Institutions, Market Power and the Big Push: The Case of Agro-Exports in Northern Honduras

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This paper examines the implementation of a Big Push policy in Northern Honduras. Big Push theory emphasizes that pro-active development policy could potentially lead to a Pareto-superior equilibrium. Market forces may not lead to the adoption of increasing-returns production processes, if spillovers between processes imply that the processes must be adopted in a coordinated fashion. The paper finds that implementing a Big Push in the presence of liquidity constraints can be immensely difficult, even if the State is far-sighted. In particular, market power comes to play an important role in the presence of liquidity constraints. The presence of market power has the potential to greatly reduce the costs of a Big Push, and render it affordable to many developing nations. However, in the presence of weak institutions, market power also carries significant risks. Firms might leverage their market power to hold up other producers, and undermine the Big Push.

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Part 1: Introduction

The production of certain goods may exhibit technological complementarities. That is, it may only be profitable to initiate production of a good if other producers introduce complementary goods at the same time. The "Big Push" literature suggests that the government may have a role to play in inducing producers to initiate complementary activities simultaneously. A State policy of large subsidies to new production in complementary industries could lead to a Pareto improvement. The phenomenal growth of the "Asian Miracle" countries under fairly proactive regimes has renewed interest in Big Push theory. But the formal models do not incorporate certain factors that may critically affect the implementation of a Big Push in a developing country: concentrated markets and weak institutions. The case study presented here underlines their impact. I review the theoretical treatment of the Big Push in the existing literature, and suggest where theory might be adjusted to accommodate the roles of market power and weak institutions.

Big Push theory presumes that market failure can occur as a result of complementarities (or positive spillovers). Complementarities between the production of goods exist if increasing the production of one good improves productivity in the others. In such circumstances, it might be profitable for a number of firms to produce complementary goods simultaneously, but not for any single firm to operate alone. If no one was producing, market signals would not encourage anyone to begin doing so. Thus the economy would remain at a low-efficiency equilibrium, producing none of the complementary goods. Such a low-level equilibrium trap creates a role for the State in development. The State can encourage the simultaneous production of complementary goods through important material incentives, such as subsidies. The large-scale subsidization of the high-level equilibrium across a wide range of complementary production activities is dubbed a Big Push.

Rosenstein-Rodan (1943) first identified such a predicament in the case of Eastern European industrialization, and Murphy, Shleifer and Vishny (1989) formalized his argument. They argue that industrialization may raise wages in an industry, generating positive demand spillovers in other industries. If industrializing requires large fixed costs, and alternative investment opportunities exist in the economy, firms might profitably industrialize together, but not one by one. Subsequent literature has focused on the benefits of variety in intermediate inputs. In that literature, each new input raises overall productivity and so creates positive technical spillovers in the application of other inputs. These and other types of spillover create scope for a Big Push.

But despite the existing literature's interest in the possibility of a Big Push, it has had little to say about how to implement one. This study of the implementation of a Big Push policy aims to identify the principal obstacles to success. I focus on a striking natural experiment found in the case of two regions of Northern Honduras of very similar size, topography, climate, and soil quality: the Sula and the Aguan valleys. Over the 1970s the Honduran State implemented a similar agro-industrial Big Push in both valleys but was only successful in the Sula. Agro-exports suffer from a coordination problem because while these crops are highly profitable, they must be planted in large quantities

for many years before they are productive. If too few farmers plant the crop, it will not subsequently be profitable for exporters to incur the large sunk costs of investment in exporting and processing operations. If farmers are pessimistic, or have no way to coordinate their activities and plant a large area simultaneously, they will not plant. The State sought to overcome the coordination problem by encouraging farmers to plant new agro-exports and introducing processing and exporting of these crops. It proposed to pay farmers to plant an area large enough to sustain processing, so that they would be assured of processing and plantings would expand. It attempted to minimize the costs of such a policy by developing single-firm processing and exporting: processing and exporting monopsonies require less area to sustain them, and are therefore cheaper to establish.

Evidence from the unsuccessful region, the Aguan valley, suggests that the Big Push was undermined by stagnating investment. The processing/ exporting monopsonies extracted rents from the growers, and so deterred any further investment in agro-exporting. The State sought to protect growers' investments from "hold-up," defined as trading prices at which they received insufficient returns to amortize sunk investments. It regulated processors, and mediated negotiations between growers and processors. But the State's institutional weaknesses and its susceptibility to influence undermined its effectiveness and transformed the processors into interest groups. The Big Push in the Sula region was very similar, with the difference that the government's activities took place in markets already occupied by vertically integrated producers. These self-sufficient processors took the role of a competitive fringe in crop markets. The conclusion to be drawn is that when institutions are weak, fostering competition appears to be a more robust solution to hold-up problems than regulation. A Big Push that fostered competition, however, would entail much higher costs than merely allowing monopsonies to develop.

The insights gained from empirical work are fairly general. In any markets where significant market power might develop, the government's policy of encouraging, limiting or eradicating market power is critical in the implementation of a Big Push. Unfortunately, the Big Push literature generally abstracts from market power. Models tend to portray complementarities between symmetric, monopolistically competitive firms, rather than firms with enough market power to act strategically. Recall that a Big Push encourages firms to initiate production of complementary goods simultaneously, when in the absence of State action firms do not produce because they fear that others will not produce. The more a firm stands to profit from the Big Push equilibrium, the less encouragement will be needed. Furthermore, if producers of complementary goods will be selling to (or buying from) a firm with market power, that firm could substantially affect their profits. The firm could use its influence to encourage its trading partners to respond to a Big Push. For instance, it might raise prices to provide incentives for potential suppliers to initiate production, even if its immediate profits were lower. Market power can greatly facilitate a Big Push and reduce its cost.

Unrestricted market power can pose a threat to the Big Push, however. If an initial, irrecoverable investment is required to initiate production of a new good, then a potential producer will invest only if he is sure to recover that investment. Ex-ante, a firm with market power wishes to commit to prices that guarantee suppliers or purchasers enough revenue to more than cover their fixed costs, to induce them to invest. But ex-

post the firm does not have an incentive to fulfill its commitment. Once suppliers (or purchasers) have sunk their investments, the firm with market power can hold them up if commitments are not enforced. Because suppliers have few other outlets, much of the value of their sunk investments can be extracted by the firm with market power. The potential for hold-up would deter individuals from investing in production, despite the Big Push, and the effort would fail.

If the State could enforce commitments by the firm with market power through regulation or effective contract enforcement, then hold-up would be averted. But the Honduras case study suggests that governments do not always have the power of enforcement. Often the only effective solution is to combine the Big Push with an active attempt to create competition instead of market power. For example, the State might subsidize several firms to produce in the influential industry. But that policy could be very costly, and the Big Push would then not benefit from the cost-effectiveness of market power. For a developing country with severe credit constraints and weak institutions, the Big Push might no longer be affordable. In this light the prospects for developing economies look bleaker, because the preconditions under which a Big Push is feasible are much more restrictive.

Section 2: A Big Push in Agro-Exports: The Case of Northern Honduras

This paper undertakes a comparative study of a Big Push in agro-industry in two regions of Northern Honduras, the Aguan and the Sula valleys. The location of the valleys is indicated in Map 2, and their topography is outlined in Map 1. As indicated by those Maps, the two valleys are side-to-side along the North Coast, linked by a single paved coastal road over the period of study; the Sula is connected to the rest of the country. The Aguan and Sula valleys and adjoining coastline are the most important agricultural area of the country, and the only zone suitable for humid tropical crops in an otherwise mountainous, infertile country.[2] The two valleys are remarkably similar in terms of their potential for agro-industrial development—their topography, climate, fertility and infrastructure is highly comparable. The area of fertile and infertile land in each, under different micro-climates, is similar. Once the Big Push was in place, both had an important port and similar transportation and communication networks. (The details of the comparison between the valleys is laid out in Appendices D and E.) Therefore it is not unreasonable to compare the success or failure of the Big Push across the regions.

In the 1950s the valleys remained far less populated and cultivated than poorer regions in the South, despite severe rural population pressures developing at the time.[3] International and national agencies intervened to further the development of these valleys and resolve inefficiencies in the use of land and labor resources. From the fifties to the

[2] There is also a large area of plains to the east of the Aguan valley, as evidenced by Map 1. But the land in that area is notoriously infertile, and as a result, little has been cleared.

[3] See Appendix A for the increase in landlessness and farm fragmentation from the 1950s to the 1970s.

70s, agencies established transportation infrastructure and several high-value labor-intensive export crops with related processing and exporting. Big Push theory was in its heyday, and development agencies structured their role according to its prescriptions. This study is centered on the Big Push to develop the Aguan valley, known as the Aguan Valley Project, because the Aguan was so sparsely settled at the beginning of the project that the project's effects can be clearly observed. Then observations are compared to those from the Sula valley.

I examine the details of implementation of the Big Push and their consequences in the two valleys. In particular, I suggest that the State actively fostered the development of monopsonies in the Big Push to reduce costs. The Big Push was unsuccessful in the Aguan valley because the monopsonies held up their suppliers, overriding institutional precautions designed to prevent hold-up. In the Sula, exogenous competitive forces prevented hold-up and allowed successful development.

a) The Coordination Problem: The Aguan Valley Project

i) The need for a Big Push. Both the Sula and the Aguan valleys had been important banana producing regions at the turn of the century. The United Fruit Company, the primary banana exporter, abandoned the Aguan in the 1930s, when an outbreak of Panama disease decimated its plantations, although it continued some production in the Sula valley. By the 1960s, the Aguan was a backward region, isolated for lack of adequate roads. Besides some 5,000 remaining hectares of bananas along a single railway line belonging to its competitor, Standard Fruit, the only land in use belonged to ranches and subsistence farms.

The Aguan Valley Project was developed in the 1960s, in a period of severe population pressure and balance-of-payments deficits, with the explicit aim of bringing the Aguan closer to the (relatively higher) development level of the Sula valley in terms of profits, exports and labor absorption. The two valleys were linked together in the mind of planners not only because of their similar physical and climate characteristics, but because their development was so similar before the exogenous shock of Panama disease. Accordingly the Inter-American Development Bank (IDB) funded the Aguan Valley Project to establish agro-export production in the Aguan. "The country needs the Aguan valley to turn itself into an axis of development of the category of the Sula valley. It has the potential to do so" (IDB 1983:10, my translation). Export agriculture is more profitable and more labor-intensive than basic grains production or ranching activities, as recorded in Table 1. Agro-exports were to be the basis for larger industrial development, as they required initial processing or packaging, and could also create additional forward and backward linkages and local demand for other industries.[4]

Table 1: Labor-Days and Profits by Crop, per Hectare per Year[5]

[4] Thus oil palm production requires the establishment of crushing mills, and encourages refineries and final-goods factories. Banana production creates linkages in the Sula valley in the form of box factories to supply materials for shipping bananas, and banana puree plants.

[5] The profitability estimates are very recent, but little has changed since the 60s, except that the relative profitability of ranching and basic grains declines over the entire period. No data exists on the profitability of African palm, one of the important plantation crops (We refer to African palm as an agro-export, although most of Honduras' production over the 70s and 80s was consumed nationally, because the crop is an important export worldwide, of high value per hectare, and it has similar characteristics to other agr-exports). No comparable data exist on profits from rice production and ranching, but those profits appears to fall between basic

	Labor Days		Present Value Profits in 1992 Lempiras
Cattle	6	**Cattle**	n/a
Corn	40	**Corn**	850
Beans	35	**Beans**	1,000
Yucca	n/a	**Yucca**	7,111
Bananas	210	**Bananas**	23,345
Plantains	121	**Plantains**	n/a
Oranges	n/a	**Oranges**[6]	4,766
Cocoa	97	**Cocoa**	7,606
Pineapple	73	**Pineapple**	24,859

Labor Statistics Source: Ruben 1991: Appendix II.4. and Norton and Paz (1993:3).
Profit Statistics: IICA (1987) and Banco Central de Honduras (1994)
$1= 8 Lempiras in 1992.

Processing and shipping had to take place locally, because the raw crops were too bulky and perishable to be affordably transported to facilities in another area.[7] The IDB's first major role in the Aguan valley was to install road and port infrastructure, without which processed goods could not profitably be shipped. The Aguan's infrastructure was brought in line with the Sula's, fully developed in the 1950s. Next, the IDB provided material incentives to farmers to plant agro-exports, in conjunction with Honduran government policies to develop processing and shipping activities. But if agro-export crops were truly more profitable, why did the government (or an inter-governmental organization) need to take an active role in development? The justification for this proactive role in crop development lies in the technology of agro-export production and processing. The two stages require careful coordination, which is difficult to achieve without an overarching firm or social planner.[8]

"Plantation crops", which dominated high-value agro-exports prior to the 1990s, naturally give rise to a coordination problem. Plantation crops are unproductive for 1½ to 7 years after planting, but are then productive for a number of years, which implies large

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grains production and agro-exports in profitability. Sources across the decades agree as to the inefficiency of ranching and basic grains production on fertile valley land: (from the 60s) "There are clear indications that pasture and fallow land occupy a high proportion of the large farms, many of which are located in soils that, as has already been indicated, would be apt for intensive agricultural production" (OAS 1962:141); (from the late 80s) "A considerable amount of land is underutilized in low-yielding activities, such as corn under traditional technologies and extensive livestock operations on natural pastures" (Norton and Paz, for the United States Agency for International Development, 1993:1). This inefficiency has been of perpetual concern to policymakers attempting to develop rural Honduras.

Figures for labor absorption suggest that agro-exports absorb more labor than subsistence crops. But note that African palm, one of the principal export crops of the Aguan valley, is an exception: systematic data are unavailable, but estimates from my survey work suggest that palm absorbs less labor than basic grains production.

[6] Regarding oranges, the 1987 estimates included a typographic error: the corrected estimate was -4,174 Lempiras; but since the publication described the crop as profitable, I believe there was an error. 4,766 Lempiras per hectare is based on the 1994 Central Bank estimate of production costs (Banco Central 1994). Prospects in the oranges market have generally been considered favorable.

[7] Producers in the Aguan supplying processors in another area would run continual risks of losing their market to nearer, more competitive producers: farms located near processing activities or ports are much more cost-effective (Jones and Krummel 1987).

[8] **N.B.** For the purposes of this discussion the production process is summarily separated into two stages. "Production" is defined as all activities occurring on the farm or between several farms, for which efficient scale falls below 200 hectares. "Processing or exporting", ("processing" for short), is defined as those activities requiring the input of more than 1,000 hectares of the crop. Descriptions follow for the crops of interest, but see Appendix B for technical details on plantation crops.

sunk costs.[9] Then they require either processing or packaging for shipping (all of which I term "processing" for short), which exhibits larger economies of scale and sunk costs. In a new region, unless significant numbers of farmers invest simultaneously, no processor will set up facilities by the time the crop reaches maturity, because the scale is not efficient. Without some means to coordinate expectations on the future arrival of processing, agro-export production might never take place.

Is it justifiable to consider this a Big Push problem? On the one hand, as in a Big Push problem, this coordination problem concerns production activities that are complementary and must be undertaken under very specific timing in order to be profitable. Complementarities exist between the actions of the processor of agroexports and the farmers. The production decisions of farmers are also complementary, by virtue of the scale requirements in processing: their crop will have zero productivity unless enough farmers grow the crop that a processing mill can afford to enter the market.[10] Farmers all need to invest simultaneously for the high equilibrium to be possible. Note that they must invest important sunk costs to begin production before they can observe that the high equilibrium will take place. Therefore at a low equilibrium, i.e. when agro-exports have not arisen spontaneously, the State can only influence rational agents by taking effective action to bring about equilibrium. This again corresponds closely to Big Push theory.

On the other hand, the vertical market structure of agro-industry differs strongly from the typical macroeconomy modelled in a Big Push. But in fact this structure has very close links to models of the Big Push that account for market power, particularly Da Rin and Hellmann (1995). Complementarities can exist between firms that are horizontally or vertically related. Therefore processing should simply be thought of as a complementary activity that involves a large sunk investment, and whose timing needs to be coordinated with agricultural production.

ii) <u>The Big Push</u>. The State[11] paid farmers to plant a subsection of their land in specific agro-exports, and organized processing by a State firm or a regulated monopsony. I indicate in what respects this policy response to the coordination problem was a Big Push. And I will suggest that processing was handed to State or monopsony agents in order to reduce the costs of the Big Push.

The first observation is that a Big Push under a monopsony is cheaper because a monopsony can be sustained on a much smaller input supply than can several competitive firms. Suppose that the problem is simplified to a one-shot investment problem, in which all labor and costs are sunk at planting time. The State wishes to fund planting of the smallest possible area that will convince farmers that processing plants will be built for their crops. If farmers are pessimistic, they are convinced to plant only if the area planted

[9] Those crops that are productive after 1½ years (bananas, plantains and sugarcane) have the highest initial costs in land preparation, construction of drainage, etc.

[10] As in a CES model, the producers do not affect each other's technical efficiency, but together they improve the efficiency of downstream firms; this might better be termed a strategic complementarity, as defined by Bulow, Geneakoplos and Klemperer 1985.

[11] "The State", meaning the social planner, will refer to either the IDB or the Honduran government, and to the two cooperatively, in the administration of the regional Big Push projects. To justify such a simplification, one might consider the IDB as having a social planner's interests, in that they wish to be repaid, and considerable control over central government's actions to ensure repayment. There can be (an in fact was) substantial divergence between the interests of "the State" (the IDB) and specific offices of the Honduran government, or specific employees of the government.

by the State is sufficient to sustain a processor. If the State declared that at least two firms must enter at once, the subsidized area would have to be more than twice the area needed to support a monopsony mill earning higher profits.[12] Therefore establishing monopsony processing, public or private, is cheaper than the alternative of establishing competitive processing at the onset. (The remainder of this section will clarify why competitive entry at a later date is not a substitute for initial competition).

Second, note that a monopsony can avoid many of the inefficiencies related to incomplete markets. The problem of incomplete credit markets is particularly pernicious in Latin America. Credit from banking institutions, public or private, is unavailable to most farmers in developing countries because of agency problems. Crop outcomes are often unverifiable, and reimbursement too costly to enforce among small farmers. Conning (1996) demonstrates that when the buyer of a crop is a monopsony, he can provide credit for crop-specific outputs because he can deduct loan payments from the crop price.[13] Under competition, however, a grower could incur a loan with one buyer, then default and sell to another buyer. Without systematic credit availability, it would be very hard to develop a sufficiently large area of supply. Consequently a monopsony structure is essential to the Aguan project, as only a monopsony can supply credit without agency problems. To sponsor competitive mills, the State would have to supply credit at a loss, or subsidize the mills providing credit with subsidies or a larger planted area.[14]

One can generalize the intuition behind these two motives for establishing monopsony. In any Big Push, the presence of fixed costs (or any increasing returns) implies that establishing one firm in every complementary activity is cheaper than establishing several. Second, a monopolist with strategic market power has a strong incentive to help bring about the success of the Big Push, if it reaps a large share of the profits. To support the Big Push, it can use its ability to influence market prices, and to internalize market externalities. In the case of the Aguan, a monopsony will provide credit to growers and build a mill so long as the government establishes a sufficiently large planted area for the monopsony to break even. The monopsony will support the State's Big Push, and internalize the problem of incomplete credit markets.

In fact, the State would favor State-owned monopsony over private monopsony, because it derives additional saving from undertaking production itself. Any profits from processing would directly reimburse the State for the cost of the Big Push. Direct reimbursement would be preferable to reimbursement through taxation whenever raising

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[12] I am presupposing that adjustment by farmers is not instantaneous, otherwise the State could announce monopsony processing and still introduce competitive firms, because all farmers would plant at once and the whole area would be planted and ready to harvest. If planting is gradual for some reason, then competitive firms would not be able to enter together at the time the first crops became mature. Probably the most likely source of gradual adjustment is scarcity of labor. Much of the Aguan was pasture or undeveloped before the Big Push, and so the area was underpopulated before the agro-export project. The State encouraged migration from overpopulated parts of the country, paying for their transportation and initial settling-in, but new migrants deserted the project in droves until the prospects for agro-exports improved. A 1979 Food and Agriculture Organization study of the Aguan project reports that 45% of migrants had deserted the Aguan region entirely (another 17% remained in the area but abandoned the project), 78% of these citing economic problems or lack of work as the motive (Mohor 1979:70-76). Prospects improved at the end of the 70s, when a critical area of palm had been planted and a first small processing plant had been built. Thereafter migration rates were positive and high.

[13] In the case of an annual crop, the monopsonist could provide loans in kind, seeds and crop-specific fertilizers and tools. In the case of permanent (plantation) crops with sufficiently large sunk costs, the grower would not abandon the crop after planting, and so wage payments and generalized crop inputs become crop-specific credit.

[14] See Thorpe (1998: Chapter 4) for the history of State-supplied rural credit in Honduras, and the heavy losses incurred due to various agency problems.

taxes was distortionary or politically infeasible. The State could also raise prices above optimal levels for quicker reimbursement, if liquidity constraints became urgent.

Does empirical observation support this theoretical explanation for monopsony or State processing? Based on the view of State policy as an affordable Big Push, one would expect the State to strongly encourage the expansion of agro-export plantings beyond the State-sponsored plantings, to encompass the region. State policies should take into account the potential credit-constraints mentioned. The State should prefer to supply processing facilities itself, unless it is a particularly inefficient provider, in which case it would encourage a monopsonist to supply facilities.

The IDB directed and funded the initial planting of agro-export crops in the Aguan. The Aguan was actually settled at the time of the project, as part of the country's ongoing land reform.[15] During the 70s, the IDB settled over 5,000 families in large collective farms that could reach the minimum efficient scale in agricultural production. Credit, seed, equipment and technological assistance were provided for settlers to plant 7,000 hectares of oil palm and 2,000 of grapefruit (IDB 1976:13). The credit took the form of a "wage" paid weekly to the new settlers for their work on these plantations. This was equivalent to paying settlers for their work and taxing them later, since they had no resources to risk on default and no options other than to accept. The project also paid for the costly (re)planting of bananas on an abandoned Standard Fruit banana farm called "Isletas," where the State helped found a 4,000-hectare cooperative in 1975.[16]

The structure of the collective farms designed by IDB indicates that it was encouraging further voluntary expansion by the farmers. Each of the hundred cooperatives owned about 500 hectares, and half of the coops were assigned to plant a 100-hectare lot of palm or grapefruit.[17] Similarly, the Isletas banana cooperative was assigned an additional area of fallow land equal to its area under bananas. Table 2 quantifies the undeveloped areas within the whole cooperative system, and within the "non-project" cooperatives left to grow basic grains. The collective-farm structure ensured that scale effects would not interfere with the expansion of the crop. And note that endowing most cooperatives with an initial base of agro-exports resolved credit problems for their entire land area. The cooperatives with agroexports could apply to their processor for specialized or general credit to expand their planted area. Because the processor could extract repayment from their existing crop supply, regardless of how the credit was used, he did not have to restrict loans to crop-specific inputs, often less subject to agency problems than generalized inputs. The farms not included in the initial project were expected to adopt agro-exports more slowly (IDB 1976).

Table 2: Status of the Aguan Valley Project in 1983

[15] The Honduran government retained ownership of most land in the area, and thus it was able to relocate the few pre-existing ranchers and farmers, leaving the IDB in complete control as a social planner.

[16] In the Big Push that took place in the Sula valley (to be discussed below), the banana exporter supplied the loan to establish the plantation. There is no difference between the State providing funds to plant, or the processor doing so, so long as the State continues to play a coordinating role. The processor has no interest in lending to growers to plant unless he knows that enough growers to sustain a mill will accept his offer. The State must take on responsibility for inducing a large enough group to invest—and this is the Big Push. In the case of bananas in the Sula, the State mediated negotiations between the farmers and the banana processors, and remained actively involved during the planting stage.

[17] Cooperatives not included in the agro-export project received small short-term loans to grow basic grains.

	Total Aguan	Palm and Grapefruit Project	Banana Project
Families	4,700	2,700	1,250
Cooperatives	101	54	1
Total Land Assigned	60,000 ha	29,220 ha	3,980 ha
Palm	7,786 ha	7,786 ha	-
Grapefruit	1,798 ha	1,798 ha	-
Bananas	2,035 ha	-	2,076 ha
Estimated Total Arable Land ***(based on Table 3; assumed to be all land in use, 1993)***	100,000 ha		

Source: IDB Closure Report on the Aguan Valley Project (1983).
See footnote 47 for sources and calculation method for the final line; based on 1993 Honduran Agricultural Census.

The State actively promoted market power for processors in the Aguan. It encouraged the new Isletas cooperative to sign exclusive contracts with Standard Fruit, which had become a subsidiary of Castle & Cooke (under the label of "Dole"). Standard was the only banana producer in the Aguan, with its own 4,000-hectare banana farm at the mouth of the valley, but United Fruit, the other multinational banana exporter, would also have been a candidate for an Isletas contract. The State might have encouraged the cooperative to sign two separate contracts: Isletas could have supplied two export companies from its 2,000 hectares of bananas in sufficient quantity to cover their fixed costs, given that in the 1990s one of the three main exporters in the Sula valley, Fyffes Ltd., operated with only 1,048 hectares of total supply.[18]

Where feasible,[19] the State chose to own the processing monopsony, so as to collect reimbursement for its subsidies and investment in infrastructure. It was indebted to the IDB for funding the palm plantations, and to several foreign governments (mainly those of England and the Netherlands) for the cost of three large processing mills, built in 1980.[20] IDB loans had also been used to construct an entire road network for the Aguan and a modern new port for exporting oil and bananas. The State seemed determined to ensure rapid collection of the loans to cooperatives and rapid amortization of the processing plants: regardless of how much palm they delivered, cooperatives were paid 3 lempiras per day per member, which was near or below the going wage for agricultural day-laborers. The cooperatives were constituted silent members of the Managing Board of the processing firm, Coapalma (Cooperativa Agroindustrial de la Reforma Agraria de la Palma Africana), and the State promised to turn over control of Coapalma to them gradually. When Coapalma's profits had reimbursed the debts incurred by the State on Coapalma's behalf, it would be turned over. Note that although the State planned to end

[18] Similarly, the State organized the 10 grapefruit cooperatives together with one packing facility, and signed contracts with Standard Fruit on the cooperatives' behalf, after it failed to market the fruit successfully itself.

[19] The State did not export bananas itself, because at the time banana exporting was a world oligopoly, with significant entry barriers (Barham 1988). The State placed Isletas under the jurisdiction of a marketing board, with the hopes that eventually the marketing board might export bananas itself, perhaps in conjunction with a Central American association.

[20] Building several processing mills does not imply that there were no advantages to monopsony. The choice was probably a function of transportation costs and efficient capacity levels. The optimal size for a mill is now around 40 metric tons of oil per hour, and in the early 1980s was closer to 20 or 25; the three mills had a combined capacity of 65 (Interview, Engineer Carlos Ramon Rodriguez, Coapalma, June 1995). Side roads and more remote roads were improving only gradually, so it might have been more efficient to locate mills at several points in the area, with some extra capacity to grow into, rather than build one central mill.

its involvement in processing after the early stages, it continued to promote a monopsony structure: the subsequent monopsonist would be the cooperative association.

b) Poor Performance of the Aguan Valley Project

This section evaluates the Aguan valley's performance in light of the project goals of increased profits from agro-exports and efficient use of land and labor resources. Even after twenty years of the project, the Aguan is lagging far behind its benchmark, the Sula valley. This is surprising given that all the technical preconditions for growth as conceived by the State were successfully established—infrastructure, planted area and processing capacity.

i) Land use. By the 1990s the Aguan had only half as much area under agro-exports as the Sula. Yet, as discussed in more detail in Appendix E, it is reasonable to think of the Aguan and Sula valleys as having nearly the same total area and total area of fertile land. Table 3 presents the area of farmland under different uses in each valley; the total area, and the area given under basic grains and pasture are rough calculations.[21] Both valleys dedicate large areas to low-profit crops, due to uneven land quality, incomplete credit markets, and other socioeconomic factors. However, the goal of the project was for the Aguan to match the Sula's agro-export production, according to the IDB, rather than to have 100% of its land in agro-exports. The Aguan fails even this modest goal. The greater prevalence of ranching activities in the Aguan is noticeable; thus Valladares and Chavez point out that vast areas are devoted to low-productivity agriculture and ranching in the Aguan valley (1992:27).[22]

Table 3: Distribution of Land in Use in the Aguan and Sula Valleys, 1993

	AGUAN: Area under			**SULA: Area under**		
	Seedlings	**Adult Plants**	**% ***	**Seedlings**	**Adult Plants**	**% ***
Sugarcane	40	97	*0.1*	553	10,603	*11.1*
Cocoa	19	48	*0.1*	725	1,981	*2.7*
Plantains	203	315	*0.5*	1,335	5,330	*6.6*
Bananas	28	6,962	*7.0*	533	12,671	*13.1*
Oil Palm	5,585	9,524	*15.0*	3,946	8,641	*12.5*
Oranges	3,063	3,887	*6.9*	1,158	2,144	*3.3*

[21] Agro-export and tree crop information is drawn from the 1993 Honduran Agricultural Census, by summing over the counties that fall in the two valleys. Unfortunately the counties in question include not only the Aguan and the Sula, but substantial area from adjoining hillsides and mountains. These areas would distort estimates of crop distribution for the valleys, because plantation crops cannot be grown on hillside land. Thus figures for area under basic grains and pasture are unusable, because they include important hillside areas. The figures on total area must be rejected, because they include hillsides land and unusable land. The estimates of area under coffee are excluded from agro-exports, because coffee is a hillside crop. As a result, one can only look at the distribution of **land in use** by uses, not total land. Percentages of **land in use** under basic grains and pasture were obtained from earlier technical assessments of the division of land in the Sula, and a local economist's assessment in the Aguan (IHDER 1983). Because the two valleys are so similar, as demonstrated in Appendix E, I assume they both have the same area of farmland in use; this probably over-estimates the Aguan's productive area, since the Aguan's land use is less intensive in general. Total areas were extrapolated from these percentages and the Census figures on agro-export crop areas.

[22] As a caveat, note that their data were drawn from a study of ranching in the municipalities that include the Aguan region, rather than the Aguan exclusively. As in the case of the Honduran Agricultural Census, reported figures include ranching on hillside lands. Valladares and Chavez draw inferences for the use of land in the valley, but the data may not accurately reflect valley practices.

Grapefruit	0	298	*0.3*	170	193	*0.3*
Other Citrus & Pineapple	37	38	*0.1*	262	573	*0.8*
SUBTOTAL	**8,975**	**21,169**	***30.0***	**8,682**	**42,136**	***50.5***
Other Fruits & Vegetables		1,551	*1.5*		2,868	*2.9*
Basic Grains					*≅ 10,859*	*10.8*
Pastureland		*≅68,841*	*≅68.5*		*≅ 35,992*	*35.8*
TOTAL		***≅ 100,536***	***100.0***		***≅ 100,536***	***100.0***

* The " % " column is defined as the area under seedlings and adult plants as a percentage of the total.
Source: 1993 Honduran Agricutural Census.
Calculation of the areas: See footnote 47.
Aguan valley definition: Municipalities of Trujillo, Sabá, Sonaguera, Tocoa, and Bonito Oriental from the province of Colón. Olanchito from the province of Yoro. Sula valley definition: Municipalities of San Pedro Sula, Choloma, Pimienta, Potrerillos, Puerto Cortes, San Manuel, Villanueva and La Lima from the province of Cortes. El Negrito and El Progreso from the province of Yoro. Tela from the province of Atlántida.

The IDB engaged in a Big Push on the assumption that the development of export crops would not arise naturally through farmers and potential processors coordinating on their own. Plantain, cocoa and sugarcane, agro-exports not included in the Aguan Project, did not expand into the Aguan, although they account for over 20% of total area in the Sula.[23] Their absence from the Aguan seems to suggest that the IDB was correct.

Project crops include bananas, palm and oranges. Oranges were included in an auxiliary project by the Japanese development agency, and came to substitute for grapefruit project, which was in disarray because of the technical difficulty of grapefruit production.[24] The crops included in the Aguan Project appear to be performing well relative to the Sula, in that they cover comparable areas in both valleys. But note that the primary project crops, bananas and palm, are far from a success relative to the intent of the project. (I leave the performance in oranges for a later discussion.) The project chose to foster an expansion of those crops over the entire area, rather than fund a wide variety of crops. But because project crops failed to expand and substitute for the absence of other crops, in the Aguan agro-exports occupy only three-fifths of their area in the Sula, implying that a great deal of fertile land is underused. From the area of palm and bananas funded by the State by 1983 (Table 2), the area under palm roughly doubled by the 1993 Census,[25] and the area in bananas has not increased at all since the beginning of the project.

Based on estimates of the average benefits of agro-exports and basic grains (Table 1), I roughly assess the social cost of not adopting agro-exports. Assume that oranges would have developed even in the absence of the Project, and maintain the assumption

[23] Note the relative unimportance in either area of vegetables and other fruit crops, or other non-traditional export crops (such as cashews, melons, and ornamental flowers). The area under vegetables and root crops does not top 1,000 hectares (or 0.5%) in either valley, and fruit trees other than plantation crops cover less than 2,000 hectares. As a result, my hypothesis can ignore any choices other than to grow export crops or to ranch or grow basic grains (corn, beans, yucca, rice). No explanation of the different outcomes in the two valleys can hinge on the choice to grow vegetables or other fruits.

[24] Oranges were destined for a juicing plant in the Sula and for local consumption, both of which were less demanding markets than the market for grapefruit, which was the fresh fruit market in Europe.

[25] Note that much of the expansion is land still under seedlings, and so the expansion may be attributable to the legal changes of 1992-1993 which I will discuss below, rather than any pre-1992 events. This section focuses on the period before the legal changes.

that the Aguan could have had the same area of agro-exports as the Sula. If pasture has the same expected earnings as basic grains, the land under pasture and basic grains earns 45% less in present value than if it had all been applied to agro-exports, for a net total loss of 401 million 1987 lempiras, or US 1987 $200 million. Just over US 1983 $200 Million is the approximate cost of the project (calculations based on IDB 1983).

ii) Employment. Another measure of the Project's success is agricultural employment in the Aguan relative to the Sula. One of the goals of the Project was to increase agricultural employment so as to absorb landless and unemployed workers from elsewhere in the country, and thereby to create a base of local demand in the Aguan. But because the Aguan has less area in agro-exports than the Sula, it generates much less employment. As a caveat, note that that palm was one of the principal crops that the State aimed to foster, and palm has lower labor absorption than other plantation crops; so even if the project had succeeded the Aguan should have lower employment than the Sula.

Total agricultural employment per category of worker is available from the 1988 population census; the most narrow definition of agricultural employment is reported in Table 4. Agriculture in the Sula generates almost twice as much employment as in the Aguan. The difference is consistent with our expectations, given the low labor-intensity of basic grains and ranching relative to agro-exports (Table 1).

Table 4: Total Rural Agricultural Employment for Farmers and Farm Workers in the Sula and Aguan Valleys.

	Aguan Persons employed	Sula Persons employed	Sula vs. Aguan % Difference
Farmers	12,923	15,312	18
Farm Workers	8,023	20,695	158
TOTAL	20,946	36,007	72

Source: 1988 Population Census. The Departments of Colon and Cortes are taken as proxies for the Aguan and the Sula, respectively. The amounts of hillside and valley land in Colon and Cortes are comparable.

If wages differ significantly across areas, total agricultural earnings may be a better measure of the contribution of each area to reducing rural poverty. Interview and data results (based on a regression from the 1989 Honduran Labor Survey, [26] reported in Appendix C) suggest that wages in the Aguan are only slightly lower, perhaps because labor is mobile. If this is the case, then the difference in agricultural earnings in the two regions is roughly proportional to the difference in employment. So earnings are not discussed as a separate issue.

[26] Based on agricultural labor earnings in the Aguan and Sula from the 1989 Honduran Labor Survey, I regressed wages and earnings on age, education and a dummy for the Aguan for 376 survey respondents (results in Appendix C). Monthly earnings for males are about 10% higher in the Sula, but an R-squared of less than 0.05 suggests the regression variables have no explanatory power. (This estimate is for males who were employed more than 20 hours in the previous week.) Note that in my field survey the wage rate was consistently reported as being higher in the Sula: respondents declared the Aguan day-wage to be 20 lempiras, and the Sula, 25 to 30. Higher wages in the Sula would decrease the wedge between farm profits in the Sula and the Aguan.

iii) The Sula as benchmark. The preceding section measured the Aguan's success against the Sula without any weighting or adjustment for regional differences. One might question the validity of such a direct comparison, as it demands an extreme similarity between the areas. If the Aguan were not near to identical to the Sula in terms of natural and infrastructural endowments, then even under a successful Big Push the Aguan's production would not rise to match that of the Sula. Appendices D and E compare the infrastructural and natural characteristics of the two areas. Appendix D provides evidence that the road and port transportation of the Aguan offered the same possibilities as did the Sula's, in terms of speed and cost of transportation of goods, and that the communication infrastructure was similar. I have mentioned that the two valleys are strikingly similar in terms of productive potential, as verified by a 1962 study by the Organization of American States (OAS) that compiled detailed data on their soil and climate characteristics (Appendix E).

c) Market Power and Hold-up in the Aguan

I suggest that the Aguan's failure was a result of its monopsonistic market structure. The State encouraged processing monopsonies to develop because of their cost advantage, but assumed incorrectly that it could prevent monopsonies from holding up growers. The potential for extreme monopsony profits from hold-up created an endogenous incentive to undermine any restrictions that the State placed on monopsony power. Processors held up farmers, and the incentives for farmers to invest in agro-export crops disappeared, thus undermining the Big Push. In retrospect, the policy of creating monopsonies was costly indeed. Thus market power can lead to inefficient outcomes in any market that involves sunk investments when institutions cannot prevent hold-up, even by taking precautions. Big Push policies appear much more risky in consequence.

i) Hold-up theory and agency problems. A grower experiences hold-up when he is paid less than his reservation utility and his sunk costs. If a processor has the market power and the incentive to pay the grower a hold-up price (for example, it might be his preferred strategy once he fills a certain share of his capacity), then a grower would never choose to enter into production, and the Big Push strategies discussed above would fail.

In longer term dynamic settings the monopsonist will not always choose hold-up, unless interest rates are very high or his capacity is nearly filled by a large existing supply. But John McLaren (1992) demonstrates the fragility of folk theorems under uncertainty in this type of problem: Often the result under uncertainty is that growers will not invest, although it would seem that hold-up could be prevented in equilibrium. He uses this result to account for the decision of the highly concentrated coffee-roasting industry to seek international regulation that provides a floor for the price of coffee beans to growers. He argues that the monopsony needed regulation to credibly commit at planting time not to hold up growers later. The same considerations render hold-up very likely in the Honduran case.

Hold-up is a familiar problem in contract theory, and a number of solutions have been devised to overcome the problem. If these solutions are effective and not costly, then

the State can pursue a low-cost Big Push that fosters monopsonies. The following "safeguards" are theoretically available to the State:

- **Government mediation** between growers and processors (including price regulation)
- **State operation of processing**
- **Enforcement of complete contracts**

Two additional safeguards should develop naturally in markets, but can be supported by the State:

- **Threat of competitive entry**
- **Partial or complete vertical integration** of growing and processing.

A new dimension arises when the social planner faces agency problems. State regulation of the processing firms might not be fully effective, or the employees of a regulating agency might have different motives in than the central government, or the State might begin with a social planner's goals but evolve away from them. In any of those circumstances, the monopsony processor may find some means of evading such safeguards and holding up growers, to the detriment of the Big Push.

Consider the safeguards described above. If the central government is not fully effective, the monopsonist could evade these by incurring costs to obstruct regulation, or by influencing local government. The monopsonist might be able to "purchase" the right to evade regulation or contractual obligations, or obtain special concessions that obstruct competition, and continue to do with the monopsony hold-up profits he earns. Under weak institutions, the effectiveness of both public and private safeguards depends on whether the cost of disobeying them outweighs the benefits. In the Aguan, monopsonists often found it profitable to evade safeguards.

This notion was first developed by Grossman and Helpman (1994) under the title "protection for sale," for a model of protectionist policies in which industries would pay to influence government policy. The more protected rents an industry was earning, the more protection it could afford to buy, and a vicious cycle of protection and influence activities could develop. Note that a model of endogenous protection has force only under imperfect competition, where a firm can hope to gain rents from protection (a national oligopoly relative to outside firms, for example). Similarly, in the Honduran case, perfect competition would imply that no additional rents are earned in the absence of State oversight, because firms were precluded by competition from charging hold-up prices. There is no benefit to influencing the State in a competitive market.

ii) Failure of safeguards to prevent hold-up: the case of oil palm. Focusing on the case of palm processing, I find that in the Aguan the State did establish a variety of safeguards, each of which failed in turn. No matter what group was given charge of the processing mill, that group found it profitable to evade safeguards and extract hold-up prices.

There is evidence that both the State and growers were aware of the potential for hold-up, and so one can interpret State policy as "safeguards." For example, an analyst discusses the views of growers from the Hondupalma project, a slightly smaller version of the Coapalma project established in the Sula near the only other processing plant, San Alejo: "Some palm plots are starting to produce and the National Agrarian Institute [the

agency administering the Aguan and Sula palm projects] hasn't begun to build the processing plant. So the groups are asking themselves what they'll do with future harvests, since the only possible buyer is San Alejo, property of United Fruit, and they know that in that case they will impose the price they want, to the harm of the peasants" (Fuentes 1980:29, my translation).

The fact that the State established long-term systems to regulate processing also suggests that it perceived the need for safeguards. Otherwise, it might have planned to sold the mills to the highest bidder after it had been reimbursed for the cost of the Big Push. Instead the State planned all along to pass ownership of the mills on to the cooperatives once it was reimbursed. Ownership by the growers seemed the surest long-term structure to protect its members' interests, a loose form of vertical integration. And the State maintained a steady involvement in the banana market: it established a banana marketing board in conjunction with the creation of the Aguan banana cooperative. The board's mandate was to increase banana growers' bargaining power relative to the multinationals; its longer term goal was to allow growers to export independently of the multinationals.

The State-run solution was a failure. Evidence suggests that the agency administering the mills, the National Agrarian Institute (INA), engaged in hold-up and rent-seeking itself. The local INA office was publicly denounced for activities such as ghost payrolling, stealing equipment, and other abnormalities (*La Tribuna* 25/1/82, cited in Noe Pino 1986:135). Such activities increased the operational costs of the project, which was passed on to the cooperatives in the form of debt. Meanwhile all of the cooperatives' earnings went toward servicing this debt. The "wages" paid to cooperatives, formally, their profits after deductions debt servicing, remained so low after inflation that they were described by the National Peasant's Union as "a miserable wage that has no relation to their actual needs and the real price of the product" (*El Tiempo* 9/8/1980, from Castro 1994:73, my translation). In 1980 the cooperatives organized a nationwide strike in alliance with other peasant's groups to protest the prices, and successfully demanded control of the plants before reimbursement was complete (Castro 1994:70). Over the next two years, Coapalma, the processing firm, itself became a cooperative owned by the farm cooperatives. Noe Pino (1986:135) suggests that the takeover was successful because they enjoyed the support of international agencies about to finance three large new processing plants. The international agencies may have expected cooperative management to be less corrupt than INA management. It is indicative that in 1981 the agencies suspended disbursements for the plants, until the cooperatives assumed final control of Coapalma in 1982. If INA profited from corruption, then it had an incentive to pay hold-up prices and gather more funds from which to siphon off rents.

Partial integration was no more effective in solving hold-up. The cooperatives, now in control of Coapalma, found that whoever they appointed to manage Coapalma would hold them up. Ownership of Coapalma granted palm cooperatives equal voting rights and the right to supply Coapalma's labor force of 400 from its members and their families. But the cooperatives, as a whole, failed to receive the full benefits of ownership, because corruption developed within Coapalma, particularly in its board of directors. Cooperatives complained in interviews that the Board "became wealthy

overnight. They not only obtain high salaries, but they travel in luxury cars and they have built houses beyond their economic means" (Valladares and Chavez 1992:14). A subset of the cooperatives also profited from the situation, obtaining a disproportionate share of the high-wage employment at the plant and trickle-down benefits when a member belonged to the Board of Directors. Such "inside" groups tended to be those closest to headquarters and the largest town (with some exceptions), perhaps initially because they had more contact with Coapalma, and their families had better access to education to qualify for clerical jobs at the plant.[27]

Apparently, corruption was profitable because "inside" cooperatives could extract rents from "outside" cooperatives. Coapalma functioned more and more as a monopsonist, purchasing cooperatives' output and reaping high profits.[28] The Board of Directors had broad discretion over the price of fruit, and was able to extract high rents without greater reprisal than a slight shift in factions at the following election.

The final safeguard available was the threat of competitive entry. Hold-up would have been deterred by an effective entry threat, but the palm monopsony was very successful in deterring entry. Coapalma's profits induced an important Honduran businessman, Miguel Facussé, to begin building a competing plant in the Aguan. But the State, under pressure from Coapalma, revoked Facussé's building permit for the Aguan, and he had to build halfway between the Sula and the Aguan valleys. Facussé claims that Coapalma used its profits to influence the government, and alternately bribe and threaten cooperatives into signing a petition against his plant (Interview, August 1995).[29]

Coapalma may also have protected its market from competition by blocking producers from leaving the Aguan, an extreme form of entry-deterrence. Several politically influential cooperatives did in fact leave Coapalma, giving up their share in its assets and any future profits.[30] But other, less powerful groups claim to have encountered difficulties when they tried to exit. The one paved road connecting the Aguan to the Sula valley and the rest of the country is guarded by a military checkpoint; all such checkpoints have been repeatedly criticized for extracting bribes from truckers to allow passage (Norton and Paz 1993:12, for USAID). The Aguan checkpoint was accused of barring exit from the Aguan by all but the above-mentioned influential groups on behalf of Coapalma. One of these three allegedly offered to smuggle out fruit for the blocked groups. Coapalma representatives, when interviewed, stressed that the three groups currently selling elsewhere had reimbursed their debts to the State, and therefore had the right to sell to any firm, whereas others still had debts serviced through Coapalma. Its State-assigned role in debt management may have been used to legitimize the blockade

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[27] This characterization arises from interviews with palm cooperatives in the Aguan ; five of the ten interviewed styled themselves as "excluded from the benefits of Coapalma" (San Isidro cooperative, July 1995); one explicitly described those cooperatives situated on the left bank of the Aguan river as being isolated from the others (Suyapa cooperative, 6/95).

[28] A scathing commentary describes the electoral process for the Board of Directors thus: "Deceitful assemblies are held with purchased delegates to keep occupying director's positions and to continue to benefit from privileges and sinecures" (Valladares and Chavez 1992:21).

[29] Facusse further claims that his plant between the Aguan and the Sula was the object of threats and attempted arson.

[30] The first cooperative to exit was Salamá, a powerful group that began to sell to United Fruit after its leader was not reelected to the Coapalma presidency. The other two are among the earliest and most prosperous cooperatives from the Sula valley, with auxiliary branches in the Aguan, Guanchías and Buenos Amigos. Only Salamá was ever offered a large-quantity bonus from United, in the form of a transportation subsidy (Interviews, United, August 1996), because it had 600 hectares of palm. Thus Salamá may have had unique incentives to exit. But the internal accounts of Guanchías suggest that it was indeed profitable to switch: "Now that we sell to CAICESA [the Standard plant] for a better price per ton we think that it's appropriate to increase our production" (Accountant Hector Gomez, Guanchías Yearly Accounts, 1989).

(particularly as it may have manipulated the sums of the debt in question—see subsection iii below). Note that the groups who sold elsewhere were not doing so to avoid debt servicing, since they had no remaining debts.

iii) Verifiable predictions of hold-up in palm-processing. The above account of hold-up gives rise to verifiable predictions: When hold-up occurred, the prices for palm fruit should be lower, and farmers should not invest in palm production.

Table 5 presents the palm-fruit prices paid by Coapalma, based on internal documents and official communications, for those years available; note that Coapalma failed to provide accurate figures. The other columns are prices at the nearest neighboring plant, Standard Fruit's in La Ceiba, and at Hondupalma, the parallel cooperative association in the Sula valley. Hondupalma has also been criticized for mild corruption in its leadership, but the situation was far less serious than in Coapalma.[31]

Coapalma's nominal prices paid to growers appear to be only some 20% lower than in other plants. But the attempts to sell fruit in the Sula valley, discussed above, seem to suggest that farmers were being paid prices far below those offered by other processors, even after the heavy transportation costs to other areas, so the real difference seems to be larger. The wedge might have arisen because Coapalma diverted funds from debt servicing.[32] Recall that the advantage of creating a monopsony processor was that it could deduct repayments of the State's planting loans from the crop price without the growers selling elsewhere to avoid loan repayment. Internal documents from 1982 and 1986 verify that Coapalma collected 30 lempiras per ton toward reimbursing the state bank (Noe Pino 1986:147). But comparing the groups' total debts to the state bank in 1985 and 1989 suggests that Coapalma over-charged groups by 67% on average, even at the 11% interest rate charged by the state bank.[33] Simply incorporating this particular over-charge reduces the effective price by another 20 lempiras. And given that several insider cooperatives had no debts at all by 1989, it is likely that the burden of this overcharge fell on the "outside" cooperatives.[34] Monopsony pricing probably took this form because it was harder to detect, it allowed discrimination between insiders and outsiders, and it made it more difficult for cooperatives to legitimately exit Coapalma and sell elsewhere.

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[31] For example, none of the Hondupalma cooperatives criticized the leadership, nor was there criticism from independent suppliers of Hondupalma. In the Aguan, by contrast, Coapalma's corruption is a byword among suppliers and other locals.

[32] From the one independent producer in the Aguan: "They make deductions for a "savings plan" from your payment, and you can't use these funds until December. Then there are deductions for payments to the Bank, and for fertilizer, which we could buy for cheaper in San Pedro Sula. After the deductions there is nothing left." "Coapalma was born an excellent firm; now it's frightening. Hopefully it will improve." (Interview, manager Reginaldo Díaz, July 1995). Another explanation may be that some groups realized they could never reimburse their debts, given low profitability and Coapalma's accounting practices, and had nothing to lose from incurring further debts. The two most remote cooperatives interviewed owed over a hundred thousand dollars to Coapalma.

[33] Note that this figure is a floor, calculated for the extreme assumption of a 25% interest rate. This is debt to the State Bank, as opposed to debts to Coapalma, who financed later plantings and costs. Coapalma was extremely forthcoming in providing data except on cooperative debts (and, later, on prices), so it may be a point of contention between it and the cooperatives.

[34] Beyond debts to the government for the initial planting costs, the cooperatives also incurred debts with Coapalma for some of their operating capital. Note that some self-styled "outside" cooperatives continued to incur debts with Coapalma, which would seem irrational if Coapalma extracts rents from the reimbursement process. But engineer Erlindo Calix of Standard Fruit noted that in addition to price differences, Coapalma often incurred substantial delays in paying for the fruit, relative to Standard's weekly payments. These delays were shorter for 'inside' cooperatives. Slow disbursement is likely to lead to debt among cooperatives, who were otherwise credit-constrained: six producers referred to the debt-trap cycle in their relations with Coapalma (Interviews, 1995). Then overcharging could be a simple way to pay different prices to 'inside' and 'outside' cooperatives.

Table 5: Palm Fruit Prices Paid by Different Processors

	Hondupalma	Standard	Coapalma, Real	Coapalma, Reported
1988	140	159		300
1989	160 to 210	172	150	350
1990	220	185	175	400
1991	240	209		400
1992	260	269	210	450
1993	320	310		500
1994	430 to 480	388	310	600
1995	500	652	400 to ?	600

Source: Estimates for Standard Fruit by Engineer Erlindo Calix, Standard Fruit oil-palm division, (Inerview, 1996) and Coapalma (internal documents and receipts from a grower). The "Coapalma reported" prices were provided after a later request.
** These prices are in unadjusted current Lempiras. Note that these are the prices paid for fruit delivered to the plant; Standard & Coapalma offer subsidies which cover a part of the transportation cost.

There should also be evidence of deterred investment. In response to hold-up or potential hold-up, one would expect farmers to cease planting palm. Outside of those whom the State induced to plant, Aguan farmers were not inclined to invest in palm production: in the Sula, 400 independent producers planted 5,000 hectares, whereas only two Aguan farmers planted 640 hectares (Interviews, United and Coapalma). There were no more than 20 hectares of palm in all the non-project cooperatives of the Aguan (those given no credit to grow palm), in contrast to non-project cooperatives in the Sula, many of whom have chosen to sow palm.[35]

The Aguan palm cooperatives planted very little additional area until a wave of active promotion by Coapalma over 1986-1990 (see Table 6). At that point most cooperatives did invest. Unfortunately, information as to the incentives offered by Coapalma is not available, but note that the smallest investors were cooperatives from the more remote left-bank area (although they had the most land available). Cooperatives further from Coapalma headquarters, on the left bank of the Aguan, with much poorer roads and only a couple of bridge connections, are more likely to be "outsiders". Outsiders so identified planted 24% of their available land, as opposed to 57% among the most central cooperatives, most likely to be insiders. Outsiders, as identified by this objective criterion, also chose to sell their land when land sales became legal, since selling would imply losing their share of Coapalma.

Table 6: New Areas Planted in Palm, 1986-1990

	% of Available Area	Hectares [36]
All Cooperatives	43	91
Most Central Cooperatives	47	105
Most Central who didn't sell land	57	121

[35] No systematic data exists, but two of the six non-project groups I interviewed there had developed palm plantations, one with credit from United and one gradually from its own resources.
[36] The figures in hectares are not substantially different between those near and those further away, because many groups nearer to Tocoa filled up most of their remainder of their available land (with some notable exceptions). Of course being near to Tocoa may not be a perfect proxy for being an 'inside' cooperative.

Left-Bank (Remote) Cooperatives	38	97
Left-Bank Cooperatives who sold land	24	67

Source: Carlos Ramon Rodriguez, head of Agricultural Operations Division, Coapalma. 1995

In addition, hold-up should reduce investment in currently cultivated palm trees. Cooperatives could cut maintenance costs in labor (weeding) and chemical inputs (fertilizer) for lower yields. Evidence on yields does suggest such a strategy. A hectare of land under mature palm yielded an average of 14 metric tons of fruit for Coapalma, relative to 17 for United Fruit, 16 for Standard and 22 for Hondupalma (as recorded in Noe Pino 1989:11). An engineer working for Oleopalma, one of the companies buying palm land in the Aguan, indicated that his firm purchased plantations so damaged from poor care that they may not be able to salvage the trees. They had hoped to bring the trees up to a yield of 24 tons per hectare (Interview with engineer Rolando Ruiz, July 1995).

vi) Endogenous interest groups. Many large development projects have failed because of unforeseen rent-seeking behavior by participants. In retrospect, it often seems obvious that the incentives of the rent-seeking groups should have been calculated more carefully (see, for example, Klitgaard's 1990 analysis of aid and corruption in Equatorial Guinea). But this line of criticism frequently oversimplifies, as the Honduran case indicates. In Honduras the State failed not only to predict the range of strategic rent-seeking behavior, but also to identify the set of agents that would undertake strategic behavior. Thus, for example, the interest groups that were able to gain control of Coapalma and thereby exert influence were far from landed gentry with long-term ties to the government, but were illiterate and impoverished settlers. Of all the pitfalls facing Coapalma, the risk that a group of these settlers would coalesce to take advantage of the others would have seemed the least likely, and the composition of such group would be impossible to predict. As a result, the State was hard pressed to correctly align the incentives of all potential interest groups.

The case of the banana industry highlights a social planner's difficulty in correctly aligning the incentives of every agent who might hypothetically be involved in rent-seeking. In that case, the relevant set of agents and actions there outstripped the predictions both of economic models of entry-deterrence and political science models of influence activities. As a result, the safeguards against hold-up that the State established were woefully inadequate.

Evidence suggests that Standard Fruit pursued a strategy of deterring entry of competing banana exporters into the Aguan, and of allowing the Isletas cooperative to be held up. Standard's behavior is complex, and its hold-up and entry-deterrence strategies were less transparent than in the case of palm-processing. The reason is that Standard, as a world oligopolist, had another motive for entry-deterrence beyond holding-up Isletas, namely, to restrict world production. This analysis is inspired by Melmed-Sanjak's (1988) comparative economic analysis of Standard's relations with Isletas and with Guanchías cooperative in the Sula valley, itself based on the strategic framework developed for the banana multinationals in Latin America by Barham (1988). The available historical documents (contracts, newspaper articles, government proceeding

relating to Isletas) have been compiled by Posas (1992), with some few exceptions that I mention.

I argue that Standard might have wished to deter competitive entry to the Aguan as part of a foreclosure strategy. "Foreclosure" is defined as an action that cuts off a rival from a scarce resource, and Barham (1988) presented evidence of such foreclosure strategies employed by the banana multinationals. Dole Fruit, of which Standard is part, belongs to a three-firm world oligopoly threatened by fringe competition (United Brands, the conglomerate that includes United Fruit; Dole Fruit; and Del Monte). The oligopoly attempts to tier the market so that they supply a tier with high prices and consistently high quality (Barham 1988: 248-257, based on evidence from Central America). Taste and quality are consistently higher if bananas are picked closer to maturity, and if shipping time is less, so closer sources of bananas are necessary to supply the high tier. Honduras had long been a desirable source of bananas for East-Coast American markets, and in the late 70s supplied a quarter of North American demand (Maillard 1991:292). The Aguan would be particularly attractive to an entrant because much of its land was undeveloped, and its port very little used, so he could build up a significant source of supply there.[37]

Standard Fruit apparently deterred entry into the Aguan by discouraging independent banana production. No Aguan farms were offered supply contracts, although many evinced interest (Interviews, 1995). In 1971 Standard refused a contract to a cooperative that had already begun planting bananas; yet the year before it had signed contracts with 4 cooperatives in the Sula valley (Posas 1979:59). How did this discourage entry? If no independent growers of bananas existed in the Aguan, exporters would be deterred from entry unless they were willing to buy land and plant it themselves. Exporters apparently did not find integrated entry profitable (I take up this point in the discussion of vertical integration in the next section), as is corroborated by the behavior of entrants to the Honduran banana-exporting business. In the past twenty years Del Monte and Fyffes successively entered and initiated fierce competition, but only in the Sula, where there were independent producers.[38]

One independent farm did develop nonetheless, and thus might have thwarted the entry-deterrence plan. In 1975 Standard decided to abandon its Isletas farm after severe hurricane damage, and began immediately to scrap remaining installations and transfer equipment. But its former employees seized control, blocked the transfers, and formed a cooperative. With State support Isletas became fully operational and independent, and it was large enough to support an entering competitor (see page 44-45); thus it represented a competitive threat.[39] Prior to this work, Melmed-Sanjak observed that Standard found Isletas' independence a threat, and provided striking evidence of the same: "A senior manager of Standard Fruit in La Ceiba stated in a 1987 interview that he considered it a mistake to give Isletas autonomy and that SFC should resume control of the Bajo Aguan

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[37] Barham (1988) demonstrates that United had in earlier years appropriated vast amounts of fertile Central American land to restrict access of competitors to that scarce resource and to deter entry through capacity commitments; after the 60s it divested and pursued a tiering strategy. Now that Central America is more built up, fertile land has again become a scarce resource. Thus later entrants in the Sula valley, such as Fyffes in 1990, were not able to secure such uniformly high-quality land as the incumbents (Interview, Standard Fruit Division Manager, July 1995).

[38] Fyffes undertook contracts with new producers for part of its production in the Sula, so there was no a priori reason why it would not have done so in the Aguan, unless entry without a minimum area of supply were infeasible. The Del Monte company attempted to contract with the one independent farm in the Aguan, Isletas, but otherwise did not offer any contracts in the Aguan.

[39] Another very small cooperative, the Santa Ines, was formed alongside Isletas. But its small size did not threaten Standard's position in the Aguan. Note that the Santa Ines experienced none of Isletas' troubles.

valley" (Melmed-Sanjak 1988:27).[40] Standard did sign a production contract with Isletas, to avoid the cooperative signing with a competitor, but probably hoped to find some means to more permanently restrict its independence.[41]

The rent-seeking group that undermined growth in the banana industry was the army. Isletas was repeatedly sacked by the local military, in an extreme form of rent-extraction; no Sula producers experienced similar problems. The Isletas cooperative started out with a very independent stance, seeking to negotiate with a new export company formed by the Central American nations and to diversify its crops. The local army battalion became suspicious of alleged communist tendencies in the group and in 1975 arrested its elected leaders on false charges. Studies agree that from 1975 to 1988 the army systematically interfered with the cooperative's leadership and extorted funds.[42] Not surprisingly, the cooperative became inefficient and corrupt, and transfers of power were chaotic. The military was similarly suspicious of the Sula banana cooperatives and played an active role in helping ranchers evict them in early struggles over land, yet once settled in, these groups experienced no violence (Salgado 1981:24). The contrast is puzzling, because it does not seem to arise from a fundamental difference in philosophy between the military in the Sula and the Aguan, nor from any exogenous check on violence in the Sula. Evidence suggests that the local military in the Sula were willing to engage in violence, and that violence related to struggles for control of Isletas frequently spilled into the Sula.[43]

Studies of Isletas have implied that the army's behavior was permitted, if not encouraged, by Standard (see, for example, Posas 1992:95, Ruben 1991:35). The fact that army interference in Sula cooperatives ceased when they signed banana-growing contracts suggests that those cooperatives were protected by the companies that they contracted with. Why was Isletas not protected? There is some evidence of complicity on the part of Standard: for example, the company remained willing to negotiate Isletas' contracts when the army insisted on being present.[44] In that sense its behavior could be seen as an encouragement to the army, since the potential costs to the army of engaging in extreme rent-seeking are lower if Standard was unwilling to interfere. State agencies also

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[40] One example of Standard's attempt to maintain control of Isletas farm occurred just before it abandoned the farm. Standard sought to reorganize Isletas as a joint venture with the State and the workers, but not as an autonomous entity. The banana workers' union rejected the offer and made plans to grow oil palm, stating that "we are not willing to grow bananas because of the risks that they carry, given the attitude of the company in regard to dependency in marketing" (Posas 1992:36, my translation).

[41] Melmed-Sanjak identifies radical differences in Standard's relations with Isletas and with other banana suppliers. Her evaluation differs from mine, in that she concludes that Isletas was a threat to Standard because of its large capacity. Maintaining excess capacity can also block entry into the high-quality tier, because the incumbent can flood that market tier at short notice if a competitor tries to enter, and thereby prevent the competitor from earning profits. Melmed-Sanjak suggests that a competitor might be able to enter by buying off some of the excess capacity (1988:7). However, it appears to me that more than one farm would have to be purchased before this was an effective entry strategy.

[42] See for example Posas (1992), and Jackson et al. (1989).

[43] The last violence among the Sula banana groups was just before those groups began to sign contracts with the banana companies. Efrain Díaz, the president of Guanchías cooperative, was ambushed and wounded in 1966 (Truitt 1981:1). And violence continued in the Sula, although it was not directed towards the Sula banana cooperatives: the 4th Battalion from the Aguan pursued several leaders of Isletas, tortured and assassinated them years after they resigned from Isletas and had taken up new professions in the Guanchías area (Posas 1992:133-135). These events, taken together, seem to suggest that the Sula banana cooperatives were receiving some measure of protection once they began to grow bananas. However, it could also be the case that the Aguan batallion was particularly powerful and pernicious. During the Contra War the government considered the Aguan a sensitive region because of its proximity to Nicaragua, and the army had considerable influence.

[44] An example often cited to implicate Standard is that the Isletas leaders arrested in 1975 were transferred to prison on a train belonging Standard Fruit (Posas 1992:92), a normal but not obligatory favor.

felt free to extract rents from Isletas without fear of interference by Standard, overcharging Isletas for services and tampering with accounts.[45]

I argue that Standard benefited enormously from ignoring the army's extraction of rents, because the army served to bind Isletas to Standard. Up to1988, Isletas leaders never exerted sufficient control to seek contracts with other export companies. The army and the marketing board viewed Standard as a trouble-free source of income, and renewed the Isletas contract without including the cooperative in negotiations.[46] The first competing offer that Isletas was seriously able to entertain was from the Del Monte corporation in 1988, as the army's influence in the area waned. To retain Isletas, Standard was obliged to offer a vast credit package for the rehabilitation of the plantations, as well as a price increase (Posas 1992:210). But by this point, Isletas was paralyzed by corruption and debt and had turned over "almost complete control of Isletas's financial operations" to Standard under loan agreements, to avoid ghost payrolling (Jackson et al. 1986:5). Standard prevailed on Isletas leaders to forego the price increase after the contract was signed. Note that again the potential safeguard of competitive forces was overridden.

Standard paid Isletas exactly the same prices as the Guanchías cooperative in the Sula, but with surcharges for some of the inputs provided.[47] Had Isletas been strong and independent, it could have bargained for a huge price from Standard, given how much Standard valued entry-deterrence. Isletas neither received a premium for entry deterrence or its enormous size, nor compensation for its larger initial investments (Standard had built the packing plants for the Guanchías cooperatives, whereas the State incurred all equivalent expenses for Isletas).

Isletas was indeed held up, but by the army and the State marketing board. Were it not for the benefit of entry-deterrence to Standard as an oligopolist, the rents extracted by Standard would have been completely dissipated to the army and the marketing board. Therefore, this particular strategy for hold-up was unlikely to be supported in the absence of a world oligopoly; but another rent-extraction, entry-deterrence strategy might well have been. The variety of potential strategic behavior observed in this case is bizarre. Strategies are particularly hard to predict when interest groups are endogenously determined by the existing institutions and the size of rents to be gained. The army was an unlikely agent of entry-deterrence, but under found it worthwhile to become involved in the presence of large oligopoly profits.

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[45] For example, Cohbana, the government marketing board created to safeguard Isletas' income, and the National Agrarian Institute (INA), who assumed control of Isletas during its most chaotic period in 1981. But these agencies also engaged in rent-seeking: one-third of Isletas' debts date from the period of INA's management, and Cohbana was discovered by a 1986 government study to have overestimated Isletas' debts to them, before they parted ways in 1983 (Posas 1992:151 and 179).

[46] In a February 1979 letter to the President of Honduras, Isletas complained that Cohbana tended to threaten the group with the loss of its contract with Standard, rather than seek other potential buyers and engage in stiff bargaining. The State was unable to maintain its commitment to a strategy of producer independence, and to maintain control over Cohbana. To begin with, most Cohbana employees were former employees of Standard Fruit, the only source of expertise in the Aguan, so they naturally oriented Isletas to Standard. Also, the board's mandate was to provide technical support and supply inputs to member growers so as to reduce dependence on the banana companies. Because Standard supplied those services itself, Cohbana's commission from Isletas became a highly profitable royalty.

[47] Prices based on calculations from contracts between Guanchías and neighboring cooperatives, and Cohbana reports to the Honduras Congress, provided by Professor Frank Ellis, University of East Anglia; from Guanchías accounts provided in interviews August 1995; and from Isletas reported in Melmed-Sanjak 1988:17 and Posas (1992). Melmed-Sanjak (1988:17) discovered the input surcharges at Isletas, based on Isletas' records of bills from Standard. Data on capital investments are from Ellis and from Posas (1992). Calculations and primary sources available from author on request.

d) Policy Prescription: Fostering Competition

Pervasive rent-seeking in the Aguan suggests that an effective policy solution would have to change the incentives for rent-seeking. Two solutions would eliminate the incentives for hold-up and entry-deterrence: vertical integration, which eliminates the market; and competitive markets, which eliminate monopsony profits. This section focuses on policies that foster competition. The next section deals with integration, arguing that integration in agro-exports is probably technically inefficient.

The benefits of competition are studied through the medium of the comparative case-study of the Sula valley, in which processing and exporting were more competitively structured. The benefits of competition can be measured by the Sula's relative performance. When the Sula banana and palm industries underwent a Big Push with almost identical policy prescriptions to the Aguan's, the program was successful as a result of pre-existing competition in those industries. The Sula valley developed divsersified and growing agro-industry and agro-exporting, with exports crops gradually covering an important share of the valley.

Before the Big Push, bananas and palm were exclusively in the hands of United Fruit. United Fruit—a subsidiary of United Brands, known under the label "Chiquita"—had a longstanding presence in these markets.[48] Since World War II, United had a vertically-integrated palm operation, growing palm trees, processing, refining and producing cooking oils. United also managed a nearly integrated banana operation, supplied by its own land and by several former employees, to whom United had provided land and initial investment costs (Ellis 1983).[49] Then in the mid-1960s the State provided negotiation aid to several Sula cooperatives interested in growing bananas for Standard Fruit (McCommon et al. 1985). Standard entered the Sula valley by signing contracts with these cooperatives, and signed on two other independent producers in the next few years (Ellis 1983:135). And in the late 1970s the State established a slightly smaller parallel project to Coapalma, known as Hondupalma, in the Sula valley. (The palm cooperatives took control of Hondupalma and structured it identically to Coapalma, after the Aguan cooperatives' successful attempt.)

The pre-existence of United's palm and banana operations changed the outcome of this Big Push. Although United was vertically integrated, it had enough capacity to absorb some additional supply. During price negotiations, small groups of growers could threaten to switch to United, as in fact Standard's largest banana producer did in 1976 (Ellis 1983:135). There was also the potential that United could expand its operations if the high prices in the market justified doing so. As a result, United exerted some competitive pressure on Hondupalma and Standard, much as a competitive fringe would, and neither offered monopsony prices.[50]

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[48] United had vertically integrated operations for a number of reasons. The first was that it obtained vast tracts of land under a contract to build railroads through the area. The second was that its plantations were established when the crops were more profitable, and therefore integrated entry was more common. See the following section for an in-depth discussion of integration.

[49] Such an arrangement is nearly equivalent to integration. A relatively small group of farmers may be able to supply a monopsony without hold-up in the presence of certain safeguards, such as relationships and hostage investments (if United owns the investments on the farmer's land, the farmer has them as "hostages"). The efficiency characteristics of such an arrangement are akin to those of integration, discussed below. But note that such small-group arrangements are in a delicate equilibrium (see de Fontenay and Gans 1997): there were in fact complaints of hold-up among such farmers as United came to monopolize the railways and export channels (Kepner and Soothill, 1967).

[50] Similarly, the existence of a competitor created the risk that crops would be re-sold to United rather than to Hondupalma or Standard, to avoid debt servicing fees deducted from the crop price. Recall that one of the benefits of establishing a monopsony had

If the hypothesis that the source of the Aguan's problems is its market structure is correct, it gives rise to systematic predictions for the Sula. We should see (1) expansions in the area and number of growers in bananas and palm; (2) competitive entry; and (3) a relative absence of rent-seeking. Indeed the area under these crops has increased steadily, prices to growers have been high, and competitive firms entered both palm processing and banana exporting in the 1990s (Facussé eventually built his palm-oil plant near the Sula). Hondupalma has had only mild problems with corruption, relative to Coapalma (personal communication, Francisco Fúnez, Assistant Director of INA, June 1995 and Melmed-Sanjak, September 1994).

Unlike the Aguan, competing processors have entered without suffering from discriminatory government policy (as did Facussé in the Aguan) or illegal hostilities. The only conflictive entry in the Sula, known as the "banana wars," was that of Fyffes in 1990, a period with a tremendously positive outlook for bananas. Fyffes convinced several growers to break contracts with United, and United in response took the growers to court, eventually reaching a settlement. But this is a far cry from influencing government policy or local army behavior to block competition. The less-than-monopsony profits earned were apparently not high enough to justify deterring competitive entry through influence activities.

Recall that before the 60s United was a monopsonist in the Sula, therefore, by analogy with the Aguan, one needs to explain why United did not deter Standard's entry into the Sula.[51] No visible entry-deterrence occurred, although Standard's entry explicitly worsened its relations with United, as it "ended years of cold war [for a more active war] between our companies" (Interview, Division General Manager for Central America, Dole, September 1994). United would presumably have had the same incentives for entry deterrence as Standard did later in the Aguan, namely, to restrict production of bananas by its competitors. United may have kept the group of "independent" suppliers in the Sula small and loyal in order to deter; and indeed none of these ex-employee suppliers later shifted over to supplying Standard. But Standard was more than equal to overcoming that tactic, in the 1960s. In that decade Standard made technological discoveries that rendered it much more cost-effective than United, and was aggressively capturing United's market share (Ellis 1983 and Barham 1988). Standard found it affordable to incur the time and investment costs in allowing new growers to establish plantations, given its cost advantage. Nor was Standard deterred by United's political influence, since Standard was equally entrenched in Honduras.[52]

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been that a monopsony could supply credit to its farmers, sure of being repaid—and so competition presented a threat. But re-sales were minimal, if they occurred at all, probably in part because it would not suit United to encourage illegal operations, for small benefits in terms of output and capacity use. The problem may have become more severe later, when United built additional capacity in palm processing in the mid-80s, and when the prospects for exporting bananas to Eastern Europe were so bright in the early 90s. By then, however, most farmers had repaid their debts.

Interestingly, United suffered from the re-sale problem itself in the 90s. United supplied credit to nearby smallholders to plant palm when it replaced its mill with a more efficiently-sized mill in the 80s. A number of smallholders have sold palm fruit to Facussé's mill since it was built, in order to avoid their debts with United (interview, Axel Sandoval, United Fruit, July 1995). It would appear that the re-sale problem increases the costs of a credit program, but may not completely undermine it; but more research is needed.

[51] The absence of entry-deterrence in palm does not need to be explained, because a vertically integrated operation suffers no consequences from competitive entry. One need only explain why United did not struggle to limit banana exporter's access to the Sula Valley, as doing so strengthens United's oligopoly position.

[52] Also at the time Standard was exporting from La Ceiba, between the Sula and Aguan valleys (see Map 2), rather than Puerto Castilla in the Aguan. Therefore there was less of a Big Push problem, in which a critical mass of producers was necessary before exporting was profitable. The Sula crop could be shipped to the port to join the rest of Standard's Aguan shipment.

Bananas and oil palm are not the only plantation crops in the Sula valley: the other principal crops are cocoa, plantain, sugarcane and, earlier, oranges (Table 3). The hypothesis must also be able to account for the development of other successful crops, despite coordination problems and potential hold-up. Generally speaking, successful crops developed in markets where buyers had always competed for the crops: Sometimes a large local demand existed for the product, as in the case of plantains, or oranges. In the case of cocoa, the scale of processing technology was initially small and allowed every grower to be his own processor, and competition persisted as scale increased. Market structure is characterized by processors with a competitive fringe of producers (plantains and oranges), or a small oligopsony (cocoa). In line with my hypothesis, the Sula valley saw remarkably few conflicts between the growers and processors of these crops, and rates of grower investment were high (see in Table 3 for the area under seedlings, which represents new investment). The exception was sugarcane, which has such high transportation costs that each mill has a natural local monopsony. The earliest growers of sugarcane were generally shareholders in the mills, and the subsequent growers were cooperatives directed to the crop by the State. Relations between growers and processors have been conflictive (Interviews, Association of Independent Cane Producers, August 1995). Government regulation of prices between growers and mills has been sporadic, with growers lobbying for increased regulation.

It would seem that the existence of even the weakest competition, namely two-firm oligopsonies, can be enough to prevent hold-up and entry-deterrence. This result is surprising, given the strong incentives for collusion among oligopsonists. The benefits of competition in the Honduran situation are hard to underestimate. The observation suggests that a more robust Big Push policy in weak institutional contexts would foster ex ante competition, rather than restricted market power. Fostering competition carries much higher costs than would a monopsony with effective safeguards, as was discussed above. No measure of the "cost of competition" is empirically available, since competition arose from the exogenous presence of United Fruit. But if fostering competition is the only robust solution, then a Big Push may be a much more costly solution than has previously been thought.

e) Conclusion

The Big Push experience in Northern Honduras was profoundly marked by the role of market power. The Aguan stagnated because Honduran institutions were not strong enough to prevent rent-extraction after creating market power. Capture and hold-up of investors deterred investment in palm and bananas for decades.

A cloud of uncertainty surrounds the question of which institutions can effectively contain market power. Several political science models suggest that institutional structures can be designed to counterbalance the incentives of existing interest groups (see Tollison 1996 for a theoretical treatment); in this category fall models of the U.S. Congress, for example. But the evidence from Honduras suggests that this analysis is insufficient, because an effective institution would have to automatically align incentives for any existing group *or* any easily formed group. If interest groups are endogenous, many more institutions are susceptible to influence than has been thought. Competition reduces the benefits and increases the costs of engaging in rent-seeking activity.

Therefore competitive market structures may be the only solution when there is uncertainty about the susceptibility of institutions to influence.

Section 3: Alternative Hypotheses about the development of the Aguan and Sula Valleys, Honduras

Hold-up is not the only explanation that has been put forward as to why the Aguan valley has lagged behind the Sula valley in agricultural development. The favored culprits are the land reform cooperatives, which are held to be inefficient and to lack entrepreneurial vision. Others ascribe the Aguan's agricultural backwardness to the fact that it lacks a large city to generate specialized services, and still others argue that it has been slowly closing the gap since economic activity started in earnest in the mid-70s. It is also possible that sponsoring integration would have been an efficient strategy and would have avoided hold-up. This section examines the evidence for and against those hypotheses to isolate the effect principally responsible for the Aguan's poor performance.

a) Inefficiency of Cooperatives

Cooperatives are held responsible for the poor performance of the Aguan by many neighboring farmers, because cooperatives owned and under-utilized the vast majority of fertile land in the valley. Many economists also believe cooperatives are instrinsically susceptible to "organizational infighting, labor shirking, and corruption" (Barham and Childress 1992:587). Others criticize the particular legal structure of collective organization in Honduras, which did not allow land sales, for example, and point out that most reform beneficiaries would have preferred private ownership: "These collectives usually were not granted full title, so they were hampered for access to commercial credit. When they could not cultivate all their land, a frequent occurrence, they were legally enjoined from renting or selling part of it" (Norton and Paz 1993:13).[53]

Cooperatives are not responsible for the Aguan's underdevelopment if they merely reduced their intensity of production in response to hold-up. Cooperatives might be responsible:

- (i) if cooperatives across Honduras systematically underuse their land resources. Using land-use evidence from the Aguan and the Sula valleys, this hypothesis can be rejected unless cooperatives under-use land in *both* valleys. [54]
- (ii) if cooperatives could not profitably grow agroexports in the Aguan, because they are inefficient and costs are appreciably higher than in the Sula. This hypothesis can be rejected if the farm efficiency survey I collected allows us to prove that cooperatives are not inefficient producers. Failing that, the hypothesis does not hold if

[53] Mortgage credit was indeed unavailable, and other private loans scarce, since it was nearly impossible to foreclose on a cooperative's assets. As we have discussed, credit would only have been a problem for the fifty cooperatives excluded from the Aguan Valley Project. The strictures on land rental mentioned above were generally ignored, however, so that law did not cause much inefficiency (Castro 1994:65). There were other details in the laws regulating cooperatives that led to inefficiencies. For example, individual members could not sell their membership, but could pass their membership on to a son. Since no age was fixed for this transfer, many members remained in the group long after they were able to perform strenuous agricultural labor.

[54] Cooperatives outside these two valleys were rarely endowed with high-quality land, suitable for agro-exports. Therefore the comparison is restricted to these two valleys.

inter-valley differences in production and transportation costs have no effect on cooperatives in non-monopsonistic agro-exports in the Aguan (specifically, oranges, discussed in section b). Overall I lack sufficient evidence to fully refute hypothesis (ii).

i) Investment in agro-exports. Cooperatives apparently do not use less of their land than independent farmers with similar endowments. Table 7, based on estimates by the Regional INA Office, shows that the Aguan cooperatives have about 43,859 hectares of land that can be used for agriculture. The OAS estimated that there are around 147,500 hectares of potentially good alluvial soils in the Aguan, 87,750 of which are known to be premium land and the remainder of which had not been surveyed in sufficient detail; see Appendix E. However this calculation does not take into account the fact that the census underestimates farmland.

Table 7: Characteristics of the Land Reform Cooperatives in the Aguan, 1991

Number of Cooperatives	138
# Members	5355
Reform Sector Area (ha)	60,675
Area/Coop (ha)	440
Land suitable for Agriculture (ha)	43,859
Land suitable for Ranching (ha)	8795
Useable Land (ha)	52,654
% of Total	**87**
Land Used for Crops (ha)	26,632
Land Used for Ranching (ha)	11,809
% of Useable Land	**73**

Source: Valladares and Chavez (1992:Table 5). From 1991 estimates by INA Regional Office, Sinaloa, Colón.
Notes: "Useable" land excludes land unfit for agriculture, infertile, too sloped or regularly flooded. Large public works could reclaim some land in this category. The INA definition of cooperatives in the Aguan includes a few on adjoining hillsides.

Table 8 presents land use in cooperative farms relative to others. Under the extreme assumptions that cooperatives have only premium land and that only premium land supports agro-exports, cooperatives would be using 37% of their fertile land for agro-exports, relative to the 43% of total fertile land in the Aguan that is in agroexports. Therefore cooperatives cannot be drastically underusing their land relative to the average in the valley. But this calculation does not control for the difference in government incentives for cooperatives and for independent farmers. Recall that the cooperative sector was favored with premium land, State credit and (in the case of bananas) production contracts. The initial investment in production was ordered by the State. A more appropriate sample of Aguan cooperatives would be the thirty-some groups given fertile land in the Middle Aguan, but not incorporated into the Project. At best these developed small cattle herds and small orange orchards (Salgado et al. 1994:158). Recall again, however, that their behavior is not conclusive evidence, as it might be the optimal response in the presence of hold-up.

Table 8: Share of Aguan Valley Reform Sector in Total Productive Area, 1993

Productive Use	* Total Area in use (ha)	% of total in use	Area used by Reform Cooperatives (ha)	% of total in use
Bananas	6,990	7.0	** 200	0.1
Palm	15,109	1.0	15,354	39.9
Oranges	6,950	6.9	1,523	0.3
Grapefruit	298	0.3	465	1.2
Corn	↑		7,870	20.4
Beans	68,841	67.5	326	0.8
Rice	(all 4 categories)		427	1.1
Cattle	↓		11,809	30.7
Other	1,626	1.6	467	1.2
TOTAL	**100,536**	**100.0**	**38,441**	**100.0**

Source: 1993 Census figures, and Salgado et al. (1994: Table 46). Figures for the reform cooperatives based on estimates from the INA Regional Office in Sinaloa, Colón, and the Ministry of Natural Resources Office in Sonaguera, Colón.

* The fact that the Census figures are an underestimate is apparent in palm production, since the INA estimates of cooperatives' and the 650 hectares of independent land sum to 6% more than the Census figure.

** In 1990 Standard Fruit purchased Isletas, the one large cooperative producing bananas. That sale explains the low percentage of cooperative land in the banana sector.

Looking at cooperatives across Honduras, there is no evidence that cooperatives underuse good land resources when free of hold-up problems. Using a "control group", I examine cooperatives' investment choices when market incentives were favorable, in the absence of State intervention. Control groups are rare because cooperatives with fertile land were generally incorporated into agro-export projects (Goud 1986:98). The only exceptions were seven cooperatives created in the mid-60s around Guanchías in the southwest of the Sula valley (see Map 2 for location; see Salgado 1981 for history of these groups). Six of these independently signed contracts to plant agro-exports, and their area under agro-exports was far above average for the Sula (see Table 3 for the average). Nonproject cooperatives in other parts of the Sula valley sometimes lacked adequate land and credit resources, but still proved resourceful in developing agro-exports on their own: of the 11 nonproject cooperatives I interviewed in the Sula's palm-growing area, five had developed a plantation crop, although for the most part only in 1990-1991.[55] Further research is needed, but it seems likely that cooperatives invest similarly to other farmers under favorable conditions.

(ii) Survey evidence on efficiency. I collected a farm-profits survey to answer the question of whether cooperatives are substantially less profitable than other farmers. If so, they might have been deterred from growing agro-exports by transportation and other costs, which might not be prohibitive for more efficient farmers.

The survey collected detailed costs and revenues for 43 farms (out of the 80 surveyed) who were producing agro-exports under competitive conditions: palm sugar and plantain in the Sula valley and oranges in the Aguan. Palm producers interviewed in the Aguan are excluded as, under my hypothesis, they are not under competitive conditions. Banana producers are excluded because of the complexity of their costs. I

[55] Two of them established palm, and two obtained banana contracts. The fifth was growing organic pineapple (a non-traditional export, NTX), which it was seeking to market as a processed product (jam, dried pineapple) through a broker in Texas (Interviews, 1994 and 1995).

collected data on recent operating costs, but not on investment costs that were more than several years old, due to inaccuracy of recall. Investment costs include planting and land preparation costs, and costs in terms of time.[56]

I regress farm profits on a dummy for whether a farm is a cooperative, after including dummies for differences in crop choice. The structure of the model assumes that investment costs are identical for every producer within one crop, but vary across crops. Operating costs are assumed to vary proportionally with crop choice, cooperative status and idiosyncratic producer characteristics:

$$\pi = I + \text{Crop Dummies} + OC*(1 + \text{Crop Dummies})*(1+ \text{Coop Dummy})*\varepsilon$$

The reduced form of this profit function is a model in which per manzana profits (a manzana is two-thirds of a hectare) are regressed on crop dummies and a dummy for whether the farm was a cooperative, and interaction terms, and errors are corrected for heteroskedasticity. Given the small size of the sample, this reduced form was the only estimable form of the base model.

The evidence suggests that cooperatives may be less efficient than private producers: a Wald test that the coefficients on the cooperative dummy and its interactions are all zero is rejected with 90% confidence. At the sample-weighted mean, cooperatives are only 66% as profitable as other farmers. Given the size of the sample, results are inconclusive, but certainly indicate the need for additional empirical work. At this stage I cannot reject hypothesis (ii) that cooperatives are inefficient, and could not cover the higher costs of agroexports production in the Aguan (such as higher transportation costs). The following section reveals that there are Aguan cooperatives engaged in orange production, higher costs notwithstanding, which might contradict the hypothesis (see discussion below). However no adequate data source exists to test whether cooperatives are less active in orange production than independent farmers.

Table 9: Regression Results from Farm Profitability Survey

Mean of dep. var. = 2605.45	Durbin-Watson = 2.01336 [<.873]
Std. dev. of dep. var. = 2928.04	LM het. test = .829040E-03 [.977]
Sum of squared residuals = .273400E+09	Jarque-Bera test = 3.97399 [.137]
Variance of residuals = .781144E+07	Ramsey's RESET2= .850706E+38
Std. error of regression = 2794.90	F (zero slopes) = 1.58528 [.172]
R-squared = .240731	Schwarz B.I.C. = 16.3650
Adjusted R-squared = .088877	Log likelihood = -397.817

Variable	Estimated Coefficient	Standard Error	t-Statistic	p-value

[56] Some respondents kept accounting records but many responded from memory, and so there are inaccuracies. Survey responses were compared with each other and with estimates by the Ministry of Natural Resources as to the prices of inputs (fertilizer, pesticides, tools), and outliers were replaced with Ministry estimates. In the case of sugarcane, survey responses were compared with guidelines from the sugar-growers' association for consistency, to verify whether the share of different expenditures was within the same orders of magnitude. The most serious problem found was in the area of machinery costs (tractors and trucks, primarily), when the machinery was owned rather than rented. Some survey responses for respondents with their own machinery were evidently incomplete in regard to repairs and maintenance, fuel costs and depreciation; and so averages across farmers of that crop were interpolated. When the machinery was rented to other farmers, these earnings were subtracted from machinery costs. Depreciation costs were extrapolated from the reported potential sale value of the machinery.

C	3071.58	1059.91	2.89796	[.006]
ORANGE	101.958	1986.41	0.05133	[.959]
PALM	3410.44	1445.05	2.36008	[.024]
PLANTAIN	-2813.43	1456.81	-1.93122	[.062]
COOPERATIVE	-1075.43	1309.20	-0.82144	[.417]
ORANGE*COOP	-767.623	2191.68	-0.35024	[.728]
PALM*COOP	-1415.36	1675.14	-0.84492	[.404]
PLANTAIN*COOP	3003.21	1998.19	1.50297	[.142]

Standard errors are heteroskedastic-consistent (HCTYPE=2).
Wald test that Coop, Orange*Coop, Palm*Coop & Plantain*Coop have zero coefficients: W=9.08615 (distributed chi-square with 4 degrees of freedom).

b) Spillover Effects

There might be other determining macroeconomic and microeconomic differences between the Aguan and the Sula. The Sula might well be ahead of the Aguan because it includes the city of San Pedro Sula and the port of Puerto Cortes. The Aguan valley has a population of around 185,360 relative to the Sula's 721,790 (SECPLAN 1990); the population of San Pedro Sula alone was estimated at 300,900 in 1989. Almost all overseas exports are channeled through Puerto Cortes, which is served by several large shipping firms, so firms must transport exports through the Sula valley. (The exceptions are Standard Fruit, which exports from the Aguan's new port, Puerto Castilla; and Coapalma, which sporadically exported from Puerto Castilla). Producers in the Sula "hub" might have a significant advantage because of more experience, lower costs of production-related goods and services in a dense area and lower transportation costs.

Subsections (i) and (ii) identify certain types of spillovers that could explain the Aguan's lag, and supply what direct evidence is available on their magnitude (evidence on the availability and cost of certain services, for instance). Subsection (iii) attempts to refute the spillovers hypothesis indirectly, by looking at the Aguan's thriving orange production. I suggest that if spillover effects were critical, production of oranges would have suffered along with the production of bananas and palm.

i) <u>The benefits of agglomeration economies</u>. "Agglomeration economies" are defined as increasing returns to scale in certain goods and services, with the implication that dense economic activity is cheaper. Costs of production might be lower in the Sula than in the Aguan, where producers are more sparse. For example, labor market and crop markets might have high transactions costs when they are thin. In point of fact, wages appear to be approximately the same in the two valleys (Appendix C), and most export crops are not sold on local markets. Transactions costs in crop markets might differ widely across valleys, if San Pedro Sula possessed important central markets. But local selling costs are not relevant for agro-exports, because producers are in long-term relationships with their processors.[57]

[57] Oranges are exceptional, as they are often sold to intermediaries with trucks, but the system is so well-developed in the Aguan that around Sonaguera, the most important orange-growing area, both producers and truckers claim they can find a partner to exchange a harvest in a matter of hours. In general oranges can be shipped along with basic grains in the same trucks, and thus could easily reach the Sula markets from anywhere in the Aguan.

Appendix D details the valley's more general services and studies their adequacy for agricultural activities. Outcomes in terms of general service quality seem more or less equal across valleys. There are more banks in San Pedro Sula, for example, but the Aguan does have several competing firms. Goods and services that are produced under fixed costs might not be available when demand is small. The Aguan lacks specialized agricultural services, such as high-end input supply stores to provide detailed dosage recommendations, but processors provide these services directly to producers of plantation crops.[58] They generally oversee production practices and provide recommendations for care and for the dosage of inputs, more intensively if the crop is fragile. They also supply inputs specific to the processed crop that are otherwise unavailable or very expensive. The processor generally suffers no diseconomies of scale, since he supplies several thousands of hectares. For example, Coapalma has a nursery of palm plants and supplies fertilizers in bulk. Banana companies across Honduras provide difficult-to-find materials for boxing bananas and caring for the plants, airplane spraying services, and pesticides for sigatoka disease.[59]

Some suggest that transportation costs negatively affected the Aguan's development. Because the Sula is a hub of economic activity, most goods are still exported through the Sula's ports (with the exception of Dole bananas). Thus the Aguan's growth might be hampered by being a smaller center of demand and trade. Transportation costs for crops are large and significant (Appendix B). The impact of crop transportation costs on growth remains an empirical question; section (iii) attempts to answer it for the case of orange production, the industry with the highest transportation costs. Transportation costs for inputs may also be important, since most inputs are imported to the Aguan through the Sula valley. Interview respondents in the Aguan confirmed that inputs are cheaper in San Pedro, but could not provide magnitudes; prices for common inputs should not be much lower, for reasons of arbitrage. Results from a survey of regional prices by the Honduran Ministry of Natural Resources seems to indicate that the price differences are small.[60]

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[58] The only exception among plantation crops would be farmers who sell oranges to truckers. But almost all of the orange-growers interviewed had made recent or present sales to the Citrus Development Corporation (CDC), an American firm with a juice plant in the Sula valley and technical personnel in the Aguan, and thus had received technical advice from CDC in the recent past. Cocoa and plantain are cultivated by smallholders all across Honduras, and are very undemanding technically, so the lack of technical support would not be an impediment. For basic grains and ranching, guidance is informally supplied by input stores belonging to peasant associations, and by the ranchers' association. The producers most likely to suffer from the absence of information services are small producers of high-quality fruits and vegetables, which may help explain why they are so scarce in the Aguan.

[59] One service that is less readily available in the Aguan is soil and leaf studies: these are performed regularly in banana production, but much more rarely in the other crops. However, the services are available relatively close, in La Ceiba (see Map 2), at not much greater cost in terms of time and transportation than if they were local.

[60] According to my calculations input prices were on average 1% higher in the Aguan. Price differences were large but not consistently unidirectional; given the standard deviation of 16.5%, I cannot exclude the possibility that prices were significantly higher in the Aguan.

	Input Price Differences
Number of Observations	63
Average Difference	1% higher in the Aguan
Standard Deviation of Difference	16.5%

Source: UPSA(1994). Percentage difference across valleys were calculated for every available input price.

ii) Costs of catch-up. The Sula might have a cost advantage from dynamic spillover effects. The goal of the Aguan Valley Project was that the Aguan would "catch up" to the Sula, by rapidly expanding its plantations. Note, as an aside, that the Sula must be in a slow-growth or steady-state equilibrium for the Aguan to be able to catch up, which seems reasonable to assume since the measure, "area covered by plantation crops", has a natural upper bound. The Aguan may not have reached the steady state because of initial conditions that slowed it down, such as land-clearing costs, or the learning costs and credit constraints that hamper latecomers.[61]

Education and experience can create spillovers that favor rapid adoption of agro-exports at the individual and regional levels. If experience is critical, a new grower may start with a small area and expand only slowly, when scale permits, so as not to make costly errors; he might wait until better-educated offspring can take over. Farmers in a region long devoted to cash crops will have more first- and second-hand experience.[62] They may have had access to higher levels of education. In the Aguan, rural primary school coverage only began with the Project, whereas schools were established earlier in the Sula. Wealth effects are important because of credit market imperfections, discussed above. There exists a significant wedge between interest rates on savings and those on loans, especially if a farmer has no access to the formal credit market. (Recall however that project cooperatives have some access to credit.) Therefore a producer with low initial wealth will be less likely to undertake a capital-intensive project such as establishing a plantation than a wealthier producer. Long-standing production of cash crops in the Sula implies that the wealth of producers in the Sula is higher.[63] Again, the importance of these factors is an empirical matter.

iii) Examining the Evidence on Spillovers: Orange Production. If regional effects are critical, whether from agglomeration economies, transportation costs or dynamic effects, then no plantation crop could be successful in the Aguan. The thriving orange production in the Aguan, even in the absence of local processing until 1995, does seem to contradict this hypothesis.[64] The major distinction between oranges and the other agro-exports is that the markets for oranges are competitive rather than monopsonistic.

Orange production was sponsored by the Japanese government in an auxiliary project to the Aguan Project. This project targeted a drier zone of the Aguan, where

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[61] In regard to land clearing, a sizable area of the Aguan remained under dense growth at the beginning of the Project, both within cooperatives and without. Clearing a deep enough layer of land for plantation crops is a more arduous and costly task than slashing and burning to clear land for pasture or basic grains. Credit constraints aside, these costs would increase the incentives for leaving land undeveloped. By 1983 the nonproject cooperatives, without the benefit of machinery provided by the project, had only cleared a fifth of the 500 hectares they were ceded, on average (IDB 1983:17). "A large part of the lands are undeveloped and their vegetation needs to be cut down before they can be incorporated into production. They also need drains. But for lack of economic resources they remain unused. The members don't have fixed incomes, nor payments from the State [for the cultivation of palm], and they are obliged to sell their labor to survive" (Valladares and Chavez 1992:13).

[62] In addition to spillovers of experience, such as learning by doing, there can be information spillovers about the latest techniques and markets, crucial to "non-traditional export" producers but less so to others. NTX show signs of beginning a rapid expansion, as they have in Guatemala (von Braun et al. 1989), but they do not yet cover much land.

[63] A number of other effects I have discussed, such as land-clearing costs, may also leave Aguan farmers less wealthy. These farmers may therefore abstain from production, or they may begin with a small area and gradually expand as their wealth increases. Development might also be delayed while plantation crops reach maturity, if earnings from the crop are needed for further expansion.

[64] In fact oranges have the heaviest transportation costs, so they should be the crop most affected by regional effects. On the other hand, oranges can be grown efficiently in much smaller plots than any other plantation crops, as small as 2 or 3 hectares. Suppose that profits are lower under transportation costs (or other region-wide effects), then credit constraints and risk-aversion might prevent many crops from being grown. But these constraints would be less binding in orange production, where production can be initiated on a small scale.

private farmers had been relocated at the time of the land reform. Its phenomenal success highlights the importance of competition. The oranges were initially for local consumption, and were subsequently exported to La Ceiba and San Pedro Sula, as roads improved (see Map 2).[65] Competition existed between a juice plant built in the Sula in 1984 and truckers shipping to regional fresh-fruit markets.[66] Orange production expanded rapidly whenever Salvadoran and Nicaraguan fruit markets were open, particularly after the peace treaties of the early 1990s, and also in 1995, when two competing juice plants established simultaneously. New investment has accordingly been rapid since 1990: as shown in Table 3, seedlings covered as much area as adult trees in 1993. The speed and strength of response to a rise in profitability indicates both the potential for responsiveness to incentives in the Aguan, despite credit constraints and other regional disadvantages, and the paucity of other options in crops. Even the credit-constrained non-project cooperatives began to grow oranges over some of their drier lands.[67]

Given their profitability, one would expect all farmers to grow oranges, but vast areas are still devoted to ranching and basic grains production.[68] The explanation lies in the fact that citrus is suited to drier areas and cannot survive flooding or poor drainage, whereas cattle can be pastured for much of the year on such land. Ranching is likely to be observed on wetlands. Likewise, oranges cannot fully substitute for wetland crops such as palm on land with drainage problems, a category which includes much of the rich alluvial land of the river banks.[69]

If the Aguan stagnated because of hold-up in palm and bananas, then farmers in more humid areas should be much worse off than in dry areas, because they cannot grow oranges. The coverage of humid lands in agro-exports is a rough measure of the impact of the monopsonies on the region. Table 10 presents a cross-valley comparison of counties that have mostly dry land, with counties of mostly wet land, attempting to contrast areas of comparable size and climate. (Comparing the area under oranges is not informative, because orange-growing in the Sula was impossible until recently, so much of the dry area is under other crops.) I find that while the Aguan's wet counties have 54% less land under permanent crops than the Sula's, its dry counties have only 31% less land

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[65] Orange production in the Aguan benefited by chance, in that an environmental problem specific to orange trees prevented their growth in the Sula valley until about six years ago: in 1970 a large cement factory settled in the orange-growing area and produced a dust that settled on the leaves of orange trees, stunting their growth and destroying the Sula crop (Interview, Dr. Gladys Tablada of the Honduran Foundation for Agricultural Research, member of the United Nations team that investigated the matter).

[66] The juicing plant located in the Sula near the port, because the Sula was in between several areas with modest orange-production. Since all oranges came to this plant from far afield, the Aguan was not especially disadvantaged.

[67] Given the location of the project, most orange growers were independent farmers rather than cooperatives. There were however several cooperatives fully engaged in orange production. More data on soil quality and drainage for cooperative and independent land would be necessary to assess whether cooperatives undertook less orange production than independents. Such data would allow us to answer whether cooperatives were too inefficient on average to produce agropoexrts in the Aguan.

[68] Barham and Childress (1996) analyze agricultural investment decisions based on a large sample of orange growers and ranchers in the Aguan, using an exogenous switching model, and concluded that landowners appeared indifferent between planting a half hectare of oranges or adding 1,800 Lempiras of livestock. "Given that capital costs for planting a manzana of citrus are estimated at approximately 3,800 Lempiras/year, if the household's land constraint was non-binding then cattle expansion would be a superior strategy." (1996:115). But the analysis is misled by omitted-variable bias in land quality. None of my interviewees (including ranchers) considered ranching a high-profit activity, as opposed to oranges. Their characterization was that ranching occurs on land unsuitable for citrus, or under stronger credit constraints or liquidity needs.

[69] "Choosing a site with adequate drainage is important for citrus production. Citrus roots are killed or damaged by anaerobic conditions in the field. Areas with high annual rainfall and poorly drained heavy soils are prone to drainage problems." (Davies and Albrigo 1994). The initial IDB project included palm and grapefruit, probably so that both wet and dry areas could be optimally used, and perhaps also as risk diversification. Palm is a relatively flexible crop, but is not as suited to dry areas as citrus.

under permanent crops than the Sula's. The data seem to agree with the hypothesis that monopsonies created a considerable lag in development and that oranges were somewhat able to compensate.

Table 10: Area under Permanent Crops, Aguan and Sula, Dry and Humid Areas

Mostly Dry-Climate Counties (hectares)		Mostly Humid-Climate Counties (hectares)	
Aguan	Sula	Aguan	Sula
15,079	22,077	16,853	36,562
Aguan = 31% less than Sula		Aguan = 54% less than Sula	

Source: 1993 Honduran Agricultural Census

Nevertheless, hold-up in palm and bananas had serious consequences, even though those crops are not the only agro-exports, because crops are not perfect substitutes. The more general theoretical point is that one hold-up problem could stagnate an entire Big Push, depending on the structure of the economy and the rate of substitution away from the good in question.

c) The Absence of Vertical Integration

The final alternative hypothesis to be addressed concerns vertical integration. According to this hypothesis, hold-up was indeed the principal source of inefficiency in the Aguan, but simply allowing vertical integration would have eliminated the inefficiency. Because cooperatives were not permitted to sell their land until the Agricultural Modernization Law of 1992, processors could not integrate backwards into farming and resolve the hold-up problem. I suggest that encouraging integration ex-ante would not necessarily have been preferable to fostering competition, as a solution to the Big Push problem.

For evidence I turn to the outcomes of the land market that opened after 1992. Prices and transactions in that market confirm that hold-up occurred, and that allowing integration would have eliminated hold-up and its negative effects on investment. However, examining more general evidence on integrated operations suggests that these have undesirable efficiency and distributional properties.

i) Evidence of hold-up. Hold-up should be reflected in land-market outcomes: cooperatives producing a monopsony crop, or with land suitable only for a monopsony crop should be seeking to sell, but only monopsony processors should be interested in buying land (except land suitable for oranges), because they alone would be able to avoid hold-up.

Standard Fruit purchased banana lands from Isletas and then some 3,000 hectares of the richest alluvial soils in the Aguan, belonging mainly to cooperatives.[70] Standard

[70] Standard made an offer for Isletas in 1990, before the new law. It did so with the government's complicity, since the sale was permitted and its illegality steadfastly ignored. The opinion was prevalent that Isletas was much underpriced at US $33 million. Sources disagree, but Ruben and Funez, the most serious investigators of the land sales, claim that United made an offer of US $60 million for the group, known only to the directors of the cooperative (1993:38). This is interesting insofar as it reveals to what extent Isletas was tied to Standard. The other purchases occurred from 1991-1994, both before and after the law was formally in effect, but lonely after the law was anticipated, so Standard gained no exclusivity.

did not keep its intent to purchase secret for long, yet it faced no competition beyond a few cases of arbitrage.[71] Standard aimed to gain from a new tax break for starting a banana farm and to capture promising European markets in 1990-1992 (when Eastern Europe was on the brink of opening). But its action is also consistent with a strategy of restricting independent supply in the Aguan, because Standard only proposed to expand production once it could purchase alluvial land from cooperatives, rather than having to contract with them. Almost all the land sold by Aguan cooperatives was sold to Standard or the palm processors, although a few ranchers and one rice grower also purchased small amounts. In the Sula, on the contrary, cooperative land was generally bought by neighboring producers or by entrepreneurs, rarely by processors. Only sugarcane cooperatives in the Sula sold to their processor in large numbers, probably because sugarcane is a natural monopsony.

Coapalma could not legally own land, so it did not integrate. But other influential palm processors bought palm land in the Aguan, presuming that Coapalma would find it difficult to hold them up. After 1992, some 20 cooperatives sold out to Facussé and another entering processor. These processors planned to ship the fruit to their own facilities until Coapalma was weakened by the land sales; in 1995 one processor had built a mill in the Aguan, and the other was planning to do so. The hold-up hypothesis also predicts that if Coapalma's corruption was a function of its monopsony position, competitive entry should alter its behavior. By all accounts the corruption problem within Coapalma has improved dramatically, and its price for palm fruit is now only 5% lower than Standard's (Interview with Engineer Erlindo Calix, from Standard's processing plant, 1995).

Almost half of the palm project cooperatives in the Aguan sold their land, as presented in Table 11. Cooperatives' decision to sell land was clearly influenced by the corruption within Coapalma, by their own accounts and those of outside observers.[72] The cooperatives and Facussé confirm that he was sought out "because they were looking for a strong person like me to scare these guys" (Interview with Miguel Facussé, August 1995). About the same proportion of all Aguan cooperatives sold, which would include the cooperatives purchased by Standard. No more systematic information is available, but none of the orange-growing cooperatives I interviewed had any intention of selling, nor was there any record of such a sale. Land sales in the Sula valley are in dramatic contrast to those in the Aguan: for example, not a single palm cooperative in the Sula had sold, by 1995.

Table 11: Cooperative Land Sales in the Aguan and the Sula, by 1995

	Land sold as a % of total land in category, Aguan	Land sold as a % of total land in category, Sula

[71] Grupo Lempira, a powerful business group including the president of Honduras, purchased a cooperative adjoining Isletas, with the sole intent of exchanging it for banana land that Standard owned in the Sula valley (and were prevented only by exogenous legal factors). The group had planted bananas in the Sula, showing that they were not averse to banana farming, yet they sought only Sula land (Interview, Grupo Lempira farm manager, and the former Guanajicilapa cooperative, June and July 1995).

[72] The lack of communication on one part and the fact that there is and was corruption, has led to a loss of trust by the member cooperatives. Rumors circulate about bad administration and the diversion of funds to the private ends of the leaders. All of the above leads to the conviction that it's preferable to sell the plantations and obtain their share all at once." (Eugenio Rodríguez, vice-president of the FECORAH peasant association, quoted in Ruben and Funez (1993:102), my translation).

Total Land in Cooperatives	42	6
Palm Project Cooperatives	43	0
Banana Cooperatives	95	18

Source: INA (1994). Updated in 1995 by INA, in cooperation with PRODEPAH (Proyecto para el Desarollo de Políticas Agrícolas en Honduras, USAID).
N.B. These figures include all cooperatives assigned to the Aguan and Sula INA offices. Therefore some of the non-palm, non-banana cooperatives lie outside the valleys.

A final prediction is that the price of land for bananas or palm should be well below the price of similar land in the Sula valley.[73] Buyer-processors should be able to bargain for low land prices, given the low expected earnings of the (nonintegrated) seller. Table 12 presents estimates given by survey respondents in the Aguan and the Sula of the price of different categories of land.[74] Surprisingly, the gap in prices across valleys is less wide for palm land than unimproved land, perhaps because (according to farmers) competition for palm land by entering processors had driven up its price, and some growers expected an improvement in their situation.

Table 12: Estimates of Land Prices in the Aguan and the Sula
(1995 lempiras/hectare)

Variable	N	Mean*	Std. Dev.	Minimum	Maximum
Unimproved, Aguan	39	5,880	2,883	350	15,000
Palm Land, Aguan	19	16,320	9,560	2,090	37,500
Orange Land, Aguan	24	27,710	13,379	10,000	60,000
Unimproved, Sula	17	17,090	13,527	5,000	60,000
Palm Land, Sula	3	28,800	9,699	19,000	40,000
Orange Land, Sula	1	32,500	.	.	.

* Means rounded out to the tens. $1 = 10 Lempiras in 1995.
Source: Interviews 1995. Hypothetical estimates of the cost of one hectare of land of different types, by survey respondents.

ii) Integration as a Big Push policy. The rapid integration of the region after 1992, with the ensuing increases in planting of agro-exports, seems to suggest that the State should have established an integrated producer from the onset. An integrated firm rarely holds up a subsidiary (although the looser integrated structure of Coapalma failed in this respect). I argue that fostering integration would have been unwise, both from efficiency and distribution standpoints.

Integration could be more efficient than hold-up in 1992 without being more efficient than a competitive market. Given the barriers to competitive entry, fostering competition in the Aguan ex-post was not feasible. And hold-up had tremendously negative consequences for efficiency and investment, as it led growers to neglect their plantations and allow their yields to plummet, which integration could correct. But ex-ante, processors might prefer to participate in competitive markets than to operate an

[73] Specifically, this does not imply that the processor will be offering less than other buyers in the Aguan, because he values the land more than do non-integrated buyers. Thus, for instance, the prices offered by Standard for the land it purchased were quite generous, relative to other land transactions (Ruben and Funez (1993), and data collected from survey respondents and from Standard). But the whole land market was depressed by Standard's refusal to offer banana contracts. The prices were sufficiently low relative to the Sula for a firm to attempt arbitrage (footnote 97).

[74] I verified the results for the Aguan using two surveys, that asked the same questions of some 300 respondents, conducted by the Land Tenure Center of the University of Wisconsin-Madison in 1993 and 1994. Data from actual sales were not used, because actual sales in the Sula were too infrequent to be informative.

integrated farm.

General evidence as to whether huge integrated plantation operations are efficient is murky. Available figures from international studies present only yields per hectare rather than measures of profitability (Tiffen and Mortimore 1990). Large firms may have higher supervision costs, higher wages because of unionization or higher tax rates because of greater visibility. In recent decades large plantations tend to appear only in undeveloped regions across the world, perhaps because of the difficulty of consolidating an area in a settled region, but perhaps because they are unprofitable at competitive land prices. Integrated entry of banana exporters was extremely rare in Central America once profit margins started to fall in the 1940s,[75] and the same seems true of other plantation crops and other regions.[76] There were entrants into processing of both bananas and palm over the last two decades (such as Del Monte and Facussé), yet no integrated entrants. Even exporters or processors already established in a region, having incurred the fixed costs of setting up business there, often seem unwilling to undertake farming under normal conditions (that is, at average land and world agro-export product prices). The rate of return to agriculture as a whole seems to have gradually fallen over the century, and large firms may have better access to other nonfarming investment opportunities in a world of incomplete credit markets. In fostering a Big Push that is not vertically integrated, the State incurs lower costs by taking advantage of the lower reservation utility of local farmers.

Integration may also have undesirable effects on growth, in which case a policy fostering integration would not maximize social welfare. Every firm producing complementary goods under fixed costs must be integrated (if the firm has few alternative trading partners), otherwise the nonintegrated firms would be subject to hold-up. But the more industries exhibit complementarities, the more diverse activities are included within one integrated firm and the less likely that firm is to be efficient. (This is the rationale for ignoring the possibility of economy-wide integration in the Big Push literature.) In the case of the Aguan, the principal spillover effects are restricted to the farmers and their processors. But future growth is impeded by potential hold-up in complementary markets. For example, market power in banana exporting has created a hold-up problem in the shipping market, because Standard is integrated into shipping. Ninety-nine percent of port traffic from the Aguan is Standard's (Interview, Port Authority, July 95), although there is unsatisfied demand for shipping of orange juice and of smaller-scale non-traditional exports (NTX). Almost no NTXs have been planted in the Aguan, as a result of the shipping problem. Denis Dubee, manager of the Colon Fruit Company juice plant, is explicit about the danger of hold up: he notes that Standard has space available on their ships, but they might cancel the arrangements at a moment's notice (Interview, July 1995).

Integration does not resolve distributional concerns, either. Efficient integration subject to State taxation could in principle reproduce the social welfare of any market

[75] In later decades, owning land in Central America carried risks associated with political nationalism, such as the risk of a land reform. But the earliest debates over land reform date from the 50s (the late 50s, in Honduras).

[76] The broader empirical observation is that while processing and exporting monopsonies do exist across Latin America, often the structure is a large vertically-integrated operation with a small fringe of independent producers under contract. de Fontenay and Gans (1997) suggest that there might be reasons why up-front partial integration would obviate some of the hold-up problem, maintaining a bargaining equilibrium between the processor and the farmers. Other safeguards against hold-up are also employed in these contexts, with more or less success: for example, personal ties between the firm and growers, or the firm paying most of the investment costs.

outcome, since the State can use taxes to redistribute profits. As such, it would be the ideal means of avoiding hold-up. But ex post redistribution seems infeasible in the Aguan, given its history of institutional weaknesses. Isletas itself was created in response to a national scandal at the time of the Union of Banana-Exporting Countries across Central America that unsuccessfully attempted to impose a uniform export tax on bananas. The Minister of Economy accepted $1.5 million in bribes from United to halve its share of the tax, and President Lopez Arellano refused to open his Swiss bank accounts to the subsequent investigation (Posas 1992:31-32). The Aguan project was explicitly designed so that its benefits would not accrue to large and influential companies. The social benefits of an integrated Big Push would not cover its costs if the economic benefits could not be redistributed.

Therefore I question the ability of integration to bring about the same level of social welfare as a Big Push under competition. For integration to succeed as well as a competitive Big Push, integration of complementary sectors would have to be not only profitable, but also efficient. And institutions would have to be able to redistribute the profits of the monolithic integrated firm, in order to produce the same level of social welfare. Yet these are the very institutions that are susceptible to the influence of a processor, who would be a mere subsidiary of a monolithic firm! The institutional requirements for a successful Big Push under integration may be even stricter than under monopsony.

Section 4: Conclusion

Big Push theory has traditionally focused on the problem of a failure to capture economywide spillovers. A Big Push might also be necessary in the context of industry-level or region-level spillovers, which may involve fewer, more interdependent productive activities. The fewer the number of goods whose production creates spillovers, the more likely that a producer will possess significant market power after a Big Push. Consequently, the contribution of market power to a Big Push needs to be carefully assessed.

A Big Push encourages firms to produce new goods in a coordinated fashion. Any factor that increases the incentives of a firm to begin production implies that the State will need to invest less in the Big Push. Any cost advantage conferred by market power, any additional profits, render a firm that much more inclined to produce a good if it possesses market power. For example, there might be cost advantages in terms of efficient scale or greater ease of synchronization with other producers, and high expected profits. In addition, the visibility of a powerful firm and its influence over the profits of its trading partners may allow it to influence others to undertake production. A firm with market power can offer advantageous terms to new investors who will be using its product, for instance. A firm with market power can even overcome market inefficiency and incompleteness. By so doing, it furthers the Big Push effort and reduces the burden on the State.

At the same time, market power can endanger the outcome of the Big Push. As agents invest in production, they may expose themselves to hold-up by a trading partner.

A trading partner with market power may establish trading prices that do not compensate agents for their investment. The Big Push would fail because individuals would not invest for fear of hold-up. The State and the firm with market power both wish to make commitments that prevent hold-up, but institutions may be too weak to uphold such commitments. As in the Honduran case, the potential rents from hold-up power can lead to a wide range of rent-seeking behavior that is very difficult to predict and forestall. As a consequence, when market power is hold-up power, countries with weak institutions may be forced to promote competition instead, despite its costliness.

Appendix A: Landlessness and Farm Fragmentation in Honduras, 1953-1974

The table below indicates the strong increase in both absolute and relative numbers of rural families without sufficient landholdings to sustain a family. These are separated into smallholders with less than a hectare, and landless. The dramatic increase over the 50s and 60s was correlated with a rise in conflicts over agricultural land, and contributed to bring about the Land Reform.

Table A.1: Small Farmers and Landless in the Honduran Agricultural Census, 1950 and 1974

	Farms, less than 1 hectare		**Farms, less than 1 hectare**		**Landless**	
	Number of farms	% Rural Population	Number of Hectares	% of Total	Number of Persons	% Rural Population
1950	15,394	10	9,991	-	19,239	10
1974	33,771	17	21,542	1	98,033	32

Source: Ruhl (1984: Table 4)

* Rural Landless figure excludes workers on banana plantations, a relatively well-off category.

Appendix B: Technical Constraints in Agro-Export Production

This appendix characterizes the crops grown for export in the humid tropics of the Honduran North Coast: bananas, plantain, pineapple, cocoa, sugarcane, oranges, grapefruit, oil palm. Production of these crops exhibits large sunk costs, high transportation costs for bulky and perishable goods, and scale economies at a number of different stages of production. General data on technical requirements is scant, so when necessary I will rely on figures I collected in Honduras.

Sunk Costs. Many plantation crops are grown on trees that are productive after 4 to 7 years for some 10 to 20 more years. In this category fall citrus crops, oil palm, and cocoa. The remaining crops are plants with a lifespan of three to ten years, productive after a year or more: bananas, plantain, pineapple and sugarcane. These crops all receive the appellation permanent crops, because the crop cannot be abandoned without substantial costs: infrastructural investments can be very long-term and specific; and optimal practice often involves replacing the plants/trees gradually, never clearing the entire area. Bananas require the largest investment, elaborate irrigation and drainage systems that could cost as much as ten times more than the land itself (cost estimates are from Dole Fruit, Honduras).

Transportation Costs. The table belowindicates the transportation costs for the different crops from the farm and for palm after crushing. Plantation crops have very high weight-to-value ratios, relative to other crops. Spoilage increases sharply as the number of hours between picking and processing/exporting increases (for bananas, grapefruit, palm fruit, and sugarcane). Thus locating processing activities close to production is very cost-effective. Transportation costs are not prohibitive within a 170-mile radius for palm or oranges, since producers on occasion shipped crops that distance to the Sula for processing. But Aguan growers are cost-ineffective in Sula markets as a result, and stood to lose their demand whenever enough competing production existed in the Sula. Transportation costs are very low for cocoa, but its prices have been so low in the 80s that production was stagnant until recently, so the prices did not justify even these transportation costs (Phone Interview, Dr. Gladys Tablada, Honduran Foundation for Agricultural Research 9/1996).

Table B.1: Transportation Costs for Different Crops

TC = Cost of Transporting the Average Production from One Hectare, per km	
Banana	26 Lempiras/ha/km
Plantain	21
Palm Fruit	8
Palm Oil (processed)	1
Oranges	13
Grapefruit	6
Cocoa Bean	1
Corn **	1
Rice **	1
Beans	0.3

* Source: Estimate from Dr. Gladys Tablada, Fundación Hondureña de Investigación Agrícola, cocoa and plantain.
** Source: Estimate from Chavez and Valladares (1992:34), basic grains
Source for other crops: Averages from interview respondents

Scale Economies. Bringing an agro-export or agro-industrial product to market involves a number of steps. I arbitrarily divide the steps into two stages, "production" and "processing/exporting", according to their scale economies. The first stage-- *production*-- includes all early activities whose minimum efficient scale falls below 300 hectares. Thus for example, bananas and grapefruit packing plants serve 80 to 300 hectares, and locate at or near the farm; so I include packing in "production." (Note that packing can always be done for smaller areas, though less efficiently, and two producers could share a packing plant; this occurs with more or less success in the Sula).

No data source has pinned down the returns to scale in the production of different crops. A study of size effects by the Overseas Development Institute finds that on average smallholders obtain an average of half the output of large crops, but small farms face different factor costs that large farms (in labor, credit markets) so technical efficiency can't be determined. Plantation-crop projects are organized to capture economies of scale: Thus in the early 1980s FELDA (Federal Land Development Authority) schemes in Malaysia that distributed farm family plots for growing oil palm assigned each family around 4 hectares, but organized them to harvest each other's plots collectively, in 80-hectare groups (Graham and Floering 1984:108). Lower-scale production abounds, but may be a result of market imperfections. For example a sugarcane project in Kenya organized farmers to work collectively, but only accepted farms above 1 hectare, and only when more than 6 contiguous hectares were part of the project. (Graham and Floering 1984:115). As regards Honduras, palm and cocoa are at the low end in terms of scale, and production takes place on as little as 5 to 10 hectares; but most farmers feel that efficiency falls off sharply below 15 hectares, and one can infer from the FELDA project that larger scale farms do have efficiency benefits. Oranges are the exception, as they appear to have no scale requirements.

The *processing/exporting* stage is defined as the later steps, some of which require crop input from several thousand hectares. From an analysis of palm oil processing: "It is now thought that the optimum size of estate served by a single factory may be about 25,000 acres [10,000 hectares]" (Little and Tipping 1972:15). Honduras mills serve 5 to 10,000 hectares on average. The average for sugarcane is 5,000 hectares per mill (across Central America). Cocoa is processed by only one mill in Honduras, about 3,600 hectares in all. Plants producing juice concentrate for the export market juice 5,000 to 8,000 hectares of oranges, but the regional Central American market for fresh oranges requires only enough supply to fill a truck at harvest, so the processing/ exporting stage for oranges includes a competitive fringe that faces no scale requirements. "Exporting" bananas includes shipping and crop-dusting activities, because crop-dusting planes probably service over 500 (not necessarily contiguous) hectares.[77] Banana production has to be exported weekly on refrigerated ships dedicated to bananas; the largest are now built with a capacity of 3,000 to 4,000 tons (Maillard 1991:54), equivalent to the weekly output from 3,000 to 5,000 hectares. The alternative is sophisticated coordination with other crops that need refrigeration. In that context, scale requirements for grapefruit are not particularly large in Honduras, because they can be shipped fresh to Europe, in conjunction with the regular banana shipments.[78]

[77] Since the mix of chemicals to spray against the sigatoka disease remain a trade secret, only the largest companies can invest (Interviews, Dole Fruit Company Honduras and Fyffes Ltd. Honduras).

[78] But while an individual can market the output from several hundred hectares, good prices requires a brand name and a relatively consistent supply, so all producers (even some who have been independent on occasion) market through Standard. Grapefruit falls somewhere between plantation crops and a non-traditional exports (NTX) in terms of scale requirements and technical requirements. It requires extreme care and expertise, as do NTXs, and is sold a high prices to Europe in a low-supply period, in a niche similar to some NTX crops. But grapefruit cannot be profitably sold by an individual farmer because larger quantities are required, whereas scale requirements for most NTX crops are very low.

Appendix C: Honduran Labor Force Survey, 1989

Table C.1: Wage Rate for Male Farm Workers: Regression Results for the Aguan-Sula Comparison.

Analysis of Variance					
	DF	**Sum of Squares**	**Mean Sq.**	**F Value**	**Prob > F**
Model	3	32.6	10.9	0.571	0.63
Error	342	6502.2	19.0		
C Total	345	6534.7			
Root MSE 4.4			**R-Square 0.0050**		
Dep Mean 4.5			**Adj. R-Sq. -0.0037**		
C.V. 96.7					
	DF	**Parameter Estimate**	**Standard Error**	**T for H_0: Param = 0**	**Prob > |T|**
Intercept	1	3.45	0.9	3.8	0.0002
Sula	1	-0.06	0.5	-0.12	0.9
Age	1	0.02	0.02	1.17	0.2
Years of Education	1	0.06	0.08	0.8	0.4

Table C.2: Earnings for Full-Time Male Farm Workers & Male Self-Employed Regression Results for the Aguan-Sula Comparison.

Analysis of Variance					
	DF	**Sum of Squares**	**Mean Sq.**	**F Value**	**Prob > F**
Model	3	88259	29419	0.962	0.41
Error	347	10645588	30590		
C Total	351	10733847			
Root MSE 175			**R-Square 0.008**		
Dep Mean 183			**Adj. R-Sq. -0.0003**		
C.V. 95					
	DF	**Parameter Estimate**	**Standard Error**	**T for H_0: Param = 0**	**Prob > |T|**
Intercept	1	126	36	3.4	0.0006
Sula	1	17	19	0.9	0.34
Age	1	0.9	0.8	1.3	0.21
Years of Education	1	3.3	3.3	1.0	0.32

Appendix D: Transportation, Communication and Service Infrastructure in the Aguan and Sula Valleys

This section describes the infrastructure developed in the Aguan valley, and demonstrates that it was of comparable usefulness to the Sula's infrastructure. Map 2 indicates the locations mentioned in this appendix. The Lower valley of the Aguan river refers to the area below Savà down to the mouth of the valley, and the Middle valley covers from Savà to the arable land 10 miles above Olanchito. The Upper valley is narrow and infertile, so it is of minimal economic interest.

Principal Roads: I review the history of road infrastructure improvements in the Aguan valley brought about by the IDB Project and assistance from other international agencies. I provide evidence that the network was fully functional for the purpose of shipping goods by 1983, and that its quality and coverage is comparable to the Sula valley network.

The Lower Aguan Project had connected all of the Lower valley's right bank along a dirt road network by 1977, and by 1983 extended that dirt road to La Ceiba, connecting the Aguan to the remainder of the country. The network was paved by 1987, and the left bank was connected by dirt road to Tocoa and to the road for La Ceiba, and three modern bridges were built. The Middle Aguan was developed more slowly, as it was connected to Olanchito by dirt road by 1983 and by paved road in 1989. Several dirt road were built from the valley to the northeastern Olancho.

The Project built 150km of high-quality side roads on both banks (IDB 1983:15) and 350 km of internal roads in the cooperatives with plantations. The Project also established and maintained a partial system of levees protecting the riverbanks from flooding, a perpetual problem in the lowlands (Castro p.52). Puerto Castilla was also rebuilt to meet the stringent requirements of modern shipping, as part of a parallel lumber-industry project, and storage areas established for palm oil and lumber. Standard Fruit abandoned the railway line to La Ceiba for transportation by refrigerated trucks to Puerto Castilla. All of Standard's exports now pass through Puerto Castilla or Puerto Cortes, the port in the Sula valley. Infrastructure for air travel is limited to the Ceiba airport, with regular service to the United States and to other Honduran cities, and to a runway in Trujillo built by the United States Army in 1983, for its training center for the Salvadoran Army (Castro 1994:79). This center was later passed on to the 5th Army Battalion of the Honduran army, and the runway is used for private commercial flights.

Further developments included a dirt "summer" road linking Olanchito to the city of Yoro by the early 1990s, and a better road to Tegucigalpa. The major project still to be completed is to pave the Tegucigalpa road. Passengers already use this road, but truckers with produce still use the paved road through La Ceiba and the Sula valley, because it causes less damage to produce and vehicles (and is not so dangerously isolated at night). Once the road is completed, the Aguan and Sula valleys will be equidistant from the Capital. El Salvador and Nicaragua to the south will be as far away for both valleys, though the Sula valley will still have shorter access to Guatemala.

Comparison with the Sula valley. One can argue that since at least 1987, no significant differences persist across valleys. The Sula has an airport in its center, near San Pedro Sula; the Aguan has one 2-3 hours away. The Sula has 30 km of double-lane highway between San Pedro Sula and El Progreso, and is very gradually building another between San Pedro and the port, Puerto Cortes, whereas all roads are single-lane in the Aguan. But differences in infastructure

are only critical when they affect the cost of transporting goods, in terms of delays and damage to the goods and to the vehicles that transported them. Now that the right-bank roads are paved, they can be traveled at over 100 kilometers an hour, and the hard-packed roads of the left bank at 60 or more. Fragile produce can be shipped out of both valleys without undue damage, and the wear-and-tear on trucks is very similar.

Other Services : Infrastructure for communications (telephone lines, post offices, local roads) is more-or-less comparable across valleys. The important banks in the country each have branches in Tocoa, and three other towns have one bank branch. Primary school-- generally thought to improve productivity-- is widely available. Tocoa has an extension school that offers certain university-level courses, and the agricultural college in La Ceiba is just hours away. The table below summarizes the availability in the Aguan of most services which could affect business productivity. The only notable gap is that agricultural machinery and bulky materials (such as materials for construction) are not widely available, but for such a large purchase, farmers often travel to San Pedro Sula in the Sula valley.

Table D.1: Urban Infrastructure for Five Urban Centers in the Aguan Valley, 1989

	Olanchito	Sabá	Tocoa	Sonaguera	Trujillo
Lawyers	8	0	2	0	3
Nursery Schools	4	1	3	1	4
Primary Schools	6	2	3	1	2
Secondary Schools	4	2	2	1	2
Banks	4	0	4	1	1
Radio Stations	4	1	3	1	0
Hotels	7	3	5	0	10
Medical Clinics	3	0	2	0	1
Telephones	Yes*	Public Only	Yes	Public Only	Yes

* "Yes" indicates that telephones exist in private homes; "Public Only" implies that there is only a telephone office.
Source: Marel Medina Bardales (1989, Table 5).

Appendix E: The Agricultural Potential of the Aguan

I discuss the agricultural potential of the Aguan, in terms of physical and climactic characteristics.[79] I also present the characteristics of the Sula valley, and show that the potential of the two valleys is nearly identical.

Physical Potential for Agriculture: Honduras is blessed with a tropical climate and close proximity to the United States, so it can supply tropical crops at low cost. The wide valleys of the Aguan and the Sula are therefore among its most important land resources, as two of the four major agricultural lowlands (see Map 1; note that the vast eastern lowlands are infertile). The Aguan and the Sula are the only important areas with a humid tropical climate, and the only regions with deep natural ports for large ships.[80]

Climate and Soils. The single systematic comparison of the Aguan and the Sula was undertaken by the Organization of American States, in a three-year study of Honduran agriculture in the early 60s. A Mission team mapped out climates based on observed vegetation and rainfall. Then the Mission undertook collated all earlier soil studies available for Honduras, and standardized their classification systems. The Mission Report provides a breakdown of the area in each soil and climate category, defined in Tables E.1 and E.2 below.

The areas surveyed in detail include almost all of the land in both valleys, but unfortunately the information for the Aguan was sometimes less detailed. Most interesting to us is the amount of well-drained fertile alluvial soils, labeled "A+". The valleys have very similar amounts of these soils. Then the Sula has vast quantities of good alluvial soils with bad drainage, while the Aguan has a substantial area of alluvial soils about which no further information exists, labeled "A?". A? may be low-productivity or fertile, well or poorly drained. If these A? all proved to be low-productivity, then the Aguan would have 20% less good alluvial land than the Sula; but if they proved to be high-quality land, the Aguan would be better-endowed.[81] Low-productivity soils are listed as "A-", and categories listed as slopes, such as "10-20^{o} " refer to unsurveyed land, about which only the slope is known. The unsurveyed land was ignored because it was on average unproductive, so those categories are of little importance.

The Table classifies land according to its climate and vegetation. Much more of the high-quality land in the Sula is classified as dry (85% of the valley is in drier zones, relative to 30% in the Aguan). But later studies point out that the proportion of the Sula suffering from lack of humidity for agriculture is much less than the climate data suggests.[82] The National Cadastre

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[79] I focus in particular on the parts of the valley known as the Lower Aguan and the Middle Aguan (see definitions in Appendix D), with a combined total of 242,250 hectares of arable land on low slopes. The "Upper Aguan" has not even a tenth of the fertile land of the lower sections.

[80] As a result, the Aguan and the Sula have greater potential for development than any other area of Honduras. From the recommendations of an evaluation study by the Organization of American States: "The network of main roads for economic development needs to be concentrated around the main ports, and at the same time, due to the physiographic conditions of the country, need to follow the flattest land routes along the great rivers. To a great extent, therefore, the zones of attraction of the large ports coincide with the divisions of the principal hydrological basins, since the transportation costs over the heights that separate these would be extremely high". (OAS 1962:129).

[81] A note of caution is justified at this point. The OAS Mission Report declares that the only information available regarding "A?" and "A? 4-15^{o}" land is its slope and its alluvial nature; but when recommending the crop mix for each type of soil, the OAS recommends only certain annual crops for its use, which seems to suggest that those soils are not sufficiently good for permanent crops such as bananas and oil palm. It is unclear whether additional information was behind those crop suggestions.

[82] One consideration is the how the definition of the Sula valley's boundaries affect the comparison. Later studies used a slightly broader definition than the OAS Mission, including the Omoa region and all land to the West of Tela on the Coast (see Map 1 for topology). The valley thereby acquires approximately 4000 ha of AB land and 8000 ha of AM land, all of it in the "Humid Topical Woods" climate (OAS Maps and Table 64).

Directorate, in a semi-detailed soil study in 1982, noted that large areas of the Sula valley earlier classified as having "Tropustic" (dry tropical) climate in fact have an "aquic" (or humid) climate, because underground water sources are very close to the surface (DEC 1982:53). Humid climates predominate the Sula, if we reclassify according to Cadastre's observations.[83]

Both areas appear remarkably well-endowed to produce tropical crops, in particular the highly demanding banana plant. Bananas thrive in the lowest altitudes, in temperatures around 25° C, and at least 1,440-1,800 millimeters of water annually, very evenly distributed. They require very well drained sandy loam. Conditions that are sufficient to satisfy the banana are amply sufficient for oil palm, rubber plantain, cocoa, sugarcane, pineapple, coconut, and most other tropical crops suited to humid climates. Citrus, on the other hand, tends to favor drier lands (see Chapter 5, Section c).

Table E.1: Soil and Climate Composition of the Sula and Aguan Valleys

Aguan Valley

	A +	A + BD	A ?	A ? 4-15°	0-10°	10-20°	A-BD	Sand	Mar-sh	Total
Humid T	58,100	34,200	16,600	22,750	9,350	7,150	19,050	17,000	0	
H Sub-T	0	0	0	0	0	200	0	0	0	200
Very HST	0	0	0	0	0	250	0	0	0	250
Dry Trop	1,950	100	1,500	7,850	400	800	1,300	0	0	13,900
Very DT	27,700	0	5,550	10,400	0	50	0	0	0	43,700
Total	87,750	34,300	23,650	41,000	9,750	8,450	20,350	17,000	0	242,250

Sula Valley

	A +	A +, BD	A ?	A ? 4-15°	0-10°	10-20°	A-BD	Sand	Marsh	Total
Humid T	7,900	15,750	0	1,150	0	0	0	3,350	22,850	51,000
H Sub-T	0	0	0	0	650	3,850	0	0	0	4,500
Very HST	0	0	0	0	0	2,250	0	0	0	2,250
Dry Trop	66,200	62,700	1,100	16,000	12,750	6,050	0	0	400	165,200
Very DT	0	0	0	0	0	0	0	0	0	0
Total	74,100	78,450	1,100	17,150	13,400	12,150	0	3,350	23,250	222,950

Table E.2: Climate Categories

	Climate	Precipitation	Average Temperature	Length of Dry Season
Humid T	Humid Tropical Woods	2,000-4,000 mm	>24° C	3 Months

[83] The areas with a humid tropical or aquic climate include all lands north of Choloma and along the Chamelecon river. While it was not possible to measure that second category, the band of alluvial soils along the Chamelecon river is substantial, and may all fall under this "aquic" climate classification. Roughly 48% of the area was classified as humid when the areas north of Choloma were included, so the humid areas most likely dominate when the river soils are included.

H Sub-T	Humid Sub-Tropical Woods	1,000-2,000 mm	16° C	4 Months
Very HST	Very Humid Sub-Tropical Woods	2,000-4,000 mm	below 24° C	2 Months
Dry Trop	Dry Tropical Woods	1,000-2,000 mm	>24° C	5 Months
Very DT	Very Dry Tropical Woods	?	?	6-7 Months

Source: OAS (1962)

Table E.3: Soil Categories

Symbol	Nature	Slope	Drainage	Potential Productivity	Recommended Use
A +	Well-drained Alluvial Soils	0-3	Moderate to Rapid	Moderate to High	Intensive Cropping
A+ BD	Badly-drained Alluvial Soils	0-3	Slow	High	Intensive Cropping after Drainage Built
A ?	Recent Alluvial Soils, no differentiation	1-3			Annual crops Crops limited by the land's particularities
A ? 4-15°	Recent Alluvial Soils, no differentiation, flat or rolling land	4-15			Crops limited by the land's particularities
0-10 °	Flat or rolling land (no more information)	0-10			
10-20 °	Rolling land (no more information available)	10-20			
A - BD	Badly-drained alluvial soils, low productivity	0-3	Slow	Low to Moderate	Ranching
Sand	Sandy Beach	0-10	Rapid	Low	Coconut Trees
Marsh	Swamp, Marsh	0	None	Low	None (mangroves)

Source: OAS (1962: Table 67-68).

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