Market Power and the Failure of the Big Push: Evidence and Theory

Catherine de Fontenay[•]
Department of Economics, University of New South Wales
2052 Sydney, NSW Australia

September 1999

The comparative history of a Big Push in two regions of Northern Honduras elicits that market power can play two important roles in the implementing of a Big Push. Under strong institutions, firms with strategic market power will support the State's efforts, greatly reducing the cost of a Big Push. Conversely, when institutions are weak, the presence of market power can undermine the Big Push, as it did in Honduras. To successfully implement a Big Push policy in a weak institutional environment, the government must take costly action to develop competitive markets, and the Push may become unaffordable.

The conclusions of the case history are then generalized and operationalized. A theoretical model indicates how considerations of market power can be incorporated in the existing literature, and corroborates the results of the case history.

[•] Support from the Alfred P. Sloan Foundation and the Mellon Foundation is gratefully acknowledged, as is the hospitality of the Pan-American Agriculture School in Honduras.

My deepest thanks to Avner Greif and to Julie Anderson Schaffner, and many thanks to Tim Bresnahan, Hector Chavez, Joshua Gans, Tue Gørgens, Thomas Hellmann, Harumi Ito, Jolyne Melmed-Sanjak, Geeta Singh, Scott Stern, and Andy Thorpe. I am indebted to Frank Ellis, Mario Posas and Ramon Salgado for providing documentation, and to interview respondents. Correspondence to C.de.Fontenay@unsw.edu.au.

Introduction

Development theory has changed its focus dramatically in the last decade. More formal treatment of complementarities, and more empirical evidence of their importance, has renewed our interest in theories based on complementarities, namely Big Push theory and Endogenous Growth theory.[1] Complementarities (or spillovers) provide a coherent explanation for persistent differences in income or growth across countries. Thus when the profitability of an investment is positively affected by investment in a complementary investment, certain investments may only be profitable in conjunction with other investments. If a wide range of economic activities have slight complementarities between them, agents may fail to coordinate their investment decisions, through lack of communication or risk-aversion, and may not invest in any of these activities. The earliest work pointed out that a country might not industrialize, if there are spillovers between industrial activities (Rosenstein-Rodan 1943). Big Push theory points out that the State could take on the role of stimulating and coordinating complementary investments, and thereby unambiguously improve welfare.

Interesting as these theoretical possibilities are, the literature has rarely moved beyond demonstrating the possibility of multiple equilibria and Pareto improvements under different types of complementarities. Empirical work as well has concentrated on finding suggestive evidence of divergence in growth rates (Durlauf and Johnson 1995) or of multiple stationary equilibria (Fafchamps and Helms 1996). The feasibility or practicability of operationalizing a Big Push has received scant attention since the 1940s, despite the apparent successes of pro-active investment policy in East Asia. Accordingly theory has not considered which factors hinder or facilitate a Big Push. This paper begins to fill that gap, by studying the problems that arose in the implementation of a historical Big Push policy, in order to identify key issues and incorporate those issues into existing theory. The paper identifies obstacles to the implementation of a Big Push that can lead to its collapse, and leave the country worse off than before.

Section 1 of this paper is the first micro-level case study of a Big Push in the context of a natural experiment.[2] It analyses the implementation of a Big Push in two remarkably similar regions of Honduras, that had very different results. The State attempted to develop a range of complementary activities in agroexport production and processing, by inducing farmers to plant the agroexports. One of the principal constraints on the Big Push were liquidity constraints, as might be expected in a lower-income country. The State allowed monopsonies to develop in one region, as a cost-saving device: the monopsonies could subsist with lower initial outlay by the State, and could solve certain market externality problems. But the policy proved disastrous, as the monopsonies led to the collapse of the Big Push. The monopsonies extracted rents from the farmers, to such an extent that farmers could not recover their planting costs, and investment stagnated as a result. The wide-ranging precautions that the State had taken to avoid rent-extraction were easily circumvented by these wealthy monopsonies. The study provides conclusions about the dual role that market power can play in developing complementary activities: in an environment with

---

[1] The seminal papers in the literature would include Rosenstein-Rodan (1943) and Murphy, Shleifer and Vishny (1989) for Big Push theory; Romer (1986) and (1987) and Lucas (1988) for Endogenous Growth theory.

[2] See Park and Johnston (1995) for a country-level analysis of Taiwan, that describes certain aspects of Taiwan's policy as resembling a Big Push.

strong institutions, market power in a key sector can significantly reduce the cost of a Big Push. However the same market power can completely undermine a Big Push, even under far-sighted precautions by the State. The implications are grim for developing countries, most of which suffer from liquidity constraints and weak institutional environments. Implementing a Big Push in those countries may require the State to actively (and expensively) foster competitive markets; consequently this range of policies may not be affordable.

Case-study results are often difficult to generalize, however, as it is unclear to which contexts the results apply. The case-study literature has sometimes claimed broader applicability than the evidence warrants. Here one might well ask if market power is likely to play a role in the broader, country-level contexts more generally associated with Big Push models. Therefore the formal section of this paper, Section 2, attempts to operationalize the role of market power and institutions within the existing literature. Small changes to a standard model of the Big Push yield results that corroborate those of the case study. The model serves as a theoretical tool, making it relatively easy to introduce these considerations into existing models. The model is also suggestive of the generality of the results, as it indicates that market power can play its dual role in widely different contexts. In considering models of market power from industrial organisation, it seems unlikely that all forms of market power and market structure will lead to similar conclusions, or even that they can be capture in an overarching model. Rather, the model presented is indicative of possible outcomes. The ensuing discussion seeks to clarify in which contexts market power needs to be considered carefully by policymakers.

Section 1: Empirical Case Study

Over the 1970s and early 1980s the government of Honduras, in conjunction with several development agencies, attempted the equivalent of a 'Big Push' to develop the North of the country. The aim was to develop agroexport crops and downstream processing and exporting industries, as a basis for further industrial development. To establish these complementary activities, the Big Push policy provided incentives for carefully coordinated investment. The same policy was implemented in a twin pair of valleys, nearly identical in natural characteristics and resources. Yet the Sula valley experienced agroexport adoption and growth, while in the Aguan the Big Push was undermined by strategic behaviour. The State, facing strong liquidity constraints, made policy choices that lent critical importance to market power and small differences in initial market conditions.

The analysis is centered on the Aguan Valley Project from 1970 to 1995, and the causes of its failure. The methodology of analysis belongs to comparative economic history. Hypotheses are developed inductively from the case study, but are subjected to a consistency test, in that they must accord with the entire range and complexity of available information, particularly comparisons of outcomes across valleys and crops. Primary sources can also supply evidence of motivations and strategies that validate or refute hypotheses.[3] For clarity, however, here I will simply outline and analyse key events, leaving the burden of historical proof for elsewhere (see de Fontenay 1999).[4]

---

[3] See Greif (1993) for an application of the historical methodology to detecting strategic behaviour.
[4] The case study is based on my fieldwork in Honduras in 1994 and 1995, including a systematic comparison based on a farm survey of 80 households across the two valleys. I also used several

a) The implementation of a Big Push

Most of the country's fertile lowlands lie in the Aguan and Sula valleys, identified in Map 1.[5] In the early part of the century, high profits in bananas had induced the United Fruit Company (now part of United Brands) and the Standard Fruit Company (now part of Dole Fruit) to establish railroads and vast banana plantations in both valleys. But after 1942, when an outbreak of Panama disease in bananas led United to abandon the Aguan valley, the Aguan's infrastructure rapidly degraded and much of the land reverted to pasture or forest. Only one railroad line remained, in the upper part of the valley, serving some 5,000 hectares of bananas belonging to Standard Fruit. The derelict valley was ignored until the growing population put pressure on many inhabited areas, and began agitating for land reform. Accordingly the Inter-American Development Bank (IADB) funded the re-development of the valley in conjunction with a vast settlement project. Over the 1970s the IADB built a road network and a modern port, and re-settled 4,700 families on 101 agricultural cooperatives, covering 60,000 hectares of the richest land in the valley, or about 60% of total arable area (see Table 2).

The primary purpose of the Aguan Valley Project was not resettlement, but the establishment of agroexports and related industries (OAS 1962; IADB 1976:13). Agroexport crops covered little of either valley in the 1970s, despite the fact that agroexports generate the most profits and employment per hectare (Table 1). At fault was the lack of transportation infrastructure, but also a coordination problem inherent to the crops in question. Agro-exports from the tropics in the 1970s and 1980s consisted of 'plantation crops', multi-year crops that require substantial up-front planting costs, and a delay of two or more years before the first harvest. Plantation crops also require processing or specialised shipping within a day of harvest: for example, oil-palm fruit and sugarcane require crushing, and bananas must be packed immediately and shipped in refrigerated containers. The efficient scale in these post-harvest activities—henceforward referred to as 'processing'—was above one per 3,000 hectares by that time, itself well above the efficient scale for farms.[6] In an

---

surveys of the Aguan by the Land Tenure Center (LTC) of the University of Wisconsin-Madison, the 1993 Honduran Agricultural Census and 1989 Honduran Labor Survey. For comparative economic history of the two regions, I interviewed all of the exporting and processing companies in palm, bananas and grapefruit, the major crops concerned, and selected representative among other crops. I also interviewed the government agencies involved in implementing the Big Push, and experts from the universities, international organizations, and research institutes. Primary historical sources include contemporaneous reports on the Big Push projects: the LTC (Jackson et al. 1986, Stanfield and Childress 1989), Benoit Goud (1985) and the Inter-American Development Bank (1976, 1983, 1987) all undertook direct survey and interview work among the project farmers. Mario Posas (1992) painstakingly recorded all evidence from primary sources on the history of Isletas banana cooperative. The analysis of the banana industry is based on the economic analysis and primary historical evidence in Melmed-Sanjak's (1988) comparative study of Isletas and Guanchías cooperatives, major producers in each region, and to the analytical economic history of multinational banana companies in Central America by Ellis (1983). Other historical sources include, for the Aguan region, a sociological history of the Aguan valley project by Father Juan Angel Castro (1994), and a history of the city of Olanchito by Posas (1993); and for the Sula, a history of the Guanchías and surrounding farms by Salgado (1981), and a history of the early reform by Posas (1979).

[5] The other vast lowland region, in the East, is characterised by notably infertile grasslands.

[6] For example, bananas are harvested every week all year, and 3,000 to 5,000 hectares of bananas would be needed to justify collection by the smallest of standard ships (Maillard 1991:54). Palm processing plants serve 7,000 to 10,000 hectares on average, in Honduras, well below efficient scale elsewhere.

earlier period integrated plantations would have introduced these crops and processed them. But plantations had their inefficiencies, and became more rare as crop prices fell over the latter half of the century (see footnote DDD for discussion). With the transition to market transactions in these agroexports, the introduction of a new agroexport faced a serious difficulty: no farmer would undertake to plant the new crop, unless he was certain that enough farmers were planting simultaneously to induce the establishment of processing activities.

Table 1: Labor-Days and Profits by Crop, per Hectare per Year[7]

	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
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.

Several development agencies sought to assist the government in meeting this challenge, by providing incentives for farmers to invest simultaneously in the new crops. Cooperatives were given enough land to achieve efficient scale in growing agro-exports, and 'induced' to produce certain crops. A subset of cooperatives was provided with credit to plant an agroexport crop on a share of their land: they were allocated to oil-palm, bananas or grapefruit (Table 2). The Honduran government arranged for the processing of these crops. A contract was signed with Standard Fruit on behalf of the banana producers, ensuring shipping for the banana crop, and a marketing board established to oversee the contract; another marketing agency was established for grapefruit exports. The government also built several palm-fruit crushing mills with multilateral financing. [Henceforth we will refer to "the State" as the consortia of development agencies that funded the Aguan Valley Project, and those parts of the central government with consonant objectives.] Similar policies were pursued in the Sula.

[7] 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 agro-exports). No comparable data exist on profits from ranching, but those profits appears to fall between basic grains production and agro-exports in profitability.

Table 2: Status of the Aguan Valley Project in 1983

	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 5; assumed to be all land in use, 1993)*	100,000 ha		

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

The Aguan Valley Project arguably resembled a Big Push in its essential characteristics. A Big Push problem is fundamentally defined by a timing problem—generally, that investment by different agents must occur simultaneously, for investment to be profitable—and a failure to coordinate investment to resolve the timing problem. A Big Push policy induces agents to invest simultaneously, when otherwise pessimism or lack of communication would have deterred them. Farmers in the Aguan seeking to produce high-value agroexports needed vast numbers of their neighbours to plant simultaneously; thus investment decisions were complementary, and faced the typical timing problem. Given the high costs of planting (and gestation) and the risk-aversion of farmers, it was unlikely that they would resolve the coordination problem. Consequently the State induced simultaneous investment, by establishing otherwise impoverished families in the area and providing credit. As these families had no collateral and no access to credit, the State's supplying credit to plant an agroexport crop had the same effect as paying their investment costs (noted by Posas 1979:81). The element of risk was removed, and thus the expected return to investment was positive.

The policy also calls to mind the theoretical discussion of the "critical mass" – the minimum number of persons that must be induced to invest, before others are willing to do so without inducement (see for instance Da Rin and Hellmann 1997, Matsuyama 1992). Once the critical mass is known with certainty to be investing, the spillovers between activities are significant enough that additional investors are certain of earning profits, and they invest. Theorists consider the critical mass to determine the range of parameter values over which a Big Push is feasible; policymakers would do so to determine whether the Big Push was affordable. A liquidity-constrained government would fund the investment of the critical mass *only* (Section 2 will formalise this notion), and broadcast that information, leaving other agents to invest of their own volition. Thus the State takes minimum-cost action sufficient to coordinate actions and allay pessimism. The Aguan Valley Project fulfils this prediction, in that the project funded what appears to be a critical mass. Only a subset of the cooperatives received credit to grow agroexports, and each of these received credit to grow a specific crop, on a subset of its land. Records of the project explicitly state that the aim of such a credit program was to establish enough crop area to induce firms to build processing facilities (DDD). It was expected that each cooperative would use earnings from annual crops and agroexports to expand their plantation, and that the remaining cooperatives would join in, when they had accumulated some capital (IADB 1976:27).[8]

Liquidity constraints will always be of paramount importance when we consider the actual implementation of development policy. Under liquidity constraints, the State is likely to pursue policies to reduce costs, including policies to reduce the size of the critical mass. There is evidence that in Aguan, the State pursued a special policy towards processors with such an aim. Specifically, the State fostered *monopsonies* in the processing of these crops. If the processor is alone in the market, she would break even with much less supply than duopsonists; therefore the State needs to establish a much smaller area (a smaller critical mass) to induce a monopsonist to build a processing plant, than a duopsony. More, because a monopsonist profits from the Big Push, she has an incentive to ensure its success, as well as some power to ensure it. She can affect market outcomes, internalise market externalities, and so on. The strategy of fostering monopsonies is part of a more general strategy of fostering market power in a Big Push. As we will discuss below, it has been shown that firms with market power have the motive and means to support the State's Big Push effort (this point was first observed by Da Rin and Hellmann 1997).

In the Aguan, the State had funded the Big Push by supplying credit, and explicitly expected the processing monopsonies to be the subsequent source of credit. The monopsonies had an incentive to encourage further planting of their input crop, by supplying credit, and suffers from fewer credit market externalities than competitive firms. Given credit and insurance market failures, a common form of credit in Latin America is a loan in the form of seeds or inputs from the buyer of the crop, repaid in the form of a lower price for the crop at harvest. The availability of such credit is sharply limited by moral hazard: it provides an incentive for the borrower to secretly sell much of the harvest to another buyer, and claim a poor outcome. However a monopsony lending similar amounts to all its suppliers will not suffer from such a strategy (theory and evidence from Conning 1996, in his study of fruit-purchasing oligopsonies in Chile).

Prompted by liquidity constraints, the Honduran State also chose to foster State-owned monopsonies whenever possible. These had the further advantage of allowing the State to use monopsony profits to reimburse itself, rather than depend on the tax system, with its severe practical and political constraints. It organised the three palm-oil mills into a State-run firm, which would pass to the control of the palm-producing cooperatives after the cost of their palm plantations had been repaid from crop revenues.[9] Lacking expertise in the more sophisticated crop of bananas, it signed a contract with Standard Fruit, the banana-exporter already operating in the

---

[8] Thus for instance the World Bank was severely criticized by the IADB ("the State") for starting a ranching project on some of the fallow land in the valley. Given the cost of the project, the IADB argues, the land should be used for high-value crops and not ranching (IADB 1983:36).

[9] The building of three mills does not contradict the claim that the State sought to establish a critical mass. Given the heavy transportation costs of palm-fruit, it was necessary to establish mills in several locations of the valley. Otherwise, more remote producers might refuse to plant, expecting their crop to be neglected in favour of closer (and therefore cheaper) supply (Jones and Krummel 1987).

Aguan, for the entire banana crop.[10] The State also undertook the grapefruit exporting, but after dramatic failures signed a contract for export with Standard Fruit.

b) The failure of the Big Push

The Aguan Valley Project was far from a resounding success. Not much of the new crops was planted beyond what the State had funded. Consequently around 70% of the Aguan's arable land remained under subsistence crops or pasture (see Table DDD). The project did not generate the hoped-for employment levels and spinoff industries. Outcomes will be analyzed in more detail below, but it seems clear that the Big Push was unsuccessful. The State's efforts failed to generate the desired takeoff of investment in agriculture and related industries.

The monopsony market structure developed by the State seems to be the root cause of the stagnation in the Aguan. Cooperatives who had planted agroexports failed overall to recover their planting costs—in other words, they were "held up" by the monopsonies that purchased their crop. Definitionally, hold-up occurs when the ex-post transaction price fails to compensate one party to the transaction for his ex-ante investment in the transaction. Although the State was far-sighted about the potential perils of establishing monopsonies, and had taken precautions to limit their market power, these precautions were inadequate to prevent hold-up. Thus the secondary cause of the failure was Honduras' weak institutional structure, under which no precaution could sustain a serious attack from firms with market power.

For clarity we will focus on the case of oil-palm.[11] The State placed all the oil-crushing mills in the control of one firm, later named Coapalma, and established a substantial supply of the crop. As a result, Coapalma could potentially earn enormous profits from charging monopsony prices for palm fruit. Monopsony prices would be hold-up prices, as they would only compensate growers for their yearly production costs, and not their planting costs; nor would they induce further planting. These potential profits created strong incentives for those who controlled Coapalma to charge hold-up prices, and for many agents to seek control of Coapalma.

Coapalma was initially managed by the National Agrarian Institute (INA). The cooperatives were silent partners who would assume ownership when the government's expenditure was reimbursed (Castro 1994:69-70). This period demonstrated that government control was not a sufficient safeguard against hold-up problems, as corruption rapidly developed. 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). Coapalma had ample revenues to extract, as officials paid very low prices for the palm fruit, and then sold the oil to refineries at an advantageous price; they paid subsistence wages to cooperative members who worked in the processing plant (Castro 1994:70).

The situation reached an impasse in 1980, when the cooperatives organised country-wide demonstrations to protest the management of Coapalma, and gained

[10] Standard might also be expected to have a lower critical mass than any other exporter, as its shipments could combine bananas from its farm and the cooperative.

[11] The case of banana exporting involved a number of additional complications, due principally to the particular incentives and strategies of Standard as a world oligopolist (see de Fontenay (1999) for further details, and Melmed-Sanjak (1988)).

control.[12] Coapalma became jointly owned by all the palm-producing cooperatives, and its employees and elected board were all drawn from the cooperatives. However, the loose form of vertical integration developed failed to solve the problem. Much of Coapalma's rank and file belonged to those cooperatives located nearer to its headquarters, for reasons of accessibility. A set of the nearby cooperatives—to which I will now refer as 'insiders'—gained ascendancy over Coapalma, through their majority presence. For instance, insider cooperatives always retained the majority of seats on Coapalma's Executive Board.[13] Evidence points to corruption within Coapalma growing rampant, with Board members extracting huge sums, and insider cooperatives obtaining significant perquisites.[14] The source of these funds was again the price paid for palm fruit. Coapalma's prices settled at very low levels, relative to mills in other areas. Furthermore, Coapalma was entrusted with the reimbursement of cooperatives' loans, and retained some of the palm-fruit price for that purpose. Corrupt accounting practices developed in the handling of such large sums, as Coapalma leaders under-reported the amount repaid by cooperatives and absconded with the difference; see footnote DDD for a valuation of the double-accounting practices. Table 4 provides a comparison of prices between Coapalma and a cooperatively-owned mill in the Sula valley, Hondupalma, and a mill between the two valley, Standard's. Coapalma's (actual) prices are far lower, and even lower if we adjust for the double-accounting practices.[15]

[12] In their protests they had the support of the international donors, who objected to INA's corrupt management. In 1981 donors suspended disbursements until the cooperatives assumed control in 1982 (Noe Pino 1986:135).

[13] 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, my translation). The definition of 'insiders' 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).

[14] Noe Pino cites a case of literal extraction: a newspaper scandal over the disappearance of $25,000 of farm equipment from Coapalma, that led to several arrests (1986:127). Cooperatives reportedly 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, my translation), and my interviews echo these complaints.

[15] Coapalma's nominal prices paid to growers appear to be only some 20% lower than in other plants. Real prices were likely to be far lower, because Coapalma seems to have retained a share of the price, and returned only a portion of it. One of the Aguan's two independent producers commented: "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." (Interview, manager Reginaldo Díaz, July 1995). The most serious diversion of funds appears to be from debt servicing. 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. Simply incorporating this particular over-charge reduces the effective price by another 20 Lempiras (note that this figure is a floor, calculated for the extreme assumption of a 25% interest rate). 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.

Table 3: Palm Fruit Prices Paid by Different Processors

(in unadjusted current Lempiras)

	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, (Interview, 1996) and Coapalma (internal documents and receipts from a grower). The "Coapalma reported" prices were provided after a later request.
** These are the prices paid for fruit delivered to the plant; Standard & Coapalma offer subsidies which cover a part of the transportation cost.

Monopsony pricing significantly deterred investment in the Aguan, which confirms that these were indeed hold-up prices. Only two farms in the Aguan entered palm production after the initial Push. Cooperative farms already invested in palm production did little to expand their area or improve their yields, despite incentives provided by Coapalma. Average yields across Coapalma fell to 14 metric tons of fruit per hectare, as opposed to 17 to 22 elsewhere. This disinvestment was especially marked among 'outside' cooperatives,[16] those that did not benefit from Coapalma's corruption. Table 4 outlines cooperatives' planting choices. 'Outsiders' are roughly categorized using several proxies: a remote (left-bank) location; and the fact that they chose to sell out of Coapalma (and lose their share of profits) when land sales became legal.

Table 4: New Areas Planted in Palm, 1986-1990

	% of Available Area
All Cooperatives	43
Most Central Cooperatives	
Most Central who didn't sell land	47
	57
Left-Bank (Remote) Cooperatives	
Left-Bank Cooperatives who sold land	38
	24

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

Coapalma's early history highlights that neither State ownership, nor the loose form of vertical integration subsequently established, was able to prevent hold-up in the form of monopsony pricing and corruption. Government supervision also failed to solve any problems: INA retained a supervisory role, but it was completely

[16] The fact that any outside cooperatives invested at all is surprising, but less so when one considers that many cooperatives had sunk into a debt trap with Coapalma (particularly outsiders, as they would not receive an equal share of Coapalma's profits). No information was available as to what incentive Coapalma offered for additional planting, but many may not have been able to refuse.

ineffectual under Coapalma's influence.[17] Coapalma's subsequent history catalogues the failure of competitive forces to prevent hold-up: When a firm attempted to establish a competing mill in the Aguan, Coapalma organised demonstrations against the project, as an "attack on the cooperative sector", and pressured the government until his building permit was revoked. When several mills attempted to ship their palm fruit to the Sula Valley for processing, preferring to incur the high travel costs and earn Sula prices, Coapalma reportedly arranged a form of blockade. The one road from the Aguan (see Map 2) is guarded by a military checkpoint, which was co-opted by some means, and its guards at this checkpoint refused exit to trucks bearing palm fruit.[18] It would seem that the potential rents from monopoly created both a motive for monopoly pricing, and a source of funding for related corrupt activities, as Coapalma used its monopoly rents to entrench its monopoly power.[19] The general insight would be that under weak institutions, most safeguards against hold-up can be overcome when there is a motive to do so. Therefore any potential hold-up problem is difficult to contain, even for a far-sighted planner.

c) Hold-up: implications and solutions

There are a number of logical questions raised by the evidence of a hold-up problem. First, one must ask why hold-up has been observed at all. Contract theory tends to assume that if agents are rational, they predict that they are likely to be held up, and accordingly refuse to invest; hold-up is only observed if an agent has made a mistake. In the present case, it seems that someone did indeed make a mistake—the State, which obliged the cooperatives to invest initially, mistakenly supposing that it could limit the use of market power through precautionary measures. (Recall, by the way, that 'the State' refers to those who designed the Big Push, rather than to those government employees implicated in the corruption.)

A second question concerns the rationality of hold-up. Because the prospect of hold-up deters farmers from investing in planting, a monopsonist wishes to commit not to hold up new investors. For example the highly concentrated coffee-roasting industry supported international regulation to set a price floor for coffee beans. The regulation provided a means of committing not to hold farmers up at harvest time (analysis by McLaren 1992). Unfortunately, weak institutions may not support any affordable and credible commitments: no contract or price law is credible if the monopsonist can circumvent it. One possible source of credible commitment under weak institutions is the repeated nature of dealings between farmers and processors. A monopsonist might find it worthwhile to refrain from holding up farmers who have invested, to induce new investment. Such an equilibrium is unlikely, however, given that it depends on low interest rates, clearly-aligned expectations,[20] unused capacity,

[17] INA's failures may have been a result of its earlier problems in the Aguan, or the fact that its offices and employees' homes shared a compound with Coapalma, or more pernicious influences. However, it should be noted that the State established more autonomous regulatory agencies in the case of bananas, who were similarly ineffectual.

[18] These military checkpoints are notorious for their propensity to unlawfully stop trucks, generally to extort a bribe for passage (Norton and Paz 1993:12). Thus the practices alleged by the cooperatives in the Aguan could have occurred.

[19] The strategic behaviour described would accord with Grossman and Helpman's analysis of "Protection for Sale" (1994). They demonstrate that protected industries will pay to maintain the protection, leading to a vicious cycle of permanent protection.

[20] McLaren's (1992) model assumes it would be profitable for the monopsonist not to charge hold-up prices if it led to further planting. He demonstrates that if there is any uncertainty about agents' beliefs

and the need for relatively frequent investment—none of which conditions are present in the Honduran case.[21]

One final question is raised by the Aguan's unstoppable hold-up problem: can any precautions can be successful under weak institutions? The State took measures against hold-up that covered many of the "safeguards" outlined by Williamson (1985):

- competitive pressures, which reduce agents' bargaining power;
- repeated interactions;
- forms of vertical integration;[22]
- third-party enforcement, primarily legal/governmental constraints.

As recounted above, the Aguan witnessed the failure of multiple forms of the above, but certain forms of competition and vertical integration remain be considered.

Vertical integration in its more traditional forms—such as the purchase of farms by Coapalma, or the purchase of both farms and mills by private interests—was illegal over most of the period. In 1992 the Agricultural Modernisation Act legalised the sale of cooperative farms to private entities, and over a third of all palm producing firms sold out in the following three years. The buyers were private consortia who intended to build processing mills in the Aguan after consolidating their position (and weakening Coapalma's). Using their combined influence, they were able to ship their palm fruit out of the area, until they could build mills, and farmers joined in. In response to competitive pressure, the price of palm fruit rose rapidly, and new areas were planted. [Integration had even more striking effects in the banana industry. Standard Fruit immediately bought out the banana cooperative, and bought an additional 7,000 hectares of land on which to expand banana production.] Such evidence confirms the theoretical prediction that integration can resolve hold-up. However theory also predicts that integration may be technically inefficient, while unquestionably more efficient than a hold-up problem. Evidence on the relative efficiency of integrated plantations is unclear.[23] Considering Big Push policy more generally, however, integration would be inefficient in many contexts. Given that a Big Push often seeks to stimulate a wide range of complementary activities, activities may require a wide range of expertise. If the Big Push can only be successful under an inefficient form of integration, the benefits accruing to the country may not justify the cost of the Big Push.

---

in the repeated game, the most likely outcome is the degenerate solution in which almost no farmers plant, and the monopsonist holds up anyone who does plant. In a related sense, the fact that no solution was found to the hold-problem and related disinvestment may be attributable in part to uncertainty over who had control of Coapalma, and for how long.

[21] The importance of the sunk investment is probably the main determining factor. The largest expense in banana production is the initial land configuration, in terms of drainage and cables across the entire area to slide banana stems into the packing plant. In palm production, the five to seven years before full production constitute a huge sunk cost; afterwards trees produce for another twenty years.

[22] I include under vertical integration Williamson's notion of 'hostages'—assets belonging to one party left to the use/control of the other party, to prevent hold-up (1985: Chapter 7). Such alternatives were not explored in great detail, in the Aguan Valley Project.

[23] There is scant evidence, either in Honduras or worldwide, that large integrated plantations are efficient (Tiffen and Mortimore 1990). Most evidence points to the greater capital intensity of integrated operations, while leaving open the question of efficiency. There is reason to believe that smaller self-owned farms may have an advantage in terms of labor and monitoring costs (DDD). Such farms can take advantage of some economies of scale without losing their cost advantage. Farming and processing also make use of very different skills and expertise. Almost no new integrated plantations have developed since the 60s (DDDD) which would seem to call their efficiency into question.

Competition, on the other hand, has substantial advantages, as reflected in the experience of the Sula. The Sula stands as an example of *ex-ante competition*—meaning that there was a competing firm engaged in processing from the outset. The Big Push in the Sula proceeded almost exactly as in the Aguan, with the same players: the State gave control of the project's oil mills to Hondupalma, a parallel association of palm-producing cooperatives, and arranged for Standard Fruit to export all the cooperatives' bananas. The critical difference lay in the competitive pressure from United Fruit's longstanding banana and oil-palm plantations. Before the project United's processing operations were not supplied by independent farmers, probably because of the hold-up problem. But cooperatives that supplied Hondupalma or Standard could improve their bargaining position (and price) by threatening to supply United instead. (It was a credible threat, as evidenced by the fact that several cooperatives did in fact switch to supplying United.)

Evidence from the Sula underlines that farmers were keenly aware of the ability of competition to protect them from hold-up. One researcher quotes members of the Hondupalma cooperatives at an early stages of the project, when the State had declared its intention to build processing but had not progressed much in construction: "Some palm plots are starting to produce and the National Agrarian Institute [INA] 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). And indeed, the effect of this mild form of competition was to raise prices high enough to avoid hold-up, and encourage further investment. Over 400 new farmers planted palm during the period of the Big Push, as opposed to two new producers in the Aguan. DDD Sula farms began to produce bananas, but none in the Aguan. Both palm and banana-producing cooperatives in the Sula substantially expanded their crop area over this period (DDD).

Another notable effect of ex-ante competition was that it led to further competition. While efforts of competing processors to enter the Aguan were repulsed by the incumbent monopolists in banana and palm, additional firms entered into processing in the Sula, reinforcing the competitive structure of the market. Because no processor earned monopoly profits under ex-ante competition in the Sula, there was substantially less struggle to secure or maintain control over processing. Integration is less appealing, because it might lead to greater problems with market power. Integration might deter entry to these markets (Tirole 1988:196), and the hold-up problem might shift to other markets related to the integrated markets, such as markets for land or for agricultural inputs.

Establishing competitive markets from the outset appears to be a very successful means of avoiding hold-up in a Big Push. Note that it must be 'from the outset'—allowing a monopoly to develop, while expecting competitive entry later, may simply give the monopoly the opportunity to erect barriers to entry, possibly to exert influence to prevent entry, as in the case of the Aguan. Yet, while effective, fostering competition may involve substantial costs. Recall that monopsonies were developed, despite their pitfalls, in an effort to reduce the cost of a Big Push—competition must therefore imply much higher costs. A much larger critical mass must be funded, market externalities must still be resolved, and so on. If fostering competition is too costly, the State may find Big Push policy unaffordable, in terms of the cost of funds.

d) Results

The difference in aggregate performance between the Aguan and the Sula is correspondingly striking. Table 5 compares the relative crop areas in the two regions in 1995. This comparison is meaningful only because the two areas have remarkably similar natural characteristics, in terms of area, climate and fertility, as demonstrated by extensive soil and climate studies (see de Fontenay 1999: Appendix 1, based on OAS 1962). The Sula therefore provides something of a benchmark as to what is feasible, given climate and soil fertility (and perhaps the functioning of credit markets); it is probably due to these factors that the Sula still has so much land under basic grains and pasture.

Recall that the Aguan Valley Project aimed to cover all of the undeveloped fertile land with palm, bananas and grapefruit, depending on the soil characteristics. The first thing to note is that the state was correct in its assessment of the coordination problem: none of the other agroexports that are flourishing in the Sula have developed spontaneously in the Aguan. Sugarcane, plantain and cocoa account for 20% of the Sula's crop area, and 1% of the Aguan's (these are small plots for local use). The next is that the Big Push crops have not filled the available space left by the absence of these other crops, as over 20% more of the Aguan than the Sula is undeveloped (under basic grains or pasture). Thus performance in palm and bananas was disappointing. The Sula began with much more land under use, yet palm and bananas expanded substantially over this period, as evidenced by the areas that are newly-planted.

The Aguan's performance in citrus is more mixed: Grapefruit was the only Big Push crop suitable for dry areas, and it failed completely. Most of the grapefruit farms were abandoned, because the technical requirements for commercial production were beyond the skills of the cooperative farmers. Fortunately a side project to stimulate planting of oranges filled the void created by the collapse of the grapefruit project. This crop probably succeeded because strong local demand for consumption created competition for the processor buying oranges (a processing plant in the Sula).[24] Oranges show dramatic success in expanding into the Aguan's undeveloped areas, but they are not suitable for the humid areas destined to palm and bananas.

A rough-and-ready measure of the social cost of the failure of the Big Push would be that, based on averages of crop profitability estimates from Table 1, the Aguan valley would be generating US $200 Million more in profits if it had as much land under agro-exports as the Sula valley. Ironically, $200 Million (both in 1985 dollars) was almost exactly the cost of the Project. The comparison gives some idea of the social cost of the Project failure—as much was wasted as was spent.

[24] Oranges could not be grown in the Sula over this period, because of an environmental problem. Therefore no direct comparisons are possible for that crop.

Table 5: 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*
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 Agricultural Census.[25]
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 Aguan's relative performance is equally disappointing in other dimensions. Despite the Project's efforts to remedy rural unemployment and landlessness, the Aguan generates only half as much agricultural employment as the Sula (Table 5). This comparison looks at narrow measures of agricultural employment, and does not even take into account the spillovers engendered by high output in the Sula, leading to greater employment. Indeed results in terms of spillovers in the Aguan are particularly bleak. In the Sula, banana production has generated box factories and puree plants in the Sula area, and palm production has ushered in refineries and factories producing cooking-oil, and detergents. None of these spinoff industries has developed in the Aguan.

---

[25] Agro-export and tree crop information is drawn from the 1993 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 hillside 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.

Table 5: 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. Therefore we assume that outcomes are similar in hillside areas, in order to compare outcomes across valleys.

The evidence from Honduras does suggest that market power can be extremely damaging to a Big Push, in the presence of weak institutions. Market power in Honduras led to hold-up and to stagnation of the Big Push effort. However, when institutions are strong enough to contain market power, it appears to confer important advantages. The State encouraged market power to develop in Honduras because it drastically reduced the cost of the Big Push. These realisations lead to a three-tiered ordering of preferences, when implementing a Big Push: if institutions are strong, then the State would prefer to foster and effectively contain market power, than to foster competitive markets and increase the cost of the Big Push. Under weak institutions, however, market power would undermine the Big Push, and is to be avoided at all costs; the State would prefer to foster competition, albeit at a cost, or to abandon the Big Push altogether. Indeed, the prognosis for a Big Push is much bleaker than was previously thought: countries with weak institutions may very well not be able to afford the cost of a Big Push under competitive markets.

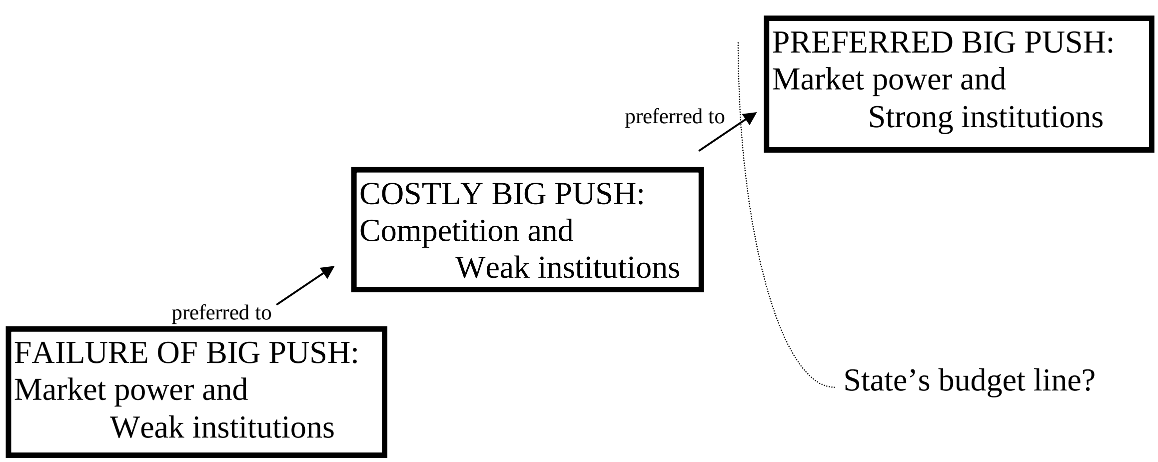

Figure 1: Policy Options for a Big Push

Section 2: Market Power in a model of the Big Push

While the case study confers a critical role on market power and the strength of institutions, these issues find no reflection in existing Big Push theory. This section returns to the theory, to highlight its peculiar relationship to market power: most models depend on the assumption of market power, yet exclude any strategic role for market power through their assumptions. A model is developed that slightly modifies the standard assumptions in order to allow for strategic market power—defined as the ability to significantly influence other firms' decisions through market choices (prices, investments and so on).

The case study yielded an extremely sharp preference ordering: market power among investors and strong institutions, over competition, over market power under weak institutions. It also predicted that if agents overestimated the strength of institutions, they would be held up. If the State overestimated the strength of institutions (and agents did not) agents would not respond to incentives and the Big Push would collapse. These powerful conclusions about market power cannot persist in every situation, for every type of market power. After all, the Industrial Organisation literature has made clear that market power can play an immense range of roles. But these conclusions are sufficiently general that the existing Big Push literature can exactly reproduce them, with only slight departures from the standard model.

a) The model

Generally speaking, the need for a Big Push arises from increasing returns in the form of spillovers between agents, and of alternative investment opportunities that do not take advantage of the increasing returns. Individual maximising behaviour may not lead an economy to take advantage of increasing returns, in the presence of alternatives, and a Big Push would seek to change individual incentives.

Many Big Push models have sought to derive increasing returns from increasing specialization, an important characteristic of industrial growth. Either utility functions or production functions exhibit the characteristic known as "love of variety"—that is, output or utility is higher for a larger number of inputs. The most common functional form chosen is the constant elasticity of substitution (CES) function (Murphy, Shleifer and Vishny 1989, Rodriguez-Clare 1996, Ciccone and Matsuyama 1996; see Matsuyama 1995 for a survey of these models). For example, suppose the final good X is produced from a range of n intermediate industrial goods, under a CES production function: [26]

$$X = \left(\sum_{i=1}^{n} x_i^{\rho} \right)^{\frac{1}{\rho}}, \qquad \text{where } 0<\rho<1.$$

This functional form, from Dixit and Stiglitz (1977), exhibits constant returns for a fixed number of goods, so that a market equilibrium exists, but increasing returns to scale in the number of goods.

Often the final good is assumed to be produced competitively, but each intermediate good is produced by a firm in monopolistic competition with the other

[26] Ethier (1982) and Romer (1987) pointed out that a CES production function could either represent the production of one good with the N inputs, or, in the limit, the production of a wide range of goods, each of which requires a specialised input or a close substitute to its ideal input (see formal proof by Weitzman 1994). The latter idea, especially, conveys the notion of increasing returns to scale.

input producers (see for instance Ciccone and Matsuyama 1996); elsewhere it is the final-production sector, or the research sector, that is monopolistically competitive. Monopolistic competition between complementary goods is at the heart of these models, as it expresses the strategic interdependency of producers' decisions, and creates the possibility of multiple equilibria. A producer's decision to invest in this sector depends on how many other producers he expects to invest. Note that while producers all have market power (as they price above marginal cost), and act strategically, strategic market power has been assumed away. Since by definition other inputs are close substitutes at any output level, no input producer could affect production by withholding its input. Yet in many production processes one good is more essential than others, in a range of complementary products. In that case the producer of that good would have strategic market power, in that he could significantly affect market outcomes and incentives. The force of this criticism will greatly depend on the context, as we will discuss below.

The appropriate way to introduce strategic market power seems to be to amplify the already existing market power. The functional form for the increasing-returns sector is slightly modified to render one of the inputs, y, essential:

$$X = \sum_{i=1}^{n} x_i^{\alpha} y^{1-\alpha}, \qquad \text{where } 0<\alpha<1. \tag{1}$$

The present model allows for two different investment choices, one with the above increasing-returns structure, in order to derive the dual-equilibria structure of a Big Push model. It posits a two-sector economy, in which the industrial good X is produced from intermediate inputs, according to equation (1). The other sector, "mining", exhibits constant returns to scale; wages in this sector are normalised to one. For simplicity all production is exported, and all consumption goods imported. The industrial sector faces a declining demand curve while the mining sector has infinitely elastic demand. It is assumed efficient to have both sectors in operation, given the size of the labour force, with the industrial sector drawing workers from mining at their opportunity cost, the mining wage. But the industrial sector may not develop.

If the industrial sector does develop, its final-good producers are competitive and therefore cost-minimising:

$$Min \quad C(\overline{X}) = \sum_{i=1}^{n} p_i x_i + p_y y \qquad s.t. \qquad \overline{X} = \sum_{i=1}^{n} x_i^{\alpha} y^{1-\alpha}$$

and the first-order conditions to their problem are:

$$\begin{cases} p_i = \lambda \alpha x_i^{\alpha-1} y^{1-\alpha} & \forall i \\ p_y = \lambda (1-\alpha) \sum_{i=1}^{n} x_i^{\alpha} y^{-\alpha} \end{cases} \tag{2}$$

$$\Rightarrow \qquad C(\overline{X}) = \sum_{i=1}^{n} p_i x_i + p_y y \qquad = \sum_{i=1}^{n} \lambda \alpha x_i^{\alpha} y^{1-\alpha} + \lambda(1-\alpha) \sum_{i=1}^{n} x_i^{\alpha} y^{1-\alpha} \qquad = \lambda \overline{X}$$

The final goods sector will expand until PX = C(X), that is until $P = \lambda$, where λ is determined by the first-order conditions:

$$\lambda = \left(\frac{p_y}{1-\alpha}\right)^{1-\alpha} \left[\sum_{i=1}^{n} \left(\frac{\alpha}{p_i}\right)^{\frac{\alpha}{1-\alpha}}\right]^{\alpha-1}$$

The intermediate-good producers are assumed to offer their inputs at a fixed price to the final export sector, and to choose their price based on the resulting demand functions. Producing a good x_i involves a marginal cost, a, and an initial sunk investment, whose per-period value is F. These are all labour costs. The *x*-producers maximise their profit function *taking P as given*. This is a standard assumption in models of monopolistic competition.[27] Substituting the $P = \lambda$ condition into the maximisation problem:

$$Max \quad p_i x_i - a x_i - F = \quad Max \quad P\alpha x_i^{\alpha} y^{1-\alpha} - a x_i - F$$

$$\Rightarrow \qquad P\alpha^2 x_i^{\alpha-1} y^{1-\alpha} = a \qquad \forall i \tag{3}$$

$$\Leftrightarrow \qquad p_i = \frac{a}{\alpha} \qquad \forall i \tag{3'}$$

Using the definition of X, the equations in (3) can be aggregated to express y as an implicit function *f(X)*, for a given n:

$$y = f(X) \equiv \frac{X}{n}\left(\frac{P\alpha^2}{a}\right)^{\frac{\alpha}{1-\alpha}} \tag{4}$$

and similarly for each x_i:

$$x_i = \frac{PX\alpha^2}{an} \tag{4'}$$

The efficiency of industrial production will depend on n, the number of intermediate inputs available. Final-good producers are assumed to observe the number of intermediate goods available, and then to decide whether to produce the final good. When few intermediate inputs are available, final output will be small or may even be zero (depending on the shape of world demand); in such a case demand for intermediate inputs will be too small for them to break even. Notice that equation (3) implies that an *x*-good producer breaks even only if there is sufficient demand for his good:

$$\pi_i = \frac{a}{\alpha} x_i - a x_i - F \geq 0 \qquad \Leftrightarrow \qquad x_i \geq \left(\frac{\alpha}{1-\alpha}\right)\left(\frac{F}{a}\right). \tag{[a]}$$

[Henceforth the notation will distinguish between behavioural equations, defining equilibrium behaviour when there is an industrial sector, marked by numbers and parentheses, and conditions for the existence of an industrial sector, marked by letters and brackets.] If the industrial sector does develop, condition [a] will hold with equality, as *x*-producers will enter until it binds.

Therefore agents face a coordination problem in investing in the production of x-goods. Agents are assumed to be risk-averse[28] and to have no means of

---

[27] We will retain the assumption to preserve comparability with earlier models and simplicity of notation. However, the assumption seems a little extreme in cases where a x-producer expects to be the only producer of x-goods in the market.

[28] Formally, we describe agents as risk-averse if their behaviour is "minimax" among all possible Nash equilibria. If one of the possible Nash equilibria is that the industrial sector does not develop—if it does not necessarily develop even when they are the only x-producer—they do not invest in x-production. If the industrial sector necessarily develops when they produce, and they break even, then the only remaining Nash equilibrium is one in which x-producers enter until they break even, at n^*, and we will assume this equilibrium occurs.

coordinating their decisions. No producer can observe investment and supply decisions of other *x*-producers, before making investment decisions. As a result, no risk-averse producer of an *x*-good will invest unless he expects to earn profits even if he is alone in producing, and in such circumstances a Big Push is often necessary to introduce industrial production.

Only the supply commitments of the y-producer(s) are assumed to be observable by other agents before they make their investment decisions. Thus a *y*-producer could potentially use her "visibility" to influence the decisions of other producers. She could, for instance, make quantity or price commitments that rendered investing more attractive to other agents. Her ability to do so depends on the competitive structure of the *y*-sector, and her ability to make credible commitments. Thus, for modelling purposes, the definition of the "strength" of institutions is restricted to the ability to enforce contracts or other forms of credible commitment. This definition is not as narrow as it first seems, as much of institutional analysis focuses on the feasibility and cost of upholding commitments under different institutions (see Williamson 1985).

This section will compare outcomes under three different cases: when several firms produce *y* under Bertrand competition **(c)**; when a monopoly produces *y* and can commit to supply a certain quantity to the market (**(ea)**, for ex-ante strategic); and when no commitment mechanisms exist (**(ep)**, for ex-post strategic).[29] The results derived echo the case-study.

The y-producer will be assumed to have no sunk investment to make, and the same marginal cost, *a*. Including sunk costs would complicate the modelling of competition (as firms could never break even under pure Bertrand competition). It would confer and additional advantage on monopoly production, because competition would imply the costly duplication of sunk costs. This is an important benefit of market power in practice: considering spillovers that generate increasing returns will often imply increasing-returns technologies in practice, and therefore a loss of efficiency under competition. However, the model will focus on the strategic benefits of market power.

Proposition 1*: There exists a range of parameter values under which the industrial sector develops without the need for a Big Push. The set of such values for the* ***(ea)*** *case contains the set for the* ***(c)*** *case, which in turn contains the set of such values for the* ***(ep)*** *case (Figure 1).*

Proof of (c) versus (ep): The proof will demonstrate that a Big Push is not needed under **(c)**, if not needed under **(ep)**.

Under **(c)**, because *y*-producers are competing Bertrand, they price at marginal cost, *a*, and the equilibrium is, after substitution:

$$P = n^{\alpha-1} a \alpha^{-2\alpha} (1-\alpha)^{\alpha-1} \tag{5}$$

A Big Push will be necessary under **(c)** if no *x*-producer finds it profitable to unilaterally invest. *x*-producers are assumed to be pessimistic, and refuse to invest in the hopes that other firms might enter. The first *x*-producer to enter will lose profits if final goods producers do not find it profitable to produce (if *P* is less than the right-

[29] No two firms will ever choose to produce the same *x*-good, under Bertrand competition, as they would be obliged to price at marginal cost and earn losses. Therefore each new *x*-producer is assumed to introduce a differentiated good.

hand side in 1, for all feasible values of *X*), or if there is insufficient demand for *x* to cover its fixed costs.

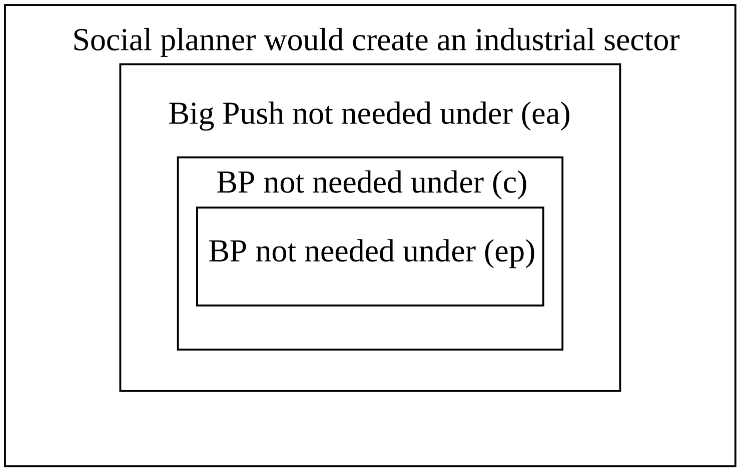

Figure 2: The space of parameter values

Therefore a Big Push is unnecessary under **(c)** if and only if, at *n=1*, a value of *y* exists that solves equation (5) and allows the x producer to break even:

$$P\left[f^{-1}(y)\right] = a(1-\alpha)^{\alpha-1}\alpha^{-2\alpha}n^{\alpha-1}$$

and $$\pi_i > 0 \quad \Leftrightarrow \quad x_i \ge \left(\frac{\alpha}{1-\alpha}\right)\left(\frac{F}{a}\right) \quad \Leftrightarrow \quad y\left(\frac{P\alpha^2}{a}\right)^{\frac{1}{1-\alpha}} \ge \left(\frac{\alpha}{1-\alpha}\right)\left(\frac{F}{a}\right) \qquad \text{[b]}$$

or, in other words, if and only if

$$P\left(\alpha^{2\alpha-1}(1-\alpha)^{-\alpha}\frac{F}{a}\right) \ge a(1-\alpha)^{\alpha-1}\alpha^{-2\alpha} \qquad \text{[b']}$$

(obtained by substituting the lowest value of *X* for which the *x*-producer breaks even).

Alternatively, *y* is produced by a monopolist, taking into account the strategic effect of her decisions on *x*-producers. The *y*-producer no longer charges her marginal cost, but she can never extract more than her marginal product from the competitive sector, whatever her market power (proof is straightforward; see Romer 1994:27 for discussion). However, she can choose the profit-maximising level of *y* to supply. In the case in which the *y*-producer cannot make credible commitments **(ep)**, *x*-producers are aware that, once a number "*n*" of them have invested, the *y*-producer will maximise her profits, taking *n* as given.

Suppose industrial production takes place. The *y*-producer charges his marginal product to a final-good producer, which is (from (4)):

$$MP_y = P\frac{(1-\alpha)}{y}X = nP^{\frac{1}{1-\alpha}}(1-\alpha)\alpha^{\frac{2\alpha}{1-\alpha}}a^{\frac{-\alpha}{1-\alpha}}.$$

Recall that the final-goods producers take *P* as given. Substituting this price of *y* into *y*'s profit function, yields the following equation from maximisation:

$$\frac{d\pi_y}{dy} = \frac{d(p_y y - ay)}{dy} = \left[nP^{\frac{1}{1-\alpha}}(1-\alpha)\alpha^{\frac{2\alpha}{1-\alpha}}a^{\frac{-\alpha}{1-\alpha}} - a \right] + \frac{dX}{dy}P'\underbrace{nP^{\frac{\alpha}{1-\alpha}}\alpha^{\frac{2\alpha}{1-\alpha}}a^{\frac{-\alpha}{1-\alpha}}y}_{X}.$$

$$\Leftrightarrow \qquad P = an^{\alpha-1}\alpha^{-2\alpha}(1-\alpha)^{\alpha-1}\left[1 + \frac{1}{a}\left(P'X\frac{dX}{dy}\right)\right]$$

The dX/dy relationship is derived from equation (4):

$$\frac{dy}{dX} = \frac{1}{n}\left[\frac{P\alpha^2}{a}\right]^{\frac{\alpha}{1-\alpha}} + \frac{1}{n}\frac{P'X}{P}\left(\frac{-\alpha}{(1-\alpha)}\right)\left[\frac{P\alpha^2}{a}\right]^{\frac{\alpha}{1-\alpha}}.$$

Substituting yields the equilibrium condition:

$$P\left(\frac{P-\alpha MR}{MR-\alpha MR}\right)^{\alpha-1} = n^{\alpha-1}a\alpha^{-2\alpha}(1-\alpha)^{\alpha-1} \qquad (6)$$

Therefore a Big Push is not needed under **(ep)** if, at n=1, a value of y exists that satisfies:

and

$$\left\{ \begin{array}{l} P\left[f^{-1}(y)\right]\underbrace{\left(\frac{P-\alpha MR}{MR-\alpha MR}\right)^{\alpha-1}}_{Q<1} = a(1-\alpha)^{\alpha-1}\alpha^{-2\alpha}n^{\alpha-1} \\ \pi_i \geq 0 \qquad \Leftrightarrow \qquad y\left[\frac{P\alpha^2}{a}\right]^{\frac{1}{1-\alpha}} \geq \left(\frac{\alpha}{1-\alpha}\right)\frac{F}{a} \end{array} \right. \qquad [c]$$

In comparing [b] and [c], note that the second condition is identical in both cases, while the first differs only by the term "*Q*". Based on the first equation of each bracket, the solution value of y will be smaller under **(ep)**, and therefore the second condition will be harder to fulfil, if the left-hand-side of the second condition is monotonically increasing in y. Monotonicity can be shown to be equivalent to positive marginal revenue, which will hold for any value of X under consideration. Thus a Big Push is never necessary under **(c)**, when it is unnecessary under **(ep)**. ■

Proof of (ea) versus (c): The proof will demonstrate that a Big Push is not needed under **(ea)**, if not needed under **(c)**. The proof focuses on the specific case in which quantity commitments can be made:
Assumption: Under **(ea)**, the *y*-monopolist can commit ex-ante to produce a certain quantity.

Suppose a Big Push is not needed under **(c)**. Let y_1 be the output of the competitive *y*-producers if only one *x*-producer entered. Under **(ea)** the monopolist could commit to producing that same quantity y_1. She would be assured of breaking even if only one *x*-producer entered. Her profits at a fixed *y* are increasing in *n*, we will show, and therefore she will earn weakly positive profits at y_1, even if more *x*-producers enter.

Showing that π_y increases as *n* increases, holding *y* constant, is equivalent to showing that PX increases, given that :

$$\left.\frac{d\pi_y}{dn}\right|_{y=\bar{y}} = \left.\frac{d(MP_y y - ay)}{dn}\right|_{y=\bar{y}} = \frac{d}{dn}\left[(1-\alpha)PX - ay\right]\Big|_{y=\bar{y}} .$$

Equation (4) is now an implicit relationship between X and n:

$$\left.\frac{dPX}{dn}\right|_{y=\bar{y}} = MRy\left[\frac{P\alpha^2}{a}\right]^{\frac{\alpha}{1-\alpha}}\frac{1}{1-\dfrac{\alpha P' X}{(1-\alpha)P}} > 0 . \quad \blacksquare$$

Let y_{ea} be the profit-maximising level for the monopolist to commit to, under **(ea)**. In fact the y-producer will commit to this profit-maximising y_{ea}, if a Big Push is not needed under **(c)**, as it will yield at least as much profit as she earns at y_1. She chooses y_{ea} by taking into account that it will determine n_{ea}, the equilibrium (breakeven) number of x-producers who enter. Given that industrial production takes place, the profits of an x-producer are declining in n for a fixed quantity y_{ea}. Implicitly differentiating (4'):

$$\frac{dx}{dn} = -\frac{x}{n}\left[\frac{\frac{a}{\alpha^2}x^{1-\alpha}y^{\alpha-1} - MR}{\frac{a}{\alpha^2}x^{1-\alpha}y^{\alpha-1} - \alpha MR}\right] = -\frac{x}{n}\left[\frac{P-MR}{P-\alpha MR}\right] < 0 \quad as \quad P > MR .$$

Therefore, given **(ea)** and an announced y_{ea}, if it is profitable for $n_{ea} > 1$ producers to operate in the market together, it is profitable for one producer to enter, and industrial production will develop spontaneously.

As a concluding point, note that the firm with market power and credibility **(ea)** cannot bring about the development of the industrial sector under all initial conditions. There are still parameter values for which a Big Push would be Pareto improving.[30] Thus the question of the cost of a Big Push is relevant.

---

[30] An example of a Pareto-improving Big Push will suffice: Suppose that the monopolist does not invest because she narrowly missed breaking even at the optimal y_{ea}. Taking into account that y is paid its marginal product, her profits can be re-written as $\pi_y = \frac{nF}{\alpha} - ay$. In this case $y_{ea} = \frac{n_{ea}(F+\varepsilon)}{a\alpha}$.

The State commits to pay an amount "G" of the fixed costs of every x-producer who invests, so that fixed costs are now (F-G) from their point of view. The social benefit of having industrial production will be:

$$SB = PX - \sum_{i=1}^{n} ax_i - ay - nF$$

$$= \frac{n(F-G)}{\alpha(1-\alpha)} - \frac{n(F-G)}{1-\alpha} - ay - nF = \frac{n_{ea}[F-(1+\alpha)G]}{\alpha} - ay_{ea}$$

Given the initial y_{ea} presupposed, the social benefit will be positive so long as y_{ea} would fall significantly in response to a fall in fixed costs:

$$SB > 0 \quad at \quad G \quad if \qquad \frac{dy_{ea}}{dF} > \frac{n}{a\alpha}(1+\alpha)$$

The equations determining y_{ea} as an implicit function of F are:

$$\begin{cases} PX = \dfrac{nF}{\alpha(1-\alpha)} \\ \dfrac{d\pi_y}{dy} = 0 \qquad \Leftrightarrow \dfrac{dn}{dy} = \dfrac{a\alpha}{F} \qquad \Leftrightarrow X_y + \dfrac{a\alpha}{F}X_n - \dfrac{a}{(1-\alpha)MR} = 0 \end{cases}$$

***Proposition 2**: When a Big Push is necessary in order to develop the industrial sector, the cost of the Big Push is lower under **(ea)** than under **(c)**, which in turn is lower than under **(ep)**.*

Proof that costs of a Big Push are lower under (c) than (ep):

Potential *x*-producers are assumed to be risk-averse, in the sense that they do not expect other firms to invest, unless it would be irrational for other firms not to do so. They do not accept the State's assurance that it is simultaneously inducing other firms to invest. However it is assumed observable that the State has convinced a producer to invest. Therefore the State has to compensate the first producer for any negative profits he would earn at $n=1$, the second for any negative profits he would earn at $n=2$, and so on. A Big Push would induce entry of *x*-producers until subsequent *x*-producers would enter of their own accord; this is the lowest value of n , denoted n_{Low}, at which both final-goods producers and *x*-producers break even. In response *x*-producers will enter until n^*.[31] Figure 3 illustrates the profits of an *x*-producer under competition **(c)**. Suppose the government is encouraging an *x*-producer to enter, and that there will be n firms in the market once he enters. If final-goods producers are not producing at that n, then the State must expend F to induce his entry. If final-goods producers are producing an insufficient amount for him to break even, the State must expend $G=-\pi_i(n) < F$, the value of his loss at n.

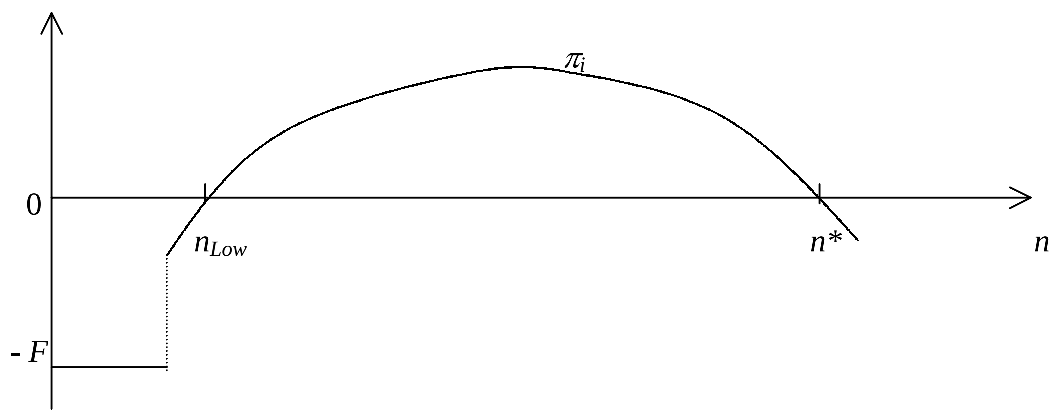

Figure 3: Profits of an x-good producer, by the total number of producers

Suppose that a Big Push is needed under **(ep)** and **(c)**, and consider the outlay on each *x*-producer. The outlay is F if no final goods are produced. Final-good production might be profitable under **(c)** and not under **(ep)** (see Proof of 1); in that case the outlay under **(c)**, G, is less than the outlay under **(ep)**. When final goods are produced in both cases, the top equations of [b] and [c] hold. Those equations imply that, at a given n:

$$SB > 0 \quad \Leftrightarrow \quad \frac{dy_{ea}}{dF} = \frac{\frac{a\alpha}{F^2} X_n}{X_{yy} + 2\frac{a\alpha}{F} X_{yn} + \left[X_y + \frac{a\alpha}{F} X_n\right] \frac{MR'}{MR}} > \frac{n}{a\alpha}(1+2\alpha)\,.$$

[31] An industrial sector can be artificially maintained by paying one x-producer to enter and produce, but a self-sustaining industrial sector more accurate description of a Big Push. The result is the same, however, under that definition: costs are equal or less under competition (c) than under (ep).

$P_{ep} > P_c \quad \Leftrightarrow \quad X_{ep} > X_c \quad \Leftrightarrow \quad y_{ep} < y_c$

$\Leftrightarrow \quad x_{ep} < x_c$ so long as $MR>0$

$\Leftrightarrow \quad \pi_{ep} < \pi_c \quad \Leftrightarrow \quad G_{ep} < G_c$.

Furthermore the value of n_{Low} for which x-producers break even will be (weakly) smaller. ■

Proof that costs of a Big Push are lower under (ea) than under (c):

The only relevant case is when a Big Push is needed under both **(ea)** and **(c)**. Suppose that under **(c)** the State must spend a sum *$S* on x-producers to bring about the Big Push. Then a strategic y-producer would always find it weakly profitable to bring about the industrial sector after the outlay *$S* (if only by making quantity commitments equivalent to prices $p_y=a$). He might also find it profitable to bring about industrial production after a lesser lower outlay, *$S′*. ■

Finally we have a pair of propositions regarding the effect of overestimating the strength of institutions:

Proposition 3: *If x-producing firms were to invest in the presence of market power, mistakenly believing that commitments would be upheld—in other words, if they believed themselves to be in case* ***(ea)*** *when in fact it was* ***(ep)***— *they would be held up.*

Proposition 4: *If the State mistook* ***(ep)*** *for* ***(ea)*** *the Big Push would fail (as it would not expend a sufficient amount), and the economy would be worse off than before the Big Push. (This point follows directly from Proposition 2.)*

Proof of Proposition 3:

Suppose that x-producers mistakenly believe that the y-producer can make credible commitments. Once she makes commitments, a number n_{ea} of x-producers invests—the number that would break even under **(ea)**. Therefore [a] holds with equality, and gives the exact value of every x_i. Along with equation (4), [a] implies:

$$PX = \frac{nF}{\alpha(1-\alpha)}.$$

Treating all x_i as constants, henceforth, the above yields the implicit relationship between n and y, which becomes after substitution:

$$\frac{dn}{dy} = -\frac{MR \cdot X_y}{MR \cdot X_n - \frac{F}{\alpha(1-\alpha)}} \qquad (7)$$

Maximisation of y's profits also implies:

$$\frac{d\pi}{dy} = \frac{d}{dy}\left[MP_y y - ay\right] = \frac{d}{dy}\left[(1-\alpha)PX - ay\right] = \frac{dn}{dy}\left(\frac{F}{\alpha}\right) - a = 0$$

Substituting into (7) yields:

$$MR\left[(1-\alpha)nx^{\alpha}y^{\alpha} + \frac{a\alpha}{F}x^{\alpha}y^{1-\alpha}\right] = MR\left[n(1-\alpha)\left(\frac{P\alpha^2}{a}\right)^{\frac{\alpha}{1-\alpha}} + \frac{a}{P(1-\alpha)}\right] = \frac{a}{1-\alpha}$$

$$\Leftrightarrow \qquad P\cdot\left(\frac{P-MR}{MR-\alpha MR}\right)^{\alpha-1}=n^{\alpha-1}a\alpha^{-2\alpha}(1-\alpha)^{\alpha-1} \qquad \text{under } \textbf{(ea)}. \qquad (8)$$

Recall from (3) the equilibrium conditions under **(ep)**, for any number of x-producers:

(ep):
$$P\cdot\left(\frac{\overbrace{P-\alpha MR}^{P-MR}}{MR-\alpha MR}\right)^{\alpha-1}=n^{\alpha-1}a\alpha^{-2\alpha}(1-\alpha)^{\alpha-1} \qquad (9)$$

Consider both equations for the case where n_{ea} of the x-producers have entered. If the monopolist is able to break commitments and behave according to **(ep)**, prices and quantities will take on the following values:

$\Rightarrow \quad P_{ep} > P_{ea}$
$\Rightarrow \quad X_{ep} < X_{ea}$
$\Rightarrow \quad x_{ep} < x_{ea}$ from (4'), so long as $MR > 0$ over this range
$\Rightarrow \quad \pi(x_{ep}) < \pi(x_{ea}) = 0.$

Therefore if n_{ea} x-producers have entered, and are breaking even under (8), they do not break even at n_{ea} if y reneges, and are thus held up. ■

b) General applicability of the result

Existing models can easily be modified to account for market power, the above demonstrates. The remaining question is, precisely when is it important to incorporate considerations of market power in formulating Big Push policy?

There is already evidence that market power is critical in a surprising number of contexts. Da Rin and Hellmann (1997) were among the first to notice that a firm with sufficient market power could usher in the industrial sector single-handedly. In their model a leading bank could loan funds at preferential rates to many potential investors, to encourage investment in industrialisation. They demonstrate that this ability is directly linked to the extent of the bank's market power. [Note that their model assumes that some credible commitments can be made, as banks supply credit and expect to be repaid.] Their results hold for a very general formulation of complementarities between investors. Justman (1995) examines monopoly provision of a new type of infrastructure, more efficient than the old type when enough agents invest in using it. He demonstrates that the monopolist can bring about sufficient investment (although socially optimal levels of investment) for a wide range of initial values. He points out that the monopolist's ability to induce investment is sharply curtailed when she cannot make credible commitments.[32]

In situations where a firm possesses strategic market power vis-à-vis complementary investors—that is, where it has a significant impact on their profits—it will almost always play a critical role, if not a dual role. The result that market power can have a negative influence seems quite robust. One firm's ability to manipulate market outcomes to increase its own profits or bargaining power will often reduce others' incentives to invest. However it is less likely that market power can have a positive influence under most structures of timing and information, as its principal means of influence is to signal and make commitments to other investors.

[32] "the capacity to commit to future fees can enable a monopoly to establish an infrastructure that it could not establish otherwise" (Justman 1995: Footnote 14).

Market power could still have a positive impact, if high expected profits increase the firm's incentive to invest, without too much reducing the profitability of others' investments. It is with such an effect in mind that many CES-based theories have tended to view any increase in market power as beneficial (Romer 1994, Baland and François 1996).[33] Increases in profits to the increasing-returns sector at the expense of competitive sectors can indeed be beneficial—but only if it does not confer asymmetrically large strategic market power on any firm.

Not all Big Push problems concern firms with strategic market power. Only certain types of complementarities can endow firms with strategic influence. Complementarities must be 'strong,' in the sense that a change in one activity's price or output has strong repercussions on the profitability of other activities. Earliest Big Push and endogenous growth theory focused on extremely 'weak' complementarities across all agents in the economy, such as individual investments in human capital (Lucas 1988), or pecuniary externalities (Murphy, Shleifer and Vishny 1989). But when we consider technological complementarities, many of these exhibit stronger complementarities. Production of a range of complementary goods often depends on certain critical inputs, including infrastructure. Consider for example the recent growth in the Internet industry, attributable to weak network spillovers between firms—and strong spillovers from web browsing to these firms. A firm with monopoly control over web browsing would have immense strategic market power over Internet firms.[34]

In considering technological complementarities it also becomes clear that these need not be economy-wide to have a significant impact on the economy. Spillovers may be concentrated at the level of a region, a city, an industry, an industry in a city—the growth of the computer industry in the San Francisco area, for example, is generally attributed to spillover effects (Saxenian 1994, Krugman 1991a on regional effects more generally). Industrial policies may resemble a Big Push more often than macroeconomic policies—consider the effort to develop the Korean chemical industry (Lee 1992). When complementarities are more concentrated they will involve fewer firms, and one or more may have strategic influence. Our assumption tends to be that vertical or horizontal integration will resolve any potential coordination or hold-up problems when spillovers are concentrated between a 'small' number of firms. But how small is 'small'? Whether integration is efficient will depend of the number of firms involved and the breadth of their activities (the similarities between their areas of expertise). Some of the difficulty is that integration may have to encompass every firm with sunk costs, otherwise integrating the firm(s)

---

[33] Paul Romer (1994) gave expression to this understanding of market power. He considers a Cobb-Douglas economy in which the introduction of a new capital good Z generates increasing returns: $X=L^{1-\alpha}(K^{\alpha} + Z^{\alpha})$. Z is produced abroad, and a firm wishing to import Z must incur fixed costs. Therefore a firm supplies Z only if profits are above fixed costs, and the fixed costs serve as a threshold level of profits. A monopolist who introduces Z increases output by $L^{1-\alpha}X^{\alpha}$ but captures only $\alpha L^{1-\alpha}X^{\alpha}$. Because the structure of production is CES, he concludes that "any intervention [referring to import tariffs] that prevents a new activity from coming into existence will be bad for development." (1994:30). Because the monopolist's decision to supply is always beneficial, any factor that reduces his profits below his threshold is socially harmful; limiting his market power through regulation would be likewise harmful.

[34] Note that the development of the Internet and related services was initially very slow, due to what we would label "coordination failure." Its development might have been faster had one company had primary control, and taken on a role similar to the government's role in the case of the Minitel system in France. However, there is also natural concern over the implications of one company, such as Microsoft, gaining control of the supply of Internet services. It might extract most of the rents from Internet activities, and so deter further investment and innovation.

at risk of hold-up could merely shift the hold-up problem into another trading relationship. Returning to our example of the Internet, integrating a monopoly browser firm with firms selling products on the Internet would place firms selling design software in jeopardy of hold-up. Consequently vertical integration will not be an effective solution in every coordination problem with strategic market power.

The pervasiveness of strategic problems and coordination problems together raises serious questions. When firms are not investing in complementary industries, the cause may lie in a coordination failure, or a hold-up problem, or both (see Figure 4). Disentangling the two is a challenge. This important point was raised by Greif and Rodriguez-Clare (1995). They provide historical evidence that the early growth of a multifirm automobile and parts industry in Detroit greatly attenuated hold-up problems. Firms would locate in Detroit not only to benefit from technological spillovers, but also to avoid hold-up. It is unclear whether areas that began with an automobile industry but failed to expand were more hampered by hold-up problems or insufficient spillovers (DDD check if this is right). Continuing this line of thought, an apparent technological backwardness might be due to inefficient integration to resolve hold-up. Therefore the first step for successful policy must be to identify exactly which factors are preventing firms from taking advantage of spillovers.

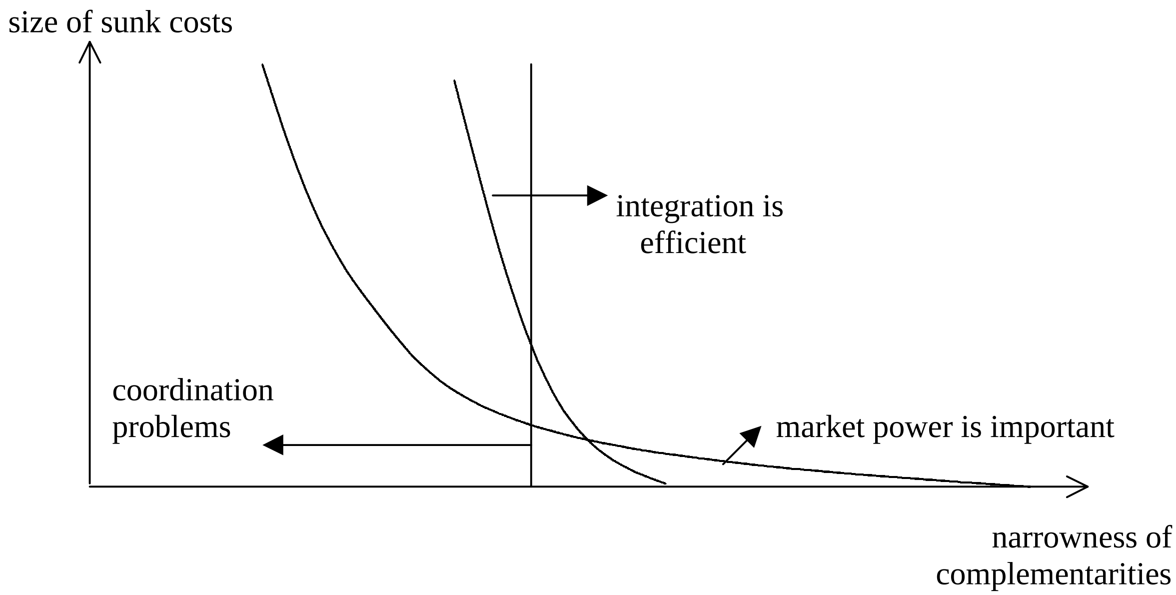

Figure 4: Coordination problems, market power and integration

4) Conclusion

Until now, market power has received little attention in the Big Push literature. The types of complementarities the models initially focused on were unlikely to give rise to market power, and the functional forms in these models abstracted away from it. However when one considers technological complementarities, it is often the case that certain investments—such as infrastructure or certain critical inputs—can yield significant influence to the investing firm. Likewise in the presence of narrow spillovers—spillovers within a region or industry—firms are more likely to possess strategic market power.

Therefore market power can potentially play an important role in a number of situations; it is sufficient for an influential activity to be concentrated. The empirical and theoretical evidence presented here suggests that when market power is critical, institutional strength is likewise critical. Market power has dramatically positive or negative effects, depending on the strength or weakness of institutions. As a result, countries unsure of their institutional strength should sheer away from trying to reap the benefits of market power, and even engage in costly efforts to foster competition. Thus the Big Push becomes much more expensive in the presence of institutional weaknesses. Many Pareto-improving Big Push policies may not be implemented because of their excessive cost.

These conclusions should amplify considerably our estimates of the cost of institutional weaknesses. The cost has generally been reckoned in terms of individual transactions: one expects hold-up to deter more individual investments under weaker institutions, given that fewer situations can be resolved through contracting. But the case study provides evidence that entire industries or regions might fail to develop because of hold-up problems among complementary investments. Likewise, the conclusions are suggestive of how much growth influential private firms could potentially bring about, under stronger institutions. Further investigation of the magnitude of hold-up problems is called for.

Finally, these conclusions stress the importance of the government's role in supporting market transactions. Development economics has emphasized the importance of government's role as 'market maker' (DDD)—providing infrastructure, information and enforcement. This role has received less attention with the resurgence of Big Push and growth theories, perhaps because the emphasis of 'market making' has always been microeconomic (rural cereal markets, and so on DDDD). But considering the implementation of a Big Push highlights how essential this role is to development. Further research (and expenditure) on policies to strengthen market institutions is clearly necessary. One such policy may be to create competitive markets, and reduce the scope for hold-up problems. This new market-making strategy is suggested by the outcomes under weak institutions. Indirectly it may strengthen institutions, by preventing firms with market power from placing undue stress on them. Reducing the pressure from influence groups may allow market institutions to develop unhindered.

Bibliography

Baland, Jean-Marie, and Patrick François (1996). "Innovation, Monopolies and the Poverty Trap," *Journal of Development Economics* 49(1): 151-78.

Banco Central de Honduras (Central Bank) (1994). *Encuesta sobre costos de produccion de Hortalizas y Frutas Seleccionadas*. Tegucigalpa, Honduras: Banco Central de Honduras.

Castro, Angel (1994). *Un Plan de Desarrollo Regional: El Bajo Aguán en Honduras*. Mexico City: Universidad Iberoamericana.

Ciccone, Antonio, and Kiminori Matsuyama (1996). "Startup Costs and Pecuniary Externalities as Barriers to Economic Development," *Journal of Development Economics* 49(1): 33-59.

Conning, Jonathan (1996). Product Market Competition and Credit Relationships: The Market for Rural Finance in Chile. Chapter 6, *Financial Contracting and Intermediary Structures in a Rural Credit Market in Chile: A theoretical and empirical analysis*. PhD Thesis, Yale University, May 1996.

Da Rin, Marco, and Thomas Hellmann (1997). "Banks as Catalysts for Industrialization," Working Paper, Stanford Graduate School of Business.

Dirección Ejecutiva del Catástro (1982). *Estudio de Suelos a Semi-Detalle del Valle de Sula*. Monograph: Tegucigalpa, Honduras.

Dixit, Avinash, and Joseph Stiglitz (1977). "Monopolistic Competition and Optimal Product Diversity," *American Economic Review* 67(3): 297-308.

Durlauf, Stephen, and P. Johnson (1995). "Multiple Regimes and Cross-Country Growth Behavior," *Journal of Applied Econometrics* 10(4): 365-384.

Dye, Alan (1994). "Avoiding Holdup: Asset Specificity and Technical Change in the Cuban Sugar Industry, 1899-1929," *Journal of Economic History* 54(3): 628-653.

Ellis, Frank (1983). *Las Transacionales del Banano en Centroamerica*. (The Banana Multinationals in Central America) San Jose, Costa Rica: Editorial Universitario Centroamericana.

Fafchamps, Marcel and Brigit Helms (1996). "Local Demand, Investment Multipliers, and Industrialization: Theory and Application to the Guatemalan Highlands," *Journal of Development Economics*, 49(1) 61-92.

Fuentes, Nestor (1980) *Diagnóstico Socio-Económico de las Empresas Campesinas de los Proyectos de Desarollo Rural Concentrado de: Monjaras Buena Vista, San Bernardo, San Manuel, Guaymas, La Masica, Puerto Arturo.* Tegucigalpa, Honduras: INA-IICA.

Graham, Edgar, and I. Floering (1984). *The Modern Plantation in the Third World*. New York: St. Martin's Press.

Greif, Avner, and Andres Rodriguez-Clare (1995). "A Transactions-Cost Theory of Agglomeration Economies." Unpublished working paper, Stanford University.

Grossman, Gene, and Elhanan Helpman (1994). "Protection for Sale," *American Economic Review* 84(4): 833-850.

Instituto Geográfico Nacional (1986). *Guía para Investigadores de Honduras*. Tegucigalpa, Honduras: Secretaría de Comunicaciones, Obras Públicas y Transporte (SECPLAN).

Instituto Hondureño de Desarollo Rural (IHDER) (1983). *Diagnóstico del Valle de Sula*. Tegucigalpa, Honduras: Internal document, IHDER.

Instituto Interamericano de Cooperación para la Agricultura (IICA) (1987). *Costo de Producción de Cultivos de Exportación*. Tegucigalpa, Honduras: IICA.

Instituto Nacional Agrario (INA) (1994). Directorio: Información Básica de los Grupos Campesinos Beneficiarios de la Reforma Agraria. Tegucigalpa, Honduras: INA, Departamento de Planificación, Sección de Informática.

Inter-American Development Bank (IADB) (1976). *Informe de Proyecto: Honduras. Proyecto de Desarollo Agrícola Integrado del Bajo Aguán (Etapa II).* Tegucigalpa, Honduras: IADB internal report.

IADB (1983). *Programa de Desarollo Agricola Integral Bajo Aguán: Evaluación de la Ejecución de la Operación.* Tegucigalpa, Honduras: IADB internal report.

IADB (1987). *Informe de Terminación de Operación- Primera etapa para el Desarrollo Forestal Industrial de Olancho.* Tegucigalpa, Honduras: IADB internal report.

Justman, Moshe (1995). "Infrastructure, Growth and the Two Dimensions of Industrial Policy," *Review of Economic Studies* 62(1): 131-157.

Krugman, Paul (1991a). *Geography and Trade*. Cambridge, MA: MIT Press, 1991.

Krugman, Paul (1991b). "History versus Expectations," *Quarterly Journal of Economics* 106(2): 651-62.

Lee, J.-H. (1992). "Government Interventions and Productivity Growth in Korean Manufacturing Industries." Paper presented at National Bureau of Economic Research Conference on Economic Growth, Cambridge, MA, October.

Lucas, Robert (1988). "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22(1): 3-42.

McLaren, John (1992). "Why did Big Coffee Seek Regulation? Theory of dynamic monopsony pricing without commitment." Discussion Paper No.623, Columbia University Department of Economics.

Maillard, Jean-Claude (1991). *Le Marché International de la Banane, Étude Géographique d'un "Système Commercial"*. Bordeaux, France: Presses Universitaires de Bordeaux.

Matsuyama, Kiminori (1992). "Market Size, Entrepreneurship, and the Big Push," *Journal of the Japanese and International Economies* 6: 347-364.

Matsuyama, Kiminori (1995). "Complementarities and Cumulative Processes in Models of Monopolistic Competition," *Journal of Economic Literature* 33(2), 701-729.

Melmed-Sanjak, Jolyne (1988). *Cooperative Agrarian Reform and Contract Farming: The Implications of Strategic Concerns for Rural Development.* Albany, NY: State University of New York, Albany: Unpublished.

Murphy, Kevin, Andrei Shleifer, and Robert Vishny (1989). "Industrialization and the Big Push," *Journal of Political Economy* 97(5), 1003-1026.

Noe Pino, Hugo (1986) *La Agroindustria de la Palma Africana en el Proyecto del Bajo Aguan.* Tegucigalpa, Honduras: Master's Thesis, National Autonomous University of Honduras.

Norton, Roger and J. Paz (1993). "Chapter IV: Reforms and Prospects for the Agricultural Sector". Draft of a United States Agency for International Development Evaluation Document. Tegucigalpa, Honduras: USAID, Draft.

Organization of American States (OAS) (1962). *Informe Oficial de la Misión 105 de Asistencia Técnica a Honduras sobre Reforma Agraria y Desarollo Agrícola.* Washington, D.C.: General Secretariat of the Organization of American States (OAS).

Park, Albert, and Bruce Johnston (1995). "Rural Development and Dynamic Externalities in Taiwan's Structural Transformation," *Economic Development and Cultural Change* 44(1): 180-208

Posas, Mario (1979) "Política Estatal y Estructura Agraria en Honduras, 1950-1978." *Economía Política* 17 (Apr-Nov): 29-124.

Posas, Mario (1992). *La Autogestión en el Agro Hondureño: El caso de la Empresa Asociativa Campesina "Isletas" (EACI).* Tegucigalpa, Honduras: Universidad Nacional Autónoma de Honduras.

Posas, Mario (1993). *Breve Historia de la Ciudad de Olanchito*. Olanchito, Honduras: Alcaldía Municipal de Olanchito.

Rodriguez, Carlos Ramon (1995). *Historia de Coapalma*. Sinaloa, Honduras: Unpublished manuscript, Agricultural Operations Division, Coapalma.

Rodriguez-Clare, Andres (1996). "The Division of Labor and Economic Development," *Journal of Development Economics* 49(1): 3-32.

Romer, Paul (1986). "Increasing Returns and Long-run Growth," *Journal of Political Economy* 94(5): 1002-37.

Romer, Paul (1987). "Growth Based on Increasing Returns Due to Specialization," *American Economic Review*, 77(2): 56-62.

Romer, Paul (1994). "New Goods, Old Theory, and the Welfare Costs of Trade Restrictions," *Journal of Development Economics* 43: 5-38.

Rosenstein-Rodan, P.N. (1943). "Problems of Industrialisation of Eastern and South-eastern Europe," *Economic Journal* 53: 202-211.

Ruben, Raul (1991). *El Problema Agrario en Honduras*. Tegucigalpa, Honduras: Centro de Documentación de Honduras.

Salgado, Ramon (1981). *Guanchías: Lucha Campesina y Cooperativismo Agrario*. Tegucigalpa, Honduras: Editorial Guaymuras.

Saxenian, Annalee (1994). Regional Advantage. Cambridge, MA: Harvard University Press.

Secretaría de Planificación, Coordinacion, y Presupuesto (SECPLAN) (1962). *Censo de Población 1961*. Tegucigalpa, Honduras: Consejo Superior de Planificación Económica (CONSUPLANE).

Tiffen, Mary, and Michael Mortimore (1990). *Theory and Practice in Plantation Agriculture: an Economic Review*. London: Overseas Development Institute.

Tirole, Jean (1988). *The Theory of Industrial Organization*. Cambridge, MA: MIT Press.

Valladares, Efraim, and Hector Chavez (1992). "La Agricultura Campesina en la Zona de Tocoa: Situación, Problemas y Perspectivas." Working Paper No. 6, Postgrado Centroamericano en Economía y Planificación del Desarollo, National Autonomous University of Honduras.

Williamson, Oliver (1985). *The Economic Institutions of Capitalism*. New York: Free Press.