul, 1973). *Temporarily*, larger farm size paid.

4.2.4 If large and unequal farm size became inefficient in colonized countries, why didn't it adjust?

As population, person/land ratios, and labor mobility grew in Latin America and Southern Africa, why was efficiency not achieved by more land transfers from big owned to smaller operated holdings (sale, lease, sharecropping, contract farming, etc.)—that is, why should the early colonial size-distribution of owned farmland affect that of operated farmland for long afterwards? First, where farm operation (as well as ownership) is inherited, large farmers may prefer perceived "life-style advantages" to profitable sale or lease to more efficient smaller units. Second, efficiency-induced pressures to cut operated farm size are reduced if large-scale owner-operation confers local extra-economic status, power, and income. Third, ethnic barriers could limit local competition. Finally, insecure property rights deter leasing: once admitted, tenants may later keep land at the point of a gun—or a vote.

4.2.5 The special case of plantations

Large proportions of farmland and workforce in the southern states of colonial America, the Caribbean, and southern and eastern Africa—and small proportions elsewhere—were appropriated by colonists for a special case of large-scale farming: plantations. But how did they affect farm size after colonial land grab? Almost always, land-water regimes provided special advantages for export crops (tea, coffee, cocoa, rubber, cane sugar, cotton, tobacco, spices) with high labor/land ratios. These lacked scale economies in production, but needed swift, orderly collection for processing, which did feature them. Nowadays, labor-intensive small-farm production is often combined with large-scale processing. However, initial colonization often drove away, killed, or dispossessed much production labor. Also, many new colonial landowner entrepreneurs chose to be absentees, unable to supervise typical paths to labor-intensive production—small-scale tenancy or sharecropping—without severe agency problems. These were eased by cutting labor's reservation utility via the plantation system (Section 3.2), with various forms of labor tying, repression, serfdom, slavery, or (above all) labor import and indenture. These same features, together with workforce growth, explain both the initial competitiveness of plantations and their later decline (Hayami, this vol.).

4.3 Land reform and farm size

4.3.1 Definition, initial situations,[34a] candidate land reforms

Land reform means legislated interventions in farm size, tenure, or transfer conditions designed to change farm size distribution. The stated motive of most land reform is more equitable distribution of *owned* landholding, but this normally has major effects on our concern in this paper: *operated* farm size. Largely compensatory, gradual, consensual land reforms in many countries have led to big falls in owned and operated farm size (Section 4.3.3), contrary to conventional wisdom. Less controversially, forcible, swift, often noncompensatory reforms have transformed operated farm-size distributions for more than a third of the world's farmers, through either internal revolutionary processes (e.g., Mexico, 1915–1925, 1934–1940; Russia, 1917–1929, 1926–1935) or external action. For example, most of East Asia before 1939 had some big and much tiny farming, very unequal, and semi-feudal or landlord dominated. From this base, (1) China made three *internal revolutionary* transitions: to much less unequal, owner-operated holdings in 1950–1952; to collectivization in 1958–1962; and to egalitarian, quasi-private "household responsibility" farms in 1977–1984;[35] (2) *external (U.S.) action* led to direct transitions to fairly equal, mainly owner-operated holdings (Ladejinsky, 1977) in Japan, 1946–1950 (Dore, 1959; Kawagoe, 2000), Korea, 1950–1955 (Ban et al., 1980), and Taiwan, 1949–1955 (Yager, 1988).

To see how land reforms work (and affect farm size), we distinguish four main pre-reform situations.

In *communal-customary tenure*, an individual (person, household, kin-group), while taking farm decisions and keeping usufruct, has land transfer rights severely limited by "the community." Individual vis-à-vis communal (or chiefly) powers to sell, rent, gift, bequeath, or mortgage land vary (Noronha, 1985). Usually the community shares grazing land, but animals are privately owned; cropland is farmed privately but not transferable outside the commons. Communal tenure covers almost all land in cyclic bush fallowing and much settled farmland: in sub-Saharan Africa, most farmland; in decollectivized land systems, the areas left in "usership" or "lifetime possession"; in Mexico, the privately run 80% of the "vast area" farmed by 3 million *ejido* households (Heath, 1992, 695–6); and substantial areas elsewhere.

Smallholder individual tenure typifies South and East Asia.[36] Over 70% of farms are largely family cultivated. Most (Table 2.3) have less than 1 ha of irrigated land (or 2 ha of rain-fed land). Less than 25% of land is in holdings above 10 times that size. And 5–30% of land is rented.

Latifundia-minifundia systems, in some cases plantation-like, are mostly Latin American. Private landowners with 100–10,000 ha, often absentee yet with local sociopolitical power, are patrons and employers for many families; each usually also farms 0.1–0.5 ha leased out, or transferred in return for labor, by its employer. Land reform and other pressures in 1950–1980 sharply raised the proportion of land in small farms. Later rural emigration and market structure changes (Section 4.4.6) are transforming many remaining largeholders into resident, capital-intensifying farmers (the "Junker path" of Binswanger et al., 1995, and de Janvry, 1981); other rural people move to the nonfarm sector, casual hired farm employment, or smallholding.

State or collective farming, despite reforms, dominated the FSU, and some persists still. It has similarities to colonial farming systems in Southern Africa. A few thousand people—large white farmers, or collective- and state-farm managers—command most farmland. Such farm systems are in transition; we ask which transitions involve "land reform" and the effects on farm size.

In these tenurial environments, there are many candidates for "land reform." We first consider classical Land Authority (LA) reform (Sections 4.3.2–4.3.4) and then a number of alternatives: titling, patrialization, tenancy, laws to restrict or regulate it, consolidation, settlement schemes, collectivization and its reversal, and 'New Wave' land reform.

4.3.2 The distributivist LA model

Here, a date is legislated, by when individuals or households (or, in principle, state or collective farms) must surrender land owned above a *ceiling* to a state LA. By a later target date, the LA divests land to land-poor or other target households. Such reforms, despite much avoidance and evasion, have been widely implemented partially in the latifundia-minifundia systems of Latin America and in the most in unequal parts of the smallholder systems of Asia, and massively in state and collective lands worldwide (4.3.4.vii; on Romania and Bulgaria [Brooks et al., 1991: 158–9]). The farm size effects depend on:

- Whether land is measured in ha or "efficiency units" allowing for soil quality, irrigation, and so on[37]
- Whether land is distributed, or permissibly kept, per household, person,[38] or family worker[39]
- Whether priority for redistribution goes to the landless, the poorest, or those needing least land to bring them to a floor (so the largest number can benefit)
- Whether land is distributed as a set amount (perhaps quality-adjusted) per beneficiary or to increase the holding to a set size (a floor)
- Whether post-redistribution holdings must suffice for a full-time livelihood (however defined)
- Whether high or low ceilings are set (seeking, respectively, fewer losers or more beneficiaries)
- Whether small or large per-beneficiary amounts (or floors, if any) are set

This last choice is crucial. Small amounts enable many people to be helped, if often only a little. It is widely claimed that this creates "unviably small" post-reform holdings, a concept that overlooks the worldwide facts of (1) part-time farming and (2) very small-scale farming where land is scarce, together with (3) the absence of evidence that either of these is inefficient. Moreover, if redistribution created inefficiently small holdings, agglomeration through sale or lease would be expected, so that the improvement in equity would not be at the expense of efficiency. Farm size effects of LA reform also depend crucially on implementation and verification. A key civil servant during the West Bengal reforms of 1969–1971 has analyzed the components required (Bandyopadhyay, 1995, 305, 319–20).

4.3.3 Did LA-led reforms substantially affect farm size distributions?

Absent political support, LA reforms suffer delay in vesting and divesting land, evasion, shortfall, corruption, and disappointment. Yet in many countries they shifted much land from rich to poor. So why did "commitment to redistributive land reforms...wane during the 1980s" (FAO, 1991)?[40] Despite some revival in the 1990s in the FSU and Southern Africa, Rashid and Quibria (1995: 133) "consider . . . land reform passé." This reflects doubts that LAs have distributed much land. These doubts sometimes rest on errors of fact; on seeing reforms as failures unless they fully achieve targets; on unrealistic expectations, for example, that land reform alone can end most rural poverty; and on inattention to indirect effects (that much avoidance and evasion of LA reforms still makes farms smaller, and that much avoidance and evasion of LA reforms still makes farms smaller, and that smaller farms help the landless, by using more labor per hectare). Yet the doubters have a case. First, land shortage reduces *supply* of above-ceiling land for distribution: increasingly "the sheer numbers of landless people . . . render [distribution of plots large enough to suffice for a livelihood] financially unfeasible and politically unpalatable," tending to "reduce" the LA model to distribution—albeit substantial—of very small field plots (and even more of home garden plots)[41] (Hanstad et al., 2004; cf. Mitchell and Hanstad, 2004) or even of land for dwellings only (Herring, 1983). Second, in Asia, despite big LA-style reforms, *demand* for land reform is uncertain. Land inequalities are usually far less than in pre-reform Latin America. Often, LA reform is alleged to be complete, as in China in 1977–1985,[42] or bogus, as in South Asia. Third, political pressure for land reform can weaken where land shortage causes less poverty than before: The Green Revolution has greatly raised yield on many tiny Asian holdings, and the Asian poor's dependence on land is moderated by education, nonfarm growth, and fertility decline.[43] These trends are weaker in Southern and Eastern Africa. There, land inequality is greater, rich-to-poor LA reforms fewer, and their urgency greater.

4.3.3.i South Asia In much of Northern India and Bangladesh after independence, "the zamindari system [in which land tax was funneled to the colonial power through] rent-collecting intermediaries . . . was abolished . . . millions of tenants were made secure on their land and freed from a host of illegal exactions" (Singh, 1990: 293; 278, 285), though beneficiaries were seldom the very poorest. The scale of reform—and in India the compensation, Rs. 6.7b in 1950–1956 prices—was vast. "Statutory landlordism constituted in 1947–1948 . . . 57% of the private agricultural land in British India [and more in] princely states . . . Over 20m tenants were brought into direct relationship with the State [as owners, paying much] less by way of land revenue" (Saxena, 1990: 116–7).[44]

Was the second, LA phase of land reform—redistribution of land in an intermediary-free system—frustrated in South Asia (Dore, 1959)? "It is conventionally thought that ceiling-redistributive reforms in India have achieved little" (Mearns, 1999) and there *was* widespread evasion of ceilings. In India by 1990, "only" 2.9m ha had been declared surplus, 2.4m possessed, and 1.8m distributed to 4.1m beneficiary households. As with the further 0.9m ha distributed in 1952–1954 in the Bhoodan movement (Section 4.3.4.ix), most land was poor, and the scale of direct distributions was "too small to make an impact on landlessness" overall. Yet LA reform reached beneficiaries, including—with families—12–18m members of scheduled castes and tribes, most of them poor (Saxena, 1990, 124–6). These numbers are not negligible compared to the 163m ha of arable land and 80m agricultural households in 1990 (FAOSTAT, 2004),[45] and especially to the 25m ha of land in 63m holdings below 1 ha (DES, 2004, Table 16.1). Also, substantial indirect land redistribution was caused.[46] Big farmers sought to evade LA ceilings via bad-faith sales and transfers, but transferees began to insist on their rights (Vyas, 1976). Field studies even in notoriously evasive states show substantial reform-induced shedding of surplus lands to poor farmers (Yugandhar et al., 1990, for Bihar). In all, "the threat of ceilings [seems] to have prevented the further expansion of large holdings and . . . redistribution of even very small plots of homestead land has brought substantial benefits to the poor" (Mearns, 1999).

Even tenancy restrictions—though usually counterproductive *without* potentially enforceable LA ceilings (Section 4.3.4.ii)—can get land rights to the poor *with* ceilings, which impede landowners from responding to restrictions by evictions. In Kerala and West Bengal, political activism helped such enforcement, and poor tenants improved their position. In Karnataka (Manor, 1989, 353–60), populist politics led to successive land reforms that benefited castes comprising mainly poor tenants. In India overall, though evictions in the wake of tenancy regulation sharply cut the proportion of land *tenanted*, the proportion of land *farmed in small holdings* rose[47] due to sales to escape ceilings legislation (and to partible inheritance alongside population growth; Vyas, 1976). The proportion of operated land in holdings up to 1 hectare rose from 39% in 1961–1962 through 46% in 1971–1972 and 56% in 1981–1982 to reach 62% in 1995–1956 (Singh, 1990, 66; DES, 2004; Swamy, 1988, 561).[48] India is among several countries in which fragmentation of land among growing farm families, plus a just-plausible threat of ceilings implementation, prevented land concentration: both owned and operated holdings became slightly less unequal (Sanyal, 1988; Singh, 1990, Ch. 3). This pattern appears confined to countries with land reforms—and covers some, such as Pakistan and Sri Lanka, with much evasion.[49]

4.3.3.ii Latin America Experience with ceilings-based "land authority" reform in Latin America and West Asia is summarized in Table 7. In Latin America, land reforms after the mid-1980s slowed down in part because several countries had largely completed them (Thiesenhusen, ed., 1989), although Ginis remain high (Table 3), especially in the largest countries. In 2006, ceilings reform is back (though ill-planned and confrontational) in Venezuela and Bolivia, while in NE Brazil and Colombia (Deininger, 1999;

Table 7 Land authority (classical) land reforms in Latin America and West Asia

Where	When	Outcomes: Land Transfers	Outcomes: People	Change in Distribution	References
Mexico	1918–1968	64m ha, 65% of 1961 farmland		Farmland Gini still high (.68 1991)	Otero 1989: 27; King 1977: 93
Ecuador	1964–1983	0.8m ha, 9% of farmland	15% of farm families received land	Share of land in holdings > 100 ha fell from 37.1% (1954) to 22.1% (1974)	Carter and Alvarez 1989: 23–43; Carter and Mesbah 1993: 291; Zevallos 1989:50–2
El Salvador	After 1980	Land acquired from holdings above 100 ha	22.7% of rural households received land		Strasma 1989: 409–12; Diskin 1989: 429–43; Powelson 1984: 105
Dominican Republic	Between 1961 and 1981	83,000 ha (2.7% of 1961 farmland) as private parcels and 30,000 ha as collectives	32,275 private parcels created, comprising 13% of peasant holdings		Stanfield 1989: 319–23
Peru	1969–1980	About 8.6m ha, 40–50% of farmland, acquired	375,000 direct beneficiaries, 24% of rural workforce	Land Gini 0.91 (1972), 0.86 (1994)	Carter and Mesbah 1993: 288–9

Chile	Up to 1973	0.9m (basic irrigated) ha acquired (20% of 1973 arable area). 1986: 57% still in reform sector		Land Gini 0.92 in 1996	Jarvis 1989: 245 Thome 1989: 204
Iraq	1958–1982	1958, 1970 reforms affected 60% of arable land by 1984	322,000 (56%) of ag. households got land by 1980	Land Gini 0.90 (1958), 0.39 (1982)	El-Ghonemy 1990: 216–21
Iran	1962–1975, in three stages	53% villages redistributed	1.9m families got land		Amid 1990: 93–9, 102–3

Tendler, 1991) it has been inserted into New Wave reform (Section 4.3.iv.ix). Overall, Table 7 and subsequent events suggest much land redistribution (though even more was targeted, and in some cases, such as Mexico,[50] there might may have been reconcentration). Unduly gloomy is the conventional wisdom that land reform has achieved little:

- It has been claimed that in Mexico "the revolution . . . did not modify property relations fundamentally" (Otero, 1989, 277). Yet in 1918–1968 intermittent but at times "truly revolutionary reforms" had redistributed two-thirds of farmland. There remained huge inequalities and many near-landless farm workers (King, 1977, 93), largely *indigenos* whose alienation precipitated violence in Chiapas from 1994.
- Despite the changes in Ecuador reported in the table, with little reconcentration (Zevallos, 1989), Carter and Alvarez (1989) report claims that neither the 1964 nor the 1970 reform brought "major redistribution of land."
- In El Salvador Diskin (1989, 429–43) claims that "a much-vaunted smallholders' reform has accomplished only [sic] half its goals . . . 40 per cent or more of the rural [landless] are not statutorily included". Yet "22.7 per cent of rural families benefited," a big achievement, even if less than "a goal of 60%."
- In Chile many stress Pinochet's counter-reforms, yet by 1986 most land acquired before the 1973 coup had stayed in the reform sector under cooperative or individual management (Jarvis, 1989, 245).
- Other Latin American countries have had substantial land reforms, but Colombia exemplifies aborted reform (de Janvry and Sadoulet, 1989). In Argentina and (despite experiments in the NE) Brazil, access to land is largely unreformed, very unequal, and (Kutcher and Scandizzo, 1981) a brake on efficient farming.

4.3.3.iii Other regions In Iran, farmland went to 92% of families eligible. Yet skeptics stress that landlords kept the best land; many peasants got to own plots "probably less than the holdings they used to cultivate" as pre-reform tenants; and even if "land reform [gave land] to a large majority of the eligible peasants . . . most of the remainder lost their rights and joined the landless" (Amid, 1990: 93–9, 102–3).

In East Asia, China in 1977–1985 saw the world's biggest LA reform, but of collective lands (Section 4.3.4.viii), as in Vietnam in 1993. There were radical LA redistributions in Japan, Taiwan, and Korea after 1945. Though nominally tenancy reforms, they included de facto ownership ceilings, which prevented resumption. Before 1990, reforms in the Philippines—although underfulfilled and with some bad side effects—were major; the debate and legislation later turned from tenancy reforms (which fortuitously transferred much land from landlords to middling-poor tenants before the Green Revolution increased economic rents [Bell, 1990]) toward attempts to help even poorer people through effective ceilings legislation that, by reducing farm size, increases employment per hectare (Hayami et al., 1990).

Substantial, rapidly increasing areas of Eastern and Southern Africa have, or are moving towards, individual farming of once communal lands. Kenya experienced much LA redistribution in the 1960s (Hunt, 1984). Ethiopia in the 1980s suffered a terrible detour [fn. 35]; very unequal crown, church, and other privileged lands were partly collectivized under Mengistu and then submerged in conflict, but since his fall in 1991, not-very-unequal family farming has emerged in most provinces. South Africa ended apartheid in 1994 with 60,000 white commercial farms occupying over 85% of farmland while over a million largely part-time African smallholders shared the remainder; the new government's program to redistribute, to these, one third of large private and state-owned farmland has moved at snail's pace and refocused on increasing medium-scale African farming. Zimbabwe, after independence in 1980, was bound by treaty to enforce no land distribution for 10 years; took no action for a further 12 years; but then embarked on a violent, confused transfer of large commercial white-owned farms, in large part to so-called "war veterans," usually ruling-party supporters and often with no farming experience or intent. This caused major crop losses and job losses by farm workers (often from neighboring countries or minority tribes).[51]

In several countries, a good case for reform has been spoiled by assigning lands to political clients. Much of Eastern and Southern Africa will see growing pressure for orderly reform but risks of land grab. The large-farm growth path in Malawi proved increasingly inefficient as land scarcity and labor surplus became the norm (Sahn and Arulpragasam, 1993).[52] In some other countries with similar trends, both poverty reduction and efficient farm growth require redistribution of land rights away from absentee yeoman politicians and their clients (on Kenya, see Hunt, 1984; but cf. Migot-Adholla, et al., 1991, 169).

4.3.4 Alternatives to the LA model: Do they change farm sizes or get land to the poor?

4.3.4.i Titling, registration Secure titling can affect size by legalizing sale and rental transactions, and/or providing land collateral so small farms can borrow or long-term security so they invest more. However, *enforced* titling has not produced these effects. Farmers with communal *tenure* almost always farm privately. In Africa, they borrowed as readily as comparable farmers with title (Migot-Adholla, et al., 1991, 171). Lack of title constrained borrowing by small farmers in Guatemala (Shearer, 1991, iv, 19) and Thailand (Feder, et al., 1988), but titled tenure is spreading voluntarily there. In four African countries, neither title nor land transfer rights affected farm productivity (Migot-Adholla, et al., 1991; Place and Hazell, 1993).

Where the state or powerful landowners have title but many smallholders do not, titling improves smallholders' security, as in Honduras (Shearer et al., 1991, iv, 9–13) and West Bengal, where landlords had shifted tenants around to stop them establishing the right to buy land under tenancy laws (Bandyopadhyay, 1995). However, under communal tenure, pressure for titling often comes from "big men" seeking to enclose common land as in the English Enclosure Acts of 1760–1830, or to ease their acquisition of formally common, but in fact private though not legally saleable, smallholdings; "titles may offer more advantage to large . . . farmers who have better access to markets" (Shearer et al., 1991, viii). Titling of customary land led to transfer of income and land from small farms to big estate owners in Malawi (Sahn and Arulpragasam, 1993, 308–11), South Africa (Cross, 1996), and Kenya (FAO, 1991, 25; Barrows and Roth, 1989, 4–11). In Uganda, assignment of square-mile freehold title, and later eviction rights, to chiefs and other notables reduced small tenants' security while not inducing investment (ibid: 15). In Latin American communal areas, titling had similar results (Hirschmann, 1984), on Mapuche lands in Chile (Thiesenhusen, 1989, 494).

State support of agreed, voluntary titling in communal lands could accelerate development of land markets. That could increase farm productivity and investment, though the African evidence is weak. Gains seldom accrue mainly to small farms; titling can often be enclosure in disguise. It helps the poor mainly on disputed or state land and when accompanied by other measures to get them land rights through enforcing ceilings on owned land, settlement, or sale of public land, as in urban areas (de Soto, 1989). Otherwise, especially in communal areas, titling could threaten the poor by helping others deprive them of land.

In general, whether stronger state backing for "property rights" advances *smaller* farms or poorer people depends on two things: initial income and power distribution (if equal, secure title protects the weak; if very unequal, it reinforces the strong) and prospective returns to landholding or to investment on land (if and only if they are high, as in peri-urban Colombia [de Soto, 1992], so are gains from title). Hence the impact of secure property rights depends critically on context, including type of rights and type of investment.

In many post-decollectivization agricultures, very small equal farms have been maintained via periodic redistribution from shrinking to growing farm families. This creates, in some areas but not others, tenure insecurity. In Ethiopia the impact . . . varies across types of investment; [for small households only] insecure tenure . . . encourages planting of trees but discourages terracing . . . [E]liminating the risk of future redistribution and resolving conflicts over land with local authorities would increase the propensity to invest in improving terraces by 28%; making land rights fully transferable [would] add . . . 38%. (Adenew et al., 2003)[53] In North Vietnam "land tenure security [strongly] and land titling [weakly] affect investment behavior *additively*," but effects are weak or absent in the South, with its history of less equal but more secure rights (Ngo, 2005).

4.3.4.ii Patrialization In British ex-colonies of East, Central, and Southern Africa and French ex-colonies of North Africa and Southeast Asia, the return, to patrials, of farmland owned by ex-colonists or descendants is a major theme of recent agrarian change. Transfer of colonially *owned* farms to grant ownership to indigenous tenants is redistributive but might not cut *operated* farm size. In Vietnam, [i]n 1955 . . . 40 per cent of riceland areas in the South were held by 0.25 per cent of the population, most of them French. [F]rom 1971 to 1974 [the state] redistributed over 1.1 million ha . . . to about 1 million tenants, [comprising] 44 per cent of total farm area and over 75 per cent of tenanted area. By 1974 agriculture in the South was dominated by small, owner-operated farms [while] per capita growth in rice production and productivity increased. (Prosterman and Hanstad, 1994, 6) Substantial equalization of *operated* farmland, however, followed only after the "family responsibility" reforms in the decollectivisation of 1993.

Where land was not yet scarce (e.g., South Africa, francophone North Africa, Kenya, Zimbabwe), colonists preferred extensive owner-farming, with labor agency costs cut by plantation-style methods instead of tenancy. This made post-colonial patrialization a rougher road to smaller, more equal farms. Laborers have less managerial experience than tenants. Colonist farmers can became nationals, using their power to skew agricultural institutions and markets in their favor and to repress indigenous farming competition. Their descendants, powerful even after independence (or deracialization), contribute substantially, and often efficiently, albeit with subsidies, to farm output and might obtain support from powerful members of majority ethnic groups. If not, in successor nations *without* mass tenant pressure, governments all too readily patrialize to civil servants and politicians, not to small farmers. Relevantly, several African countries have retained colonial Subdivision Laws that forbid new holdings below a given size or subsidies to labor-displacing equipment. In such cases, patrialization can bring little extra land to smallholders.

4.3.4.iii Tenancy as quasi-land-reform? Tenancy may be the means through which operated farm size becomes efficient, irrespective of the distribution of ownership (Section 3). In most of Latin America and Asia (and some of Africa), tenancy—often concealed—covers 10–25% of farmland.[54] Typically this leads to smaller farms, providing the otherwise landless with returns to enterprise and raising the demand for labor (Singh, 1990; Otsuka et al., 1992). In India, tenancy reduces plot fragmentation (Mearns, 1999). In China, tenancy markets move land to the poor more efficiently than official redistributions from shrinking to growing farm families (Jin and Deininger, 2002). However, in advanced areas of Asian developing agriculture (e.g., Korea, Punjab), "reverse tenancy" grows (reflecting the rise in equilibrium farm size discussed in Section 3), with small farmers renting at fixed rates to big farmers (Otsuka et al., 1992). If, as is often the case, reverse tenancy affects only a part of a small farmer's landholding, the effect is to raise median but not mean operated holding size.

4.3.4.iv Laws to restrict or regulate tenancies Tenancy, like land reform, normally strengthens the poor's access to land where land access is unequal, as in South Asia—and much of Africa, despite "communal tenure." Yet this often prohibits tenancy

(Noronha, 1985),[55] as do some Indian states (Mearns, 1999). As population mounts, the gains to all parties from reducing farm size via tenancy increase; even when illegal under land apartheid in South Africa, surreptitious "labor tenancies" emerged. Many governments have outlawed or limited sharecropping, given tenants rights to buy at below-market prices, granted near-absolute security of tenure, set maximum rentals, or otherwise controlled contracts to favor tenants.

Such laws (when backed up with a credible threat of enforcement) induce large owners to evict tenants and self-cultivate (Lanjouw and Stern, 1999, for village evidence from India), so are normally not incentive-compatible. They further concentrate land in big farms; reduce employment, efficiency, and equality; and harm those denied tenancy (Otsuka, 1991). Small tenant farmers' security also suffers via laws seeking "to ban tenancy outright . . . [which] inevitably [bring] concealed tenancy . . . more informal, shorter (increasingly seasonal), and less secure than . . . prior to reform" (Mearns, 1999). In much of rural Asia and Latin America, less farmland is rented—especially for sharecropping, where risk sharing best suits the risk profile of the rural poor—than 25–50 years ago or than would be the case if the landlord were not afraid of tenancy restrictions. So, despite gains to some small-farm tenants who enjoy better terms and can retain their rented land, enforced tenancy restrictions have militated against small farms, except where combined with ceilings laws, which (as in Taiwan and South Korea in the 1950s and West Bengal in 1968; Mearns, 1999) stop large owners from evicting for personal cultivation.

4.3.4.v Consolidation Partible inheritance and population growth mean more fragments per farm in developing countries, raising the cost of land in borders and of labor in moving among fragments. This cuts output, deterring intensive farming, and land value. Consolidation[56] seeks remedy by exchange of fragments. The gains rise with the marketed share of output and as more heavy inputs (from tractors to fertilizers) must be got to the fields: that is, as farms develop, specialize, and exchange (Johnson, 1970). Though, absent redistribution, land consolidation benefits large farmers most *absolutely* (Mearns, 1999), it probably raises income proportionately more for small farmers. First, fragments per hectare vary inversely with farm size. Second, on small farms even a given number of fragments per farm can mean tiny plots. Even twenty years ago, in China, "each farm household . . . cultivates an average of 0.6 ha divided into nine separate plots" (Bruce and Harrell, 1989, 6). Oldenburg (1990) argues that, since consolidation means greater gain for small farmers, it may achieve the same goals as LA reform but less contentiously.

To assess this, we should ask: Why do farmers seldom "simply agree to consolidate their holdings" (Johnson, 1970, 176), if this benefits everybody, cuts unit cost, and does not challenge the power structure?[57] First, agency costs, including those of creating trust and providing information on others' land, are big. It might be easier for outsiders to facilitate consolidation for a village, but private firms seldom offer such services. A public authority can, as in Maharashtra; but costs remain high.[58] Second, private farmers often want to keep their fragments. Apart from attachment to plots known from long experience, this can raise or smooth a farm's income. Armenian family farms "are fragmented because irrigated, rain-fed, orchards, grasslands and pasture were distributed separately within each village" at decollectivization (Csaki et al., 1995, 34), as in Albania (Stanfield et al., 1992, 9, 12). In Ghana and Rwanda "consolidation [via] restrictions on sales or rentals limits ability of farmers to adjust optimally the fragmentation . . . of their holdings over time" (Blarel et al., 1991). Fragments may have different seasonal peaks for labor, water, or food production (hence Farmer, 1960, advised "not controlling subdivision of paddy lands" in Sri Lanka). Fragmentation can also reduce risk. In wet years, when lowland is waterlogged, higher patches can yield at their best; in drought years, low-lying patches may get enough water while upland yields nothing.[59] Finally, consolidation may have an ecological "downside. Farmers [concentrate on] pockets of land [with] better soils and moisture [and so] . . . retard the spread of pests and diseases" (Roth and Bruce, 1994, 36).

So consolidation, though raising input and net output most for small family farms, raises risk (to which they are specially vulnerable) and cuts flexibility (one of their major advantages). In addition, although consolidation cuts labor movement costs, that raises incentives to employ labor; if on balance wage-rates rise, that can induce shifts to larger, less labor-using farms (Csaki et al., 1995, 40; Bain, 1993, 129–36), especially if costs of labor-saving capital (e.g., of tractor movements) fall. If consolidation reduces costs of titling, the poor can lose because they lack influence on deciding claims, setting borders, and valuing lands. Even *after* titling, it may harm the poor if big owners unduly influence it. That did not happen in the Indian Punjab mainly because, after partition, the exchange of refugees and migrants between the Pakistani and Indian rural Punjabs led to equalizing land redistribution (Randhawa, 1986, 58). Such special conditions may be required if consolidation is not to shift land from small farms and poor people. Although consolidation of fragments need not raise farm size, in practice it has tended to do so.

4.3.4.vi Settlement schemes These, like consolidation, seem to redistribute to small farms without confronting the rich. Settlement involves (1) abandoned farmland, such as tea estate land in Sri Lanka in the 1970s; (2) "new" lands, after state-supported development; or (3) state lands. Many governments have tried such schemes (Kenya, Malaysia, Brazil) and some are huge. Transmigration from Java to Indonesia's "outer islands" involved 418,000 persons in state-supported settlement and 604,000 spontaneously in 1950–1972 and a further 377,000 and 221,000, respectively, in 1975–1980

(FAO, 1991, 7–18). After 1980, in Indonesia, Thailand, and North Africa, settlement took increasing priority over direct land redistribution.

Settlement has performed worse than the LA model at cost-effectively getting land to small farms. Most LA beneficiaries had experience nearby; much settled land reached people with remote, or no, farm experience (FAO, 1991; Kinsey and Binswanger, 1993, 13). In Indonesia in 1976, one in three settlers had never owned or managed farms (Oberai, 1988, 52). Whether settled land reaches able small farmers depends on:

- *Whether planners assume "that 'big is beautiful.'"* In Kenya and Zimbabwe, "obstacles to efficient land use and . . . employment generation" included "laws against subdivision [, enforcing] large blocks of land"; in Zimbabwe "insistence [in] official settlement . . . on large, contiguous areas . . . meant that many isolated farms acquired remained unused." In Sudan's Gezira, "settlers became absentee landlords because the land allocated to them initially far exceeded the labor capacity of their families . . . [Conversely, i]n Kenya . . . the increase in production arising from [an early] shift from large to small units [was] 15–90%" (Kinsey and Binswanger, 1993, 5–9).
- *Whether settlers must move house.*
- *Whether land has to be "developed" through irrigation, fencing, etc.*
- *Whether settlement is (1) supported by low-cost infrastructure, (2) spontaneous, or (3) for individual farming.* (1) For the Settlement Authority to meet many settler needs has high costs (cf. FELDA in Malaysia), but "the finite horizon of the Kenyan task force approach and of the Indonesian handover to local governments has avoided . . . perpetual paternalism." Public provision of extension and clean water to initial settlers has advantages, yet "there is no direct evidence . . . that higher public costs per beneficiary family are associated . . . with success" (Kinsey and Binswanger, 1993). (2) In the 1970s three out of four settlers were spontaneous (World Bank, 1978). Infrastructure for a spontaneously settled 5 ha rice farm in the Philippines cost half as much as in a scheme (Oberai, 1988, 155). (3) Collective farming (usually directed) almost assured settlement failure in Latin America (Nelson, 1973, 265), as elsewhere.
- *Whether poor settlers farm worse.* "Agricultural settlement schemes do not make good welfare programmes." However, of features linked to settler success in farming—being married; more workers per household; age under 45; farm experience and skills; better education—the first three are more common among poorer (and presumably smaller) settlers. Only the last goes with affluence (ibid., 13).
- *Whether pluralist politics pressurizes the authorities to settle the poor and to provide them appropriate public goods such as research.* In Kenya pluralism weakened after 1974, and land reform as well as settlement increasingly favored the less poor (Harbeson, 1984, 157). In Malaysia local leaders favored claims to remote lands for "known troublemakers . . . to get rid of them" (Oberai, 1988, 96). Politics can trump economics, so bigger farmers engross the benefits. In Brazil, one in three settlers were "familiar with cropping 25 ha or more"; settlements replicated farm inequality in areas of origin (Oberai, 1988, 337–9).

Though small farmers may gain from a settlement scheme, that outcome is often is costly and uncertain. If the rich retain great power, schemes will not get much good new land to the poor. Historically, schemes have aimed mainly to even out population density and develop "new" lands—not to redistribute land or to cut poverty. Population growth and spontaneous settlement have greatly reduced the scope for such schemes.

4.3.4.vii State and collective farms Russia's October 1917 Revolution[60] and the 1949 Chinese Revolution were supported partly because they promised small, fairly equal family farms and initially delivered tens of millions of them[61]; but 10–15 years later most (Wolf, 1969; Bruce and Harrell, 1989) were forced into Soviet collective and state farms and Chinese communes and brigades. Huge units, without independent farmers, were ideal foci for state extraction of food and fuel wood by compulsory quotas and "price scissors." After 1945, such policies found analogues in parts of Southeast Asia, East Europe, Africa, and Latin America. After decades of rural misery, the promise of land reform was redeemed again in 1977–1984 in China and in the 1990s in Vietnam, Armenia (Csaki et al., 1995), Albania (Stanfield et al., 1992), and Romania. There, de facto privatization into small, fairly equal family farms is almost complete.

Through force or famine, the "terrible detour" killed thousands in Africa in the 1980s and millions in the Soviet Union in the 1930s and China in 1959–1963. As for productivity, in the U.S.S.R. the tiny proportion of land in private smallholdings achieved many times the TFP of the (large) collective farms (Hanstad, 1998). "[For] vegetables, potatoes, meat and milk, these large farms failed to compete against small, subsidiary land plots . . . privately operated by workers of state and collective farms after work" (Overchuk, 2003). In Zimbabwe in the 1980s, the semicollectivist Model B farms on reform lands did far worse than Model A family farms; this was "typical of experiments in Ethiopia, Tanzania and Mozambique" (Roth and Bruce, 1994, 25–6; cf. Bruce, 1986, 63).

Why was the record so bad? First, collective action and centralized management are especially costly in farming—a geographically extended, micro-location-specific, sequential activity needing swift, hands-on adjustment and personal knowledge of the land. Second, forced surplus extraction, so convenient from big state or collective farms, removed much of whatever incentive remained for them; in their lower output per ha-year (than small family farms) outweighed the higher marketed share of output, *reducing* surplus (Ellman, 1975)! Third, advocacy of huge state/collective farms in the U.S.S.R. (less so in China) ignored the fact that growing labor surpluses and increasing land scarcity favored small *operated* holdings. Later, unsuccessful African and Latin American collective/state farm experiments, though less violent and disruptive (outside Ethiopia), were similar in these respects to U.S.S.R. and Chinese experiences.

4.3.4.viii Privatization and decollectivization Around 1976, over a billion persons were trapped, often unable to leave legally, in state or collective farms. Yet China had completed the move to near-egalitarian household farming by 1985, and Albania, Armenia, Romania, and Vietnam had done so by 1995.[62] By 2000 most other transitional economies had divested much of the former enforced joint farms to family or middle farmers. Russia made a slow start, and in some of the FSU the move from "forced farming" stalled. In some cases (Poland, Hungary), development has meant rising rural capital/labor ratios so that transaction costs have come to favor, if not giant farms as under collectivism, at least moderately large farm size.[63] Elsewhere, will decollectivization create thriving small family farms? Key issues are:

- Is land *supply* truly privatized? In Russia[64] most "decollectivized" land was distributed via shares, without demarcation of plots, and with strong pressure on recipients to sell, or even give, shares back to the collective management (Duncan and Ruetschle, 2002). In 2000 (Giovarelli and Bledsoe, 2001) "Western CIS countries [were] ... primarily farming through large collective-style farms" and many remain today. Some attribute this to fear that demarcated small farms, or part-time farms, even if chosen in the market, are "uneconomic" (Overchuk, 2003; Rembold, 2003). The evidence does not justify that fear (Hanstad, 1998).
- Is land *demand* for post-reform private plots constrained by demographics (e.g., irreversibly aging rural populations) (Wegren and Durgin, 1997)?
- How trammeled are private-property rights? Most joint farmland in transitional economies was divested with usufruct rights for 20–40 years or life but with limited or no rights to sell, mortgage, or rent. Whatever the disadvantages,[65] land thus redistributed into small farms tended to stay that way.
- Is the land restituted or redistributed? Most countries dissolving state and collective farmland (over and above marginal uses to enlarge household plots) redistribute to members of collectives or state farm workers, often in proportion to household size. Armenia, Albania, and Vietnam have almost completed this process. However, Bulgaria, the Czech and Slovak republics, East Germany, and the Baltic FSU restituted to original owners or descendants; Hungary and Romania combined restitution and redistribution (Brooks and Lerman, 1994, 27). They can reach similar results if, as in Bulgaria (Kopeva et al., 1994, 203–4) and Albania, pre-Communist farm ownership had been fairly equal and most rural families had continued to farm locally on state or collective farms. Elsewhere, restitution may impede small farms. In the Czech Republic, land moved back to former aristocrats, "big men" with local monopoly power, and other rich victims of expropriation under Communism. Even if some take the "Junker path" to progressive, albeit labor-displacing, large-scale farming, this is hardly geared to optimal farm size.
- Does change aim to shift state and collective lands toward (1) more or bigger household plots, (2) small commercial farms, or (3) large commercial farms? Household plots helped prevent starvation in the Ukraine in the 1990s. Hanstad (1998) summarizes evidence that "small is efficient" in parts of the FSU. But this cannot apply everywhere (in combine-harvested Russian and Ukrainian wheatlands laid out in

large farms), nor forever, as development brings rural exodus and capital-intensification.

- Where land has moved from state or collective farms into fairly equal family smallholdings (e.g., China, Vietnam, Romania, Armenia, Albania, and Ethiopia), how is any transition to larger farms, which may be indicated as economic growth reduces rural labor/capital ratios, handled to minimize inefficiency and inequity? Alternative models of change in China—where, it should be noted, 5 ha is a large farm—are reviewed in Prosterman et al. [1998], Chen et al. [1998], Zhou [2000], and Ping Li [2003].

4.3.4.ix New Wave land reform (NWLR) NWLR (Bell, 1990; Carter and Mesbah, 1991; de Janvry and Sadoulet et al., 1991; Tendler, 1991; Deininger, 1999; Deininger and Olinto, 2000) seeks to shift farmland from big to small farms by consensual, decentralized, market-assisted transfer. That implies measures to raise the poor's land demand curve, big farmers' land supply curve, and/or the proportion of land sales that are from rich to poor (call this *N-land*); normally, most sales are among big landowners or among small ones (Shearer et al., 1991).[66] In most NWLR, consensus requires subsidies or compensation, and thus taxpayers or donors willing to share land redistribution costs normally borne by those who transact in land.

Demand-led NWLR often is implemented via land vouchers for poor buyers, raising the issues of detail discussed in Section 4.3.2 and with the effect of raising land prices. That, over time, cuts the amount of land obtained for a given subsidy (e.g., voucher fund)—and hence affordability for state or donor—to an extent arithmetically dependent on initial farmland turnover, the supply elasticity of farmland, and the share of N-land.

Supply-led NWLR may be driven by fear that governments will enact LA reforms, implement more forcefully those already enacted, or fail to respond to land seizures, for example, by movements of the landless or small farmers. Then, specifically, rich-to-poor land sales are stimulated. Vinoba Bhave's Bhoodan, or land-gift, movement in India in the 1950s appealed to rich people's moral sense and released several million hectares of land.[67] In Taiwan in 1953, the government induced higher land supply by offering landlords compensation with shares in seized Japanese urban assets. In Africa, derestricting subdivision raises the share of N-land in total supply. States can also make sales to the poor more attractive to the rich; in Brazil's decentralized reforms, local authorities offered large farmers who gave up N-land cheaply access to new irrigation on retained land (Tendler, 1991).[68] This works if someone, taxpayers or (as here) a World Bank loan, pays. Even here, threats as well as promises lay behind the increases in the supply of N-land: rich nonparticipants might be exposed to *Sim Terra* land invasions (*Financial Times*, August 15, 1991; August 11, 1994) or to enforcement of laws, currently ignored, that set land ceilings and restricted the occupation of common lands (Tendler, 1991).

4.4 Market interventions and farm size

4.4.1 Taxes and subsidies and farm size

In this section we consider the relationship between the tax regime (i.e., taxes and subsidies on inputs and outputs) facing agriculture and farm size. In principle this relationship may be two-way, and the "political economy" effects from farm size to the tax regime may be rather subtle. For instance, in France it may be that large farmers have an interest in keeping small farms in business in order that pressure for farm protection may make appeal to the need to preserve *la France profonde*.

The analysis in Section 3 suggests three general ways in which tax policy and levels can impinge on farm size.[69] We begin with the case where the conditions, discussed in Section 3, for a single equilibrium size of farm are met and restrict attention to proportional taxes and subsidies. Tax policy can affect (1) the equilibrium size of the family farm, (2) the equilibrium size of the nonfamily ("commercial") farm, and (3) the relative advantages of family versus commercial farming.

As regards (2), commercial farms, by definition, are large enough that a high proportion of labor input is hired, so the lower supervision costs of family labor are not having a significant influence on optimal scale. We do not here explore whether unit supervision costs of hired labor *itself* vary enough to significantly affect equilibrium farm size. We have seen that for such large farms the evidence is consistent with the hypothesis of constant returns to scale, and if that is correct equilibrium farm size is indeterminate. *A fortiori*, the impact of the tax regime on equilibrium farm size is indeterminate.

As regards (3), we argued in Section 3 that as capital becomes cheaper relative to labor, the advantages of large scale in reducing unit capital-related transactions costs may come to outweigh the advantages of small scale in reducing unit labor-related transaction costs. This shift of advantage may cause an equilibrium shift from family to commercial farming in the course of economic development. Evidently changes in the tax regime that cheapen capital relative to labor could bring about the same shift.

As regards (1), tax policy can affect the equilibrium size of the family farm on land of given quality in two main ways. First, it can affect the equilibrium land/labor ratio; for example, an output subsidy will, as observed in Section 3, raise land rents and lower the land/labor ratio, thus making the family farm smaller for given labor input per farm. Second, tax policy might affect that labor input—and therefore equilibrium farm size—by changing either the amount of hired labor used on the farm or the amount of family labor used off the farm. For instance, if the earnings of temporary migrant strawberry pickers on family-operated U.K. farms should become effectively free of tax, that would raise the incentive for the farms to employ such labor at harvest time and would tend therefore to raise equilibrium farm size.

Allowing for variation in land quality so that there is a Ricardian "margin of cultivation" is one way to get equilibrium heterogeneity in farm size; therefore tax policy can affect the size distribution of family farms by moving the extensive margin. Thus a tax change that favors agriculture will bring more low-quality land into use, with an effect on average farm size that depends on whether the land/labor ratio is relatively high or low on this marginal land. This might go either way. Low quality in rocky or hilly terrain might mean that extra labor input is needed to extract a given output from a given patch of land; this means that family farms on marginal land will be relatively small. The opposite case would obtain where lands were marginal because they were of low fertility and suitable only for grazing.

The discussion so far has ignored taxes that are explicitly discriminatory across farms of different sizes. Plainly a tax that only applies to farms above X ha will discourage such farms. More subtly, in many circumstances the reach of the tax authorities will not extend to the interior of the farm, so self-consumed product and the employment of family labor and of other own-farm inputs will be exempt. Rises in output or labor taxes in such cases will clearly favor farming for subsistence.

Turning to political economy, larger size is artificially favored because big farms are better placed to have tax laws written or interpreted to their advantage. As for subsidies, except perhaps in efficient autocracies, the biggest farmers need to share gains with others, to create popular backing for farm support despite its costs to consumers and/or taxpayers. A few dozen large French farmers alone cannot alone block the roads with tractors, nor a few dozen large U.S. farmers swing the vote in marginal states; to achieve large distortive subsidy they need support from many others, and it is usually smaller farmers (plus perhaps rural traders dependent on their custom) who can most plausibly be mobilized—but only if their share of subsidies is attractive enough.[70] A dominating coalition, even if not reconciled to much overt land reform, might accept, or advocate, output tax and subsidy reform, increasing incentives to big owners to sell or lease land to smaller and more labor-intensive holdings. In Brazil, removal of fiscal concessions that favor large owners or operators or their typical crops over small farmers has been advocated to level the tax-subsidy treatment of outputs (Thiesenhusen and Melmed-Sanjak, 1990, 408) and inputs (Binswanger and Elgin, 1988). Such processes sit well with liberalization and are sometimes advocated as less contentious than land reform. Both may be impeded by the self-same often powerful potential losers. Fiscal crises make governments readier to reduce deficits by tax-subsidy reform but less ready to spend on land reform. Furthermore, democratic pressures can push small and middle farmers, who might oppose the landless when these sought land reform, to join them in seeking more equitable tax-subsidy treatment (de Janvry and Sadoulet, 1991).[71]

4.4.2 OECD farm support: effect on farm size

In 1995, OECD agricultural subsidies to producers totaled \$182 billion, or 40% of production. OECD farm producer prices were 66% above border prices (de Moor, 1996). Subsidies reached \$248 billion in 1999–2001 (Ricupero, 2003). This is often stated to help smaller farms (which are relatively labor-intensive) to survive, thereby enabling more people to stay in farming or farm employment—the *peasant outcome*.[72] In fact, OECD farm support has not overcome the tendency of farm size to grow and of farm numbers and employment to decline. Moreover, the (weak) evidence suggests that farm support went with *worse* prospects for the peasant outcome. Between 1986–1990 and 1996–1997, farm employment fell from 7.1% of the workforce to 4.9% and in absolute terms fell 14% in the EU-15, despite massive farm support.[73] The fall was far slower in the two OECD countries with least farm support, New Zealand (10.4–8.8%, an absolute fall of only 5%) and Australia (5.7–5.1%, an absolute *rise* of 2%; Findeis et al., 2001). Between 1989–1990 and 1997, farms with over 40 ha in the EU-12 rose from 6.3% to 8.5% of all farms; if land is standardized by quality, the rise in the "largest" groups' share was more, from 6.8% to 10.5% (Directorate-General for Agriculture, 2002, Ch. 1, Tables 2.3, 2.7). So farm support has not prevented concentration, nor employment decline in agriculture. Part of the reason may be that incidence is not impact. Only about $1 of every $5 of EU net farm support added to *net* farm income; in the early 1990s, "$2.75 is spent [on] additional inputs [and] $1 covers the opportunity cost of diverted household resources" (de Moor, 1996).

Has the part of farm subsidies that stays with farmers benefited mainly big farms? Their pressures on the U.S. Senate/House reconciliation committee blocked the proposal in the 2001 Farm Security Bill to cap (at $275,000) producer support to any single farm. In the EU in 2003, their pressures successfully blocked the Commission's proposal to reform the Common Agricultural Policy by paying out producer supports that declined as farm size rose (van Donkersgoed, 2003). In the EU, the best-off 20% of farmers receive 80% of subsidies; the 15% of French farms receiving over 20,000 euros in subsidies account for 60% of total payments (Ricupero, 2003). In the United States, from 1995–2002 the top 10% of recipients received 71% of all USDA subsidies, whereas the bottom 80% received only 14% (Environmental Working Group, 2003), but such figures can mislead, both because proportions of land and value added are not known and because some apparently large recipients (including the four largest) are cooperatives.[74] More tellingly, at the very top end, the 20 largest recipients of USDA subsidies in 1995–2002 include Tyler Farms ($35 million of commodity support), Pilgrims Pride ($15.1M), Cargill ($10.9M), J. G. Boswell ($10.5M) and Morgan Farms ($9.5M; EWG, 2003). In 1996–2000, although the median farm subsidy was $4675, among Fortune 500 companies Westvaco in 1996–2000 received $269,000, Chevron $260,000, John Hancock $211,000, and du Pont $118,000, and David Rockefeller secured $352,000 of subsidies for his family farm. Of U.S. commodity subsidies, 90% are for five crops; this excludes some 60% of farmers for whose products there is no government program and among whom small farms are overrepresented (Riedel and Frydenlund, 2001, 2003).

In sum, we find an interesting tension among three ideas: (1) that subsidies keep small farms on marginal land afloat, (2) that small farm workforces have fallen fastest in OECD countries with the heaviest farm subsidies, and (3) that manipulable subsidies favor very large size for reasons of political economy.

4.4.3 Forex and other farm price repression in poor countries: Farm-size effects

Agricultural producers in a sample of 18 developing countries faced a *de facto* net output tax rate of 30% from 1960 to 1984, usually less due to *overt* interventions (overt input and output, including export, taxes net of subsidies; quotas) than *implicit* in exchange rate overvaluation and selective industrial protection. Income transfers out of agriculture averaged 46% of agricultural GDP annually between 1960 and 1984. In showing this, Krueger et al. (1995) identify four groups:

- *Extreme taxers*. These are all, and only, the sample countries in sub-Saharan Africa, viz., Ivory Coast, Ghana, and Zambia, with implicit or overt net taxes on agriculture above half its value added. (The proportions have since declined sharply.)
- *Representative taxers*. For example, Argentina, Colombia, Egypt, Morocco, Pakistan, and Thailand: 30–40%.
- *Mild taxers*. From 8–22% (Brazil, Chile, and Malaysia).
- *Protectors*. South Korea and Portugal subsidized agriculture by roughly 10% of value added.

"Graduating" developing countries often become fiercer protectors than long-developed countries; on Mexico in 1982–1986, see (Burger, 1994), and note the trajectories of Portugal and South Korea from 1984 to 2003.

Burger (1994) finds similar results for 1982–1986 and concludes that most developing countries had net production taxes. "There is no hard evidence [that] agriculture is taxed in the 1990s" in developing countries, but—despite liberalization, and as with farm support in the developed world—"many . . . policies which previously produced the large taxation [in developing countries] still exist" (de Moor, 1996). This occurs despite large gross subsidies to pesticides (Farah, 1994) and fertilizers (Repetto, 1988), though these have declined since the 1980s as fiscal pressures pushed developing countries, if they liberalized, to do more to curb overt farm input subsidies than (far larger, but usually implicit) output taxes.

As argued in Section 4.4.1, net taxation of agriculture tends in principle to raise equilibrium farm size, except to the extent that small farms are insulated by subsistence. Such insulation declines with developmental and agricultural specialization and progress, as in much of Asia. Moreover, despite their net taxes on agriculture, most developing countries have subsidized inputs, which big farmers have the most power to access. Therefore, even though the size of the effect cannot be quantified, the extractive price regime in most developing countries in the past 50 years appears to have conduced to increasing farm size. Conversely, Nishio and Akiyama (1996), using data from Sulawesi Island, Indonesia, showed that the boom in cocoa prices during 1990–1994 favored small farmers against large ones. Moreover, just as price extraction tends to be especially harmful to small farms, so support for provision of market-undersupplied roads, research, extension, land policy, credit, water, and so on—not just of "pure public goods"—potentially favors them.

4.4.4 Progressive land taxes to affect farm size?

Progressive land taxes, unlike output taxes and subsidies, are *intended* as incentives to land redistribution. However, a prerequisite is a reliable, up-to-date land register; few developing countries have this. Second, "the trick . . . of distributing the burden in a manner acceptable to the contending parties" (Bell, 1990, 157) may be no easier than for land redistribution. Third, some claim that land tax, especially if progressive, is costly, evadable, and hard to collect. Fourth, success in stimulating land redistribution implies revenue losses from progressive land tax. However, progressive land tax can be made simple, at some cost to fairness. Especially where land is very unequal, tax can be confined to holdings above a given worth—say, the highest-value 10% of owned holdings. These are almost always titled and registered. A tax of 1% per year on land value *above* that of the 20th highest percentile would achieve rough-and-ready progressiveness. Assuming that farmland value is 10 times the net farm income it generates, this tax would take 10% of net farm income of the top landed quintile—unlikely to engender counterrevolution, especially if it replaced top rates of agricultural income tax.[75] Avoidance of progressive land tax by subdivision (via sale or lease) of large owned holdings is not an objection to, but an object of, such taxation.

There were successes "in Japan and Australia in the 19th and early 20th centuries." In the United States, property or land taxes absorb over 15% of the return on farmland, and in 1994 Sweden introduced a 1.7% tax on land values (see also Dorner and Saliba, 1981). In the Indian states as a whole, land taxes fell from 20–21% of revenue in 1950 and 1960 to 2.6% in 1989–1990, but this is no iron law; in West Bengal, the proportion recovered from 3% in 1970–1971 to 17% by 1989–1990 (Prasad, 1993, 73, 76). Zimbabwe allowed local councils to impose modest but progressive land taxes, and most do (Roth and Bruce, 1994, 55–6). In Meitan County, China, small land taxes for local use were effectively collected (Bruce and Harrell, 1989, 14–15). Chile, Jamaica, and Colombia have significant land taxes (Shearer et al., 1991, 41). So do other Latin American countries, some with progressive elements; low revenue yields indicate lax implementation, but this does "not indicate that land taxes have little potential but the lack of a strong commitment" (Dorner, 1992, 78).

Particular tax-subsidy reforms, such as a shift toward progressive land taxes, can, if feasible, achieve some of the aims of land reform. But tax-subsidy reform can only rarely substitute for land reform. Bell (1990, 158) advocates announcing land reform "only after the effects of tax reform are largely realized." However, progressive inheritance taxes, if these preserve horizontal equity among locations and types of assets, may be complementary with New Wave land reform (Section 4.3.4.ix).

5. LIBERALIZATION AND SMALL FARMS IN POOR COUNTRIES: SUPERMARKETS, GRADES, HORTICULTURE, AND INTERMEDIATION FAILURE

Standard Heckscher-Ohlin models and their modern successors (e.g., Wood, 1994) imply that liberalization and globalization (LG), by reallocating activity within a country toward products for which it has a comparative advantage, favor sectors and types of firms that make intensive use of that country's relatively plentiful factors. Developing countries have plentiful labor, per unit of capital and of skills (and in a growing majority of cases, of land), compared to developed countries. So, LG should, in principle, change GDP structure and hence redistribute national income—within developing countries progressively, toward labor, toward agriculture, and within it toward labor-intensive products (e.g., horticulture) and producers (e.g., small farms); within developed countries regressively, against all these.[76] LG is many-faceted and gradual, and evidence on its distributive impact is incomplete and controversial (Winters et al., 2004; Cornia, ed., 2004). However, it is hard to detect shifts—factor-price-induced or other—toward smaller-scale farming in the slipstream of LG in most developing countries. Small farms in South and East Asia raised their share of land *before* LG. Why, contrary to theory, might LG fail to redistribute activity and income toward small farms in developing countries? First, agricultural LG has proceeded more slowly than for industry in most developing countries and at snail's pace in their OECD customers. Second, where LG *has* affected agriculture in a developing country and its trading partners, that country's gains could go to larger and more capital-intensive farms (despite Heckscher-Ohlin-Wood) for reasons of political economy, time lags, or the path of agrotechnical progress.[77]

Recent narratives suggest that perverse pro-large-farm, anti-labor results of LG in developing countries can be rooted in the interface between LG institutions and those of most developing countries. In that context, Reardon et al. (2001, 2002, 2003, 2005) argue that three linked concomitants of LG—the growing role of *supermarkets, grades and standards*, and *export horticulture*—often tend to favor large farms but that outcomes more favorable to small farms can sometimes be achieved through policy interventions, changed incentives, or collective action by small farmers.

First, LG in the form of greatly expanded foreign direct investment (FDI) is the main factor among many (Reardon et al., 2003) raising the profile of *supermarkets*, "increasingly and overwhelmingly multi-nationalized (foreign-owned) and consolidated," in developing countries. "Latin America [in the 1990s experienced] the same development of supermarket [share at retail as] the USA had experienced in five decades" (ibid., 5). By 2000, the supermarket share of food retail sales for the six largest Latin American countries was 60%; in South Africa, 55%; rising fast in East Africa; and (for processed and packaged foods only) 63% in Korea, Taiwan, and the Philippines; 33% in Malaysia, and Thailand; and increasing fast in China. Due mainly to lower salience of FDI, supermarket expansion has been slower in South Asia and much slower in Central and West Africa (in Nigeria, supermarkets still accounted for only 5% of food at retail; ibid., and Reardon et al., 2002). Supermarket expansion initially concentrates on packaged foods but increasingly affects fruits and vegetables, meat, dairy products, and even food staples. Expansion starts in the main cities but soon spreads, first to smaller towns, then countrywide.

To cut unit acquisition costs, supermarkets have come to rely on fewer and consolidated wholesalers and have otherwise developed procurement methods and supply chains highly favorable to deliveries of standardized products in large quantities. This hampers, or even cuts out, small farmers. Even where their unit production costs are lower, their market share can be imperiled by higher unit transaction costs in the new, supermarket-induced distribution chain (Reardon et al., 2003, 12–16, 18, 20). Rapid, LG-fueled expansion of supermarkets into the hinterland, and recently into horticulture, seems, in some countries, to threaten all small-farm competitiveness, outside a few high-weight/value products for self- or local consumption in remote areas unattractive to supermarkets.

Until nonfarm opportunities expand rapidly, are there policy options to help small farmers and to avoid farm size concentration, with its tendency to reduce the share of labor in agricultural income? Restrictions on supermarket growth or FDI are unlikely, given LG. However, some public or collective actions, or incentives, can make supermarket growth friendlier to small farms. Reardon et al. (2002) emphasize "public support (for investment, retraining, certification, and licensing) to producers and their organizations to allow them direct access to supermarkets; promotion of . . . payments within 30 days by supermarkets; promotion of competition among supermarkets [and alternative retail outlets for small farmers,] including . . . modernization of specialist shops and street fairs." In Zambia and South Africa (Weatherspoon et al., 2003), "where projects can be put in place to 'upgrade' the small farmers to meet the needs of supermarkets, the chains appear to be eager to participate." The "meteoric" growth of supermarkets in China, with average farm size of 0.5 ha and low farmland inequality, has spawned a variety of small-friendly arrangements for outgrowing and procurement, with producers' associations prominent around Shanghai, as in Indonesia (Reardon et al., 2004; and personal communication).

Second, LG accompanies the spread of *grades and standards* (G&S). Public G&S are imposed by state or state-like agencies overseeing health, labor, and environment largely on behalf of cities, developed countries, the EU, and international agencies.

Private G&S—imposed by supermarkets or other retailers or by wholesalers or other intermediaries—may add areas of overview not required by public G&S. Otherwise, private G&S are pointless except to advertise firms' will to enforce public G&S or, more commonly, to be more rigorous than these. Such rigor is partly to satisfy concerned customers or outspoken NGOs—and partly to increase the competitive edge of large buyers. "The role of G&S has shifted from a technical instrument [to cut] transaction costs in homogeneous commodity markets to a strategic instrument of competition in differentiated product markets . . . The changes have tended to exclude small firms and farms . . . because of the implied investments" (Reardon et al., 2001).[78] Economies of scale in financing and constructing these, and in supervising their application, threaten small farms' competitiveness. The threat is exacerbated because G&S increasingly apply not only to *products* (specifying, for example, fruits' pesticide maxima, size, or color) but also to *processes*. For example, farms supplying formal buyers are increasingly required to abjure child labor. Though small farms have lower unit labor-linked transaction costs and may thus face lower unit costs in *meeting* G&S, that may be outweighed by their higher costs in *validating* G&S, especially process G&S; it is cheaper to monitor and certify absence of child labor or safety of pesticide application on one farm selling 5000 kg of bananas than on 50 farms each selling 100 kg. Many small dairy and poultry farmers in Latin America have gone out of business due to such effects (Reardon et al., 2001; Farina et al., 2000). Small farms risk being confined by G&S to "markets that are purely local and traditional"—unless helped to *upgrade* products (e.g., by the joint work by Technoserve and ICRISAT with smallholder pigeon-peas in India) or to *certify* products already meeting G&S (e.g., by certification companies, such as Mayacert in Guatemala) (Reardon et al., 2001). It is in the interests of buyers to stimulate such small-farm competition in meeting G&S and of smallholders to elicit it, whether through market or political processes. The question is: for what crops, countries and markets is this process fast enough to help smallholders *before* large farms exploit their earlier management of G&S to obtain an unchallengeable niche?

Third, LG have increased the proportion of developing-country farm activity devoted to *export horticulture*. EH products are either climate-specific or only seasonally able to undersell domestic horticulture in developed countries. This has undercut protectionist opposition in the rich world. Also, developing-country EH, as a part of international expansion in farm trade, is favored absolutely by long-term falls in the ratio of transport to production costs and relatively by EH crops' generally high value/weight ratio and income-elastic demand. In several developing countries, EH has recently received most foreign and much large-scale domestic private investment in agriculture. Technical progress in increasing shelf life has enabled developing-country producers, especially those with reliable water and near the equator, to provide a year-round stream of EH products from an almost aseasonal agriculture. EH exports from sub-Saharan Africa grew 150% in 1989–1997, most sold through major Western supermarkets. Yet, though EH is usually more labor-intensive than staples farming, smallholders often benefited little, supplying only 18% of export vegetables in Kenya and 6% in Zimbabwe in the late 1990s (Dolan et al., 1999). Incomplete and imperfect credit markets for smallholders (due to asymmetric information) may explain their exclusion from fruit tree crops, which have long gestation periods; in parts of Latin America, such exclusion has eroded or reversed smallholders' gains from earlier land reform (Kydd et al., 2002). However, there are not long gestation periods for pineapples, raspberries, or most vegetables. Rather, in a world of spreading G&S and supermarket procurement, small farms have been disadvantaged in—even excluded from—EH expansion by demands for product standardization, precisely timed and coordinated delivery, and capacity to negotiate credibly with large buyers. Yet most vegetables and many fruits have traditionally been smallholder products in developing countries. Cooperative marketing enabled them to remain competitive in EH in Guatemala (von Braun et al., 1989). Private intermediation can also work; in 2001–2003, the well-developed hierarchy of wholesale markets made it easy for tiny farms to export a range of fruits and vegetables to big Indian cities (though seldom for export) in the wake of commercial drip irrigation in Maharashtra (Phansalkar, 2002).

The three challenges to the Heckscher-Ohlin expectation that LG in developing countries would shift activity and income toward small farms—supermarkets, grades and standards, and export horticulture—share a key feature: *intermediation failure*. Intermediation is required when an upstream sector, such as farming, minimizes unit production costs at one (usually a small) size or output level but has to supply to a downstream (e.g., processing) sector in ways that minimize unit delivery costs, which is achieved at a different (usually larger) farm size or scale. The tension can be reduced or reconciled by appropriate intermediation.[79] In many countries, specialized firms have long collected small amounts of rubber, tea, or sugar, intermittently but to a strict schedule, from many small farmers; checked quality and fed back problems to them; and delivered a smooth, large product flow to large processors (Binswanger et al., 1996). The main barrier to the natural small-farm, labor-intensive, and hence redistributive outcome of LG is the failure, in new countries or for new products, of analogous intermediaries to emerge efficiently or rapidly between small farms and supermarkets, horticultural exporters or buyers, or dealers requiring specific G&S. Intermediation failure can arise from market failure (due to lack of information or otherwise) or from high startup costs of intermediation in countries with inadequate information, contract law, or transport. In either case, some initial subsidy to administrative cost of (rather than to prices paid or charged by) intermediaries between small farmers and the emerging LG system may be indicated. Successful intermediaries have included cooperatives, firms, and (as with AMUL in India) public enterprises, usually with a hard budget constraint.

End Notes

⋆. We gratefully acknowledge valuable comments from Robert Evenson, help with data from Hiek Som of FAO and Steve Wiggins of ODI, and research assistance from Alvaro Herrera.

1. FAO Agricultural Censuses involve fieldwork by the implementing country—a minority in most continents and a small minority in Africa—to a (more or less) standardized FAO template and with FAO help at any time in the identified decade but most of the time in the first three or four years of the decade, though processing and availability can take another three or four years.
2. Some countries exclude tiny farms. This omission can undermine international comparisons of mean farm size. Since the proportion of farmland in tiny farms is normally itself tiny, "median by area" may be a preferable measure in some circumstances.
3. Just three countries represent Africa here: Ethiopia, Lesotho, and Malawi.
4. Argentina is not included, but comparison of 1914 data (from Diaz-Alejandro, 1970) with the 1988 FAO census shows little change in the size distribution of holdings over the century and certainly no increase. In 1914 the mean holding was 531 ha, compared to 469 ha in 1988. In 1914, 33% of holdings in Argentina were less than 25 ha; in 1988, this proportion was roughly 37%.
5. Canadian farms were around 40 ha on average 1870 to 1880 and increased to an average of around 80 ha in 1920, over 100 ha by 1950, and over 270 ha by 2001. In England and Wales the rise was comparatively slight. The proportion of holdings with more than 121.5 hectares of crop and grass rose from 3.4% in 1875 to 5% in 1966 (MAFF, 1968).
6. In the DR Congo, only the traditional sector is included in the census.
7. The outlying observations for Finland and Norway are intriguing. See also Figure 5.
8. Correlation coefficient 0.68, significant at 1%. Data in Appendix A.
9. The surveys for Benin, Burkina Faso, and the Democratic Republic of the Congo include only holdings in what is defined as the traditional sector, for which collection of data on hired labor may have been judged not worthwhile.
10. These data differ from the FAO data because in censuses and labor force surveys individuals are asked to decide their status in their main job. People who both operate smallholdings and work for other farmers will have to choose which is their main occupation and reply accordingly. By contrast, in a farm survey, these people may legitimately be counted twice. It follows that the reported proportion of hired workers will differ depending on the whether the farm or the individual is the unit of observation. Unfortunately, the difference between the two measures cannot be signed unambiguously. The difference depends upon, among other things, the amount of dual job holding and the probability with which dual jobholders will report themselves as hired or self-employed. A further complication arises as one notes that agricultural contractors who are hired labour from a farm perspective are self-employed from a labour market perspective.
11. In contrast, the United States and Canada have unexpectedly high shares of family labor in total farm labor, given their mean *farm size*.
12. A detailed discussion of how these elements interact in sub-Saharan Africa to determine the geographical pattern of intensification is provided by Pingali, Bigot, and Binswanger (1987), Part 1.
13. It is consistent, therefore, that a big majority of farms in country X are family farms, whereas a big majority of the agricultural population are *not* family farmers, because many of them are peripatetic temporary laborers.
14. If account is to be taken of transaction costs associated with the supervision and training of family members, one may define such costs for hired labor as net of the family labor transaction costs.
15. No neat equivalent to 1(b) and 2(b) exists for this case.
16. In the limit, as in the case of most livestock production in the United States, land could become sufficiently insignificant as a factor of production that the activity is best viewed as industrial rather than agricultural.

17. This discussion has avoided many of the complexities of three-factor production theory, especially much of the interplay between factor prices and factor proportions. A fuller explanatory note is available from the authors.
18. Development has an ambiguous effect on land rent in this model—for example, technological advance and rises in reservation utility pull in opposite directions. Schultz (1964) noted that land rents tended not to rise with development.
19. If labor productivity in nonagriculture sufficiently exceeds that in agriculture, just a rise in the share of the labor force in nonagriculture (small enough not to absorb all the absolute growth in the labor force) can generate such a result. So, it is not even necessary to appeal to differential rates of productivity growth across sectors.
20. Causation is complex; for instance, livestock may predominate in remote areas, both because it is relatively cheap to deliver to market in good condition and, independently, because land is cheap.
21. An exception to the East Asia generalization is the Philippines, where a land reform that prohibited leasing led, in the context of the introduction of high-yielding varieties of rice, to an expansion in contract labor (Hayami and Otsuka, 1993).
22. In Sri Lanka, the gradual extension of citizenship to Indian Tamil laborers after 1971 allowed them to move off plantations, forcing them to raise wages, lose experience, and become uncompetitive; in general, free labor markets normally undermine indenture systems.
23. This criterion, although far superior to crude measures such as yield/hectare, itself appears open to question if capital-related transaction costs should be scale-dependent. Perhaps the best measure, assuming a fixed supply of land, is Ricardian surplus per hectare, i.e., surplus calculated after accounting for all inputs except land.
24. Where there is a rental market in draught animals, those who own their own animal(s) are typically able to rent others on relatively favorable terms.
25. We are avoiding some complexities here, since whether processing occurs on- or off-farm might not be independent of farm size.
26. Interlinked markets are often seen as pressures toward larger farms, being ways for a large landowner to entrap small farmers by pressing them to give him the first—or only—option as a merchant, employer, or (above all) creditor and subsequent forecloser. However, whether interlinking of markets is good or bad for small farmers clearly depends on the alternative, which could be virtual exclusion from ready local access to hired work, output sales, and, above all, collateral-free credit (Bell and Srinivasan, 1989).
27. The authors control for the selectivity bias that arises if titling should be endogenous.
28. See also Taslim (1989), who uses evidence from Bangladesh to suggest that labor supervision costs become important only after the ratio of hired to family labor exceeds a threshold. Among his findings is that the correlation between family labor per hectare and hired labor per hectare is negative for small farms and positive for large farms (above a threshold of 2–3 ha). The idea is that hired labor may be plugging a labor gap on small farms while being used up to a limit associated with the supervisory constraint on larger farms.
29. There is evidence for Bangladesh of more intensive use of fertilizers and seeds on smaller farms (Hossain, 1988). This could be understood in terms of a fixed adoption cost and a relatively low shadow price of labor on small farms. See also Lipton's analysis of Lenin's work on 1890s Russia (Lipton, 1977, p. 115).
30. See, for instance, evidence for Guatemala over 1964–1979 in von Braun et al. (1989)
31. A useful list can be found in Heltberg (1998).
32. We can note another possible cause of an IR: For farmers specializing in staples, production price risk (and the absence of market mechanisms for consumption smoothing), together with risk aversion, may induce small food-deficit farmers to raise production in the direction of self-sufficiency, with large food-surplus farmers reacting analogously by reducing production (Barrett, 1996).

33. Aggregate input equals 0.15 times aggregate capital (capital value plus land value), plus labor input, valued at a number of different shadow wages.
34. The appropriation by colonists, for owner-farming, of Native American and Inuit lands in North America conforms roughly to the Latin American model, but later history, and hence trajectories of land inequality, were very different (Section 4.2.2).
34a. Lipton [2009] provides fuller analysis and evidence on land reform updated to mid-2009.
35. "The path from concentrated individual property rights to [their] fairly egalitarian distribution . . . may have entailed an unnecessary . . . detour into collectivism" (Bell, 1990). Vietnam (like parts of Latin America [Thiesenhusen, 1988], Ethiopia, and Albania) suffered a similar "terrible detour."
36. These juxtapositions (of land rules and areas) are rough and ready. "Tribal" areas of Thailand, Burma, N.E. India ("jhum" cultivation), and parts of Latin America (e.g., Mapuche areas in Chile, "Indian: areas of Amazonia in Brazil and Ecuador) feature cyclic bush fallowing. Rwanda and much of Kenya are increasingly in individualist mode as person/land ratios grow. Sugar, coconuts, and many fruit crops in the Philippines approximate latifundia-minifundia systems (Hayami et al., 1990).
37. Simple options—for example, *X* ha of irrigated land, 0.5X of unirrigated land, or a combination, as a ceiling–may be less fair or "efficient" than complex scaling of land quality, but are easier to administer, with fewer prospects for corruption or evasion.
38. Sometimes even with periodic redistribution as family size changed, as in Vietnam and China.
39. Land-per-person ceilings (and rights to reform land) better reflect wealth but ease evasion and bad-faith transfers, and can encourage fertility and discourage farm investment (Prosterman and Hanstad, 1994, 28 and fn, 56).
40. FAO 1991: iv. Iran, Zimbabwe and the Philippines are noted as exceptions. Also in "1984–9, Indonesia transferred 400,000 families from densely populated areas to . . . uncultivated [public] lands . . . Thailand allocated 650,000 ha to 170,000 households in 1987–1990 . . . Morocco reported distributing 320,000 ha to 23,600 beneficiaries . . . in Algeria 3139 state farming enterprises [went to] 5677 individual[s] and 22,356 groups [and] 273,000 ha to 66,945 beneficiaries . . . Iran . . . distributed [564,000 ha]" [ibid.: 17].
41. Studies show that tiny home gardens, "from 10–120 m2 [to] 5000–20,000 square metres in [Zambia and from] 172–500 to 200–1700 square metres in [Java]" can substantially raise household income, security, or labor-market bargaining power (Mitchell and Hanstad, 2004).
42. China is an extreme case of the Bell detour (Section 4.3.4.vii): the reforming of hugely unequal private holdings into much more equal and productive family farms but via wasteful, often cruel, interim collectivization.
43. In Korea, these trends, plus rapid development, have long caused market-led *increases* in farm size and inequality, albeit both from very low post-reform levels. In 1970–1989 farms below 0.5 ha fell from 32.6% to 17.7% of all farms (NACF, 1992).
44. See, however, Stokes 1983, p. 86: "Despite all the revolutions in the revenue-collecting right and proprietary titles . . . the upper and middle agricultural castes remained . . . hardly altered in their cultivating possession" from "the time when the stillness of the *pax Britannica* first fell upon the land" to the conclusion of zamindari abolition.
45. FAOSTAT gives farmers plus landless laborers 493m *persons*; we assume rural households average 6.
46. In Tamil Nadu ceilings forced big "landlords to sell land and resulted in a more equal distribution"; in Rajoor, West Bengal, "large joint families, in an attempt to evade the land ceilings, separated into smaller [owned] units" (Lanjouw and Stern, 1999). In six semi-arid villages, "the threat of confiscation enhanced the perceived risks [of] land accumulation among large farmers" (Mearns, 1999).
47. Proportions of area *both* in tenanted *and* in large holdings declined in most Indian states between the Agricultural Censuses of 1961–1962, 1971–1972, and 1981–1982 (Singh, 1990; Sanyal, 1988). So other factors outweighed the tendency of reductions in the quantum of tenancies (to avoid the restrictions) to put land

back into larger holdings, now self-cultivated. However, the *period* of tenancies has shortened, and they have become more frequently concealed and/or insecure, harming remaining tenant farmers.

48. The proportion of land in such holdings rose faster, from 7% to 17.2% over 1961–1995 (DES, 2004).
49. The rise in land equality excludes the landless; in India, however, the proportions of rural people who *own* no land, who neither own nor operate, and even—in some states—who *operate* no land, all fell between 1960–1961 and 1970–1971 (Singh, 1990, 72–3).
50. With so much land distributed in 1918–1968, Mexico's still high Gini suggests: much redistribution was counted more than once; much redistributed land got back to large holders; or farmland fell sharply from 1910–1968 (FAOSTAT 2004 shows a fall in 1961–1968).
51. All this was unfortunate and unnecessary. Post-independence smallholders had shown their capacity to gain from removal of past biases; smallness was linked to higher maize productivity (Kinsey, 1999). Tobacco, the main cash crop, is ideal for nucleus-estate, consensual smallholder farming. Aid was available for orderly land redistribution.
52. Dorward's (1999) data, however, show large farms outperforming small ones in Malawi. This is only, we suggest, due to heavy bias in laws and in input, output, research, service, and credit arrangements; cf. Sahn and Arulpragasam (1993).
53. They further cite much evidence of large "investment effects of land title" in Latin America and (contrary to Carey and Faruqee, 1997) parts of Asia, while "in Africa . . . many observers have found [that titling is] unimportant in effect on investment and subsequent farm income" or that investment is cause, not effect, of "more secure property rights to land."
54. Much land is tenanted to cut labor-linked agency costs, but some is tenanted for convenient location or timing of farming, e.g., vis-à-vis urban education or employment.
55. The rules vary. Often some tenancy is allowed but restricted to short leases and/or to a particular tribe or clan (Noronha, 1985).
56. The word is sometimes misused to mean "joining small farms to create larger ones."
57. It may have raised output by over 15% in the Indian Punjab (Oldenburg, 1990) and France (Roche, 1956, 541).
58. Even in one village, months of time of a skillful and trusted official are needed to win acceptance for complex land exchanges. Bain (1993, 128–39) shows the high cost of consolidation in Taiwan.
59. In an Indian village, farmers bequeathed strips of land, from top to bottom of slopes, to give each legatee a mix of high and low land, diversifying against risk. Over the generations, this leads to ever-thinner strips that must be ploughed up and down the slope because animals (or tractors) cannot turn in a very narrow space. The result is increasing erosion (Lipton, 1969).
60. It at first speeded up an ongoing process in which poor peasants seized, and farmed privately, land held by big farmers or the community (the *mir*). In 1923–1924, Lenin restituted some of these lands to medium farmers (*kulaks*) (Wolf, 1969).
61. "[I]n the early 1930s less than 10 per cent of the rural population owned . . . 70–80 per cent of China's arable land . . . [I]n 1949, the government redistributed about 47 m. ha [of China's 100 m. ha] of arable land on an equitable basis to some 50–60 m. rural households" (Bruce and Harrell, 1989, 3).
62. Romania in 1990–1992 transferred the collective 80% of its farmland to fairly equal private holdings, though semivoluntary "associations" continued to offer some of the services—and problems—of the old collectives. As in several other transitional economies, wage-secure state farm workers proved less favorable to reform than farmers in collectives.
63. This can also be induced by post-Communist removal or easing of laws against townward or overseas migration and by the requirements of trade for new EU members.
64. In Russia "12 million people suddenly became legal owners of 119 million ha of prime agricultural land. Most . . . never planned or anticipated [it.] . . . Early reformers [saw] land shares as a transitional tool that will allow transfer of land [and] believed that . . . shares would start to be traded . . . and

eventually find their way to more efficient owners. Most land-shares owners have *preferred* to lease their property to large farms... Less than 5 percent of landowners have *decided* to transform their land into real-estate parcels and become independent private farmers... Large [mostly de facto nonprivatised: ML] farms constitute 79% of agricultural land . . . *In about 70 percent of cases the land they are using is leased from owners of land shares* . . . At the start of the reforms, private family farms were expected to become the main type of business in the agricultural sector. *By 2002 they occupied approximately 9% of agricultural land. They only own 40 percent of the land they occupy*" (Overchuk, 2003, our italics).

65. It cuts incentive to invest (or conserve), the user's family has limited time to enjoy income from improvements, and lack of land collateral can restrict access to credit. This matters most when, as in China, sources of agricultural improvement shift from seeds and fertilizers, giving benefits in the same season to longer-term investments (Prosterman and Hanstad, 1993, 30). However, we lack evidence that 20–40 years' usufruct rights, often renewable and heritable, do less than full ownership to stimulate farm investment or to help poor land users. Ukrainian farmers prefer a regime of lifetime heritable possession, without sale rights, to full rights including sale (Lerman et al., 1994, 49).
66. Mearns (1999), while summarizing longitudinal village-study evidence that both land sale and rent markets improve operated land distribution in India, shows counter-examples precisely where markets were thin and imperfect and hence confined to distress sales. So steps to create or improve such markets—often part of NWLR packages—probably tend to cut median farm size.
67. Although, predictably, mostly bad land, which did not always pass to the poor quickly or at all.
68. The scale of these NWLRs has grown. In Ceara, Brazil, the World Bank's 1996 program had by 2002 placed 15,000 families on over 400,000 ha and was set to expand into four further states (Teofilo and Prado Garcia, 2003).
69. Rural people's decisions affecting farm size have long-run effects and so are normally influenced, not so much by current levels or trends in tax or subsidy on farm inputs and outputs but by the credibility of policymakers' claims that such levels or trends will last– that is, by expectations of *future* price levels, trends, and policies.
70. We recognize that this analysis is inconsistent with a simplistic reading of Olsen (1965).
71. Leveling tax-subsidy treatment between big and small farmers has two advantages over credit policy as a means to enhance the poor's access to land. First, easier credit to buy land raises demand and bids up the price; removing tax-subsidy incentives to big farms raises supply of land to small buyÂers, not just demand. Second, it is hard to identify, for credit, those who are poor, will use it to buy land, and will repay, but lower subsidies on post-reform inputs and ancillary services went with greater success in steering land to the poor—that is, discouraging the rich from incurring costs to capture gains—in Northeast Brazil (Tendler, 1991, 120).
72. This is often claimed to be socially, culturally, or environmentally desirable, for example, to preserve *la France profonde*. It is beyond the scope of this paper to assess this claim, let alone to juxtapose it against the cost of OECD farm support to OECD consumers and taxpayers and to farmers in developing countries.
73. These data understate the decline because they fail to allow for the growing role of part-time labor. Standardizing for part-time versus full-time employment, the agricultural workforce in the EU-15, minus Germany, fell from 11.7 million "annual working units" in 1980 to 6.1 million in 2001 (Directorate General for Agriculture, 2002, Ch. 1, Fig. 3.1).
74. The largest recipient, Riceland Foods Inc., received $426 million of USDA support from 1995–2002 ($110 million, of $12,151 million total USDA support, in 2002 alone; EWG, 2003), but this is a cooperative of some 9000 farmer members (www.riceland.com/about/); a subsidy of $12,222 per farmer is only about double the U.S. mean.
75. This has proved, as in India, to be costly to collect, easy to avoid, and hard to administer—perhaps more so than land tax.

76. In line with Section 3, LG raises agricultural demand and land rent and thereby the labor/land ratio; any resulting general-equilibrium rise in the wage will provide a partial offset.
77. These can be combined; for example, despite a thrust to labor-intensity and small farms from LG in a developing country, its technical progress may be embodied in farm capital or inputs (1) imported from rich countries (where most research is done) and responding to incentives to be labor-saving and pro-large-farm, and/or (2) though generated in developing countries, responding with a lag to pre-LG incentives to generate technology supportive of protected, capital-intensive or large-farm activity.
78. In Brazil especially, refrigeration tanks, to meet milk quality and safety standards, require a minimum scale (Farina et al., 2000). AMUL and its successors in India have succeeded in safely and profitably collecting and safely processing milk from millions of tiny farms.
79. Vertical integration (common in EH) can solve the problem only if the integrated firm intermediates internally and thus harmonizes small-scale optimal production with large-scale optimal delivery. Managerial costs and company norms are not necessarily more likely—perhaps less so—to permit this with vertical integration than without.

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APPENDIX

Table 1 Measures of the distribution of farm size from the 1990 and 2000 rounds of FAO farm censuses

	Year	Mean	Gini	% Permanent Pasture	% Holdings < 2 ha.	% Area < 2 ha.	% Holdings < 5 ha.	% Area < 5 ha.
Africa								
North								
Algeria	01	8.26	0.65		16.7	0.44	21.8	0.8
Egypt	99/00	0.83	0.69	..	90.8	47.4	..	..
Libya	87	14.22	0.75	19.2	17.7	..	42.5	..
Morocco	96	5.84	0.64	..	..	..	71.1	23.9
Sub-Saharan								
Botswana	93	3.18	..	..	..	..	..	..
Burkina Faso	93	3.92	0.42	..	32.4	12.9	73.6	61.5
DR Congo	90	0.53	0.37	..	97.1	86	..	..
Ethiopia	01/02	1.01	0.47	9.0	87.1	60.4	99.0	93.1
Gambia	01/02	4.41	..	..	..	..	..	..
Guinea	95	2.03	0.48	..	65.2	32.2	93.2	74
Guinea-Bissau	88	1.14	0.62	..	87.8	..	97.9	..
Lesotho	89/90	1.44	0.49	..	76.8	..	96.5	..
Malawi	93	0.75	0.52	..	95.0	..	..	..
Mozambique	99/00	1.28	..	..	83.4	..	97.3	
Namibia	96/97	2.89	0.36	..	38.9	15.8	87.8	69.9
Reunion	89	4.42	0.61	..	55.9	11.4	83.5	36.5
Senegal	98/99	4.30	0.50		37.5	8.1	70.0	33.3
Togo	96	1.96	..	..	..	29.3	..	72.7
Uganda	91	2.16	0.59	..	73.4	..	90.8	..
Zambia	90	..	..	..	..	..	92.2	..

Americas								
North								
Canada	01	273.4	..	..	..	..	..	..
United States	02	178.35	0.78	47.9	4.2	0.0	10.1	0.2
Central and Caribbean								
Bahamas	94	11.55	0.87	15.9	61.2	4.3	..	..
Barbados	89	1.26	0.94	10.2	97.8	13	98.9	15.6
Dominica	95	2.34	0.67	11.6	74.5	23.5	..	..
Grenada	95	0.77	0.73	8.4	92.5	32	..	..
Guadeloupe	89	3.24	0.56	34.7	58.9	17.8	90.4	42.6
Honduras	93	11.17	0.66	64.3	..	..	54.7	7.7
Martinique	89	2.40	0.75	51.3	77.9	16.4	93	36
Mexico (ex ejidos)	91	24.58		68.4	..	..	59	3
Nicaragua	01	31.34	0.72	..	21.3	0.7	..	..
Panama	90	13.75	0.87	77.6	58.1	1.5	71.5	4.2
Puerto Rico	02	15.37	0.73	..	22.9	2.5	50.9	7.0
South								
Argentina	88	468.97	0.83	82.9	..	..	15.1	0.1
Brazil	96	73.09	0.85	78.0	20.3	0.3	36.8	1.0
Chile	97	83.74	0.92	84.9	..	..	42.5	0.9
Colombia	01	23.90	0.78	74.2	..	..	50.3	3.8
Ecuador	99/00	14.66	0.85	41.2	43.42	2.0	63.5	6.3
French Guiana	00	6.52	..	..	56.3	..	91.1	..
Paraguay	91	77.53	0.93	69.3	..	..	40	1.0
Peru	94	20.15	0.86	..	..	..	..	..
Uruguay	00	287.40	0.85	82.5			23.4	0.4
Venezuela	97	60.02	0.90	83.4	22.6	0.3	48.4	1.6

Continued

Table 1 Measures of the distribution of farm size from the 1990 and 2000 rounds of FAO farm censuses—Cont'd

	Year	Mean	Gini	% Permanent Pasture	% Holdings < 2 ha.	% Area < 2 ha.	% Holdings < 5 ha.	% Area < 5 ha.
Asia								
Bangladesh	96	0.46	0.57	..	95.5	68.8	..	..
China	97	0.67	..	..	95.8	57.5	99.2	77.3
Cyprus	94	3.41	0.63	3.5	53.9	11.2	..	..
India	95/6/7	1.41	0.60	..	80.3	36.0	95.1	67.5
Indonesia	93	0.87	0.46	..	..	..	..	..
Iran	93	4.29	0.70	7.2	50.5	4.8	71.2	17.1
Israel	95	12.35	..	..	..	..	..	..
Japan	95	1.20	0.59	..	88.5	48.2	97.6	69.9
Jordan	97	3.15	0.78	..	69.9	11.0	86.2	26.2
Korea, Rep. of	90	1.05	0.34	..	92.4	71.8	..	..
Kyrgystan	02	1.16	0.90	..	88.2	14.0	97.2	31.3
Laos	98/99	1.57	0.76	1.7	72.7	42.8	..	..
Lebanon	98	1.27	0.89	..	86.8	34.8	..	..
Myanmar	93	2.35	0.77	..	56.7	20.7	..	..
Nepal	02	0.79	0.49	1.5	92.4	68.7	99.2	92.7
Pakistan	02	3.08	0.61	..	57.6	15.5	85.7	43.4
Philippines	91	2.16	0.55	1.3	65.1	23.4	90.6	56.2
Sri Lanka	02	0.81	0.38		..	..	..	..
Thailand	93	3.36	0.47	1.2	33.9	7.6	72.9	43.8
Turkey	01	5.99	0.58	4.1	34.5	5.3	65.4	21.3
Vietnam	94	0.52	0.53	..	..	..	..	..

Europe								
Albania	98	4.05	0.84	21.6	90.0	17.3	..	..
Austria	99/00	34.11	0.59	28.7	14.6	2.2	36.4	7.4
Belgium	99/00	23.12	0.56	..	17.2	0.9	30.8	3.0
Czech Rep.	00	64.50	0.92	..	44.3	0.5	72.5	1.3
Denmark	02	52.75	0.54	..	..	..	..	..
Finland	99/00	72.24	0.27	4.6	3.4	1.1	10.6	3.9
France	99/00	45.04	0.58	35.7	16.8	0.7	29.1	2.0
Germany	99/00	40.47	0.63	30.0	8.0	0.3	24.9	2.5
Greece	99/00	4.74	0.58	14.0	49.0	11.4	76.8	32.0
Ireland	00	33.31	0.44	86.5	2.2	0.1	8.3	0.9
Italy	00	7.57	0.80	25.8	57.2	6.0	77.8	14.5
Latvia	01	19.89	0.58	25.3	6.2	0.4	25.9	3.7
Netherlands	99/00	22.05	0.57	49.8	15.9	1.0	31.3	3.7
Norway	99	89.85	0.18	11.5	8.2	4.2	20.5	10.6
Poland	02	6.59	0.69	21.1	50.9	7.4	72.4	20.0
Portugal	99	12.47	0.75	36.0	54.6	9.2	78.8	19.7
Slovak Rep.	01	48.7	..	36.3	..	..	94.3	..
Slovenia	91	5.83	0.62	59	41.1	..	64.3	..
Spain	89	18.79	0.86	34.3	44.2	1.8	65.3	5.4
Switzerland	90	11.65	0.50	69.8	..	..	37.9	4.8
United Kingdom	99/00	70.86	0.66	56.8	13.9	0.3	23.1	0.8
Oceania								
Australia	90	3601.7	..	96.1	..	..	2.6	..
New Zealand	02	222.64			6.8		17.1	

Notes: 1. Italicized numbers are linear interpolations from grouped data. 2. Data for Mexico are shares less than 5.1 ha.; data for Myanmar data shares less than 2.02 ha.; data for Thailand are shares less than 1.6 ha and 4.8 ha..

Source: FAOSTAT at www.fao.org/es/ess/census/default.asp.