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MEASURING THE IMPACT OF GOVERNMENT REGULATIONS ON FIRMS' COMPETITIVENESS

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Measuring the Impact of Regulations on Firms' Competitiveness

I. ASSESSING THE REGULATORY ENVIRONMENT

1. Introduction

The central objective of the West African Industrial Research Project "WAIRP" is to learn how government policies and regulations affect the costs and competitiveness of African manufacturing firms. The purpose of this paper is to examine some of the concepts and methods one might use to measure the impact of regulations. Methodologies to capture the influence of other economic policies, such as trade policy, have been thoroughly reviewed in many publications and do not need further elaboration here. The regulatory environment, on the other hand, has not been widely investigated in developing countries. The first section defines some of the transmission mechanisms from regulatory policy to firm-level impact and quantifies the effects of regulation. The second section explains various methods used to analyze the incidence of regulation. Finally, because of the absence of time-series data in most developing countries, the third section explains how a study might use cross-sectional data to investigate the impact of regulation.

2. Prospective Contributions to the Research

From previous studies in several countries, we learn the following facts about the influence of the regulatory environment on African private enterprise:

(a) Complexity of rules: African countries have many administrative procedures and regulations that shape the "rules of the game" and potentially affect the start up, operation, and expansion of firms. These rules and regulations, however, often differ by country (although many are common), and their incidence varies by sector and by enterprise size-class. Moreover, enforcement of procedures and regulations varies by country and by sector.

(b) Multiplicity of constraints: Small and medium firms operate in a complex environment and confront a diverse array of constraints. Which constraints are binding varies substantially among countries--and, within countries, among industries and classes of firms. It is, therefore, folly to search for a single binding constraint, common across all countries, which, once released, will set in motion rapid growth. Most often, the release of one constraint is likely to bring to the forefront some other constraint whose inhibiting influence had not previously been as clearly evident.

(c) Differential effects: In addition, regulatory problems were found to affect larger firms more than smaller ones. This finding is probably connected to another conclusion of the same study, which suggests that regulatory problems affect exporters more than those producing for the domestic market (most studies find that larger enterprises do most of the exporting) and the fact that smaller firms can more effectively hide from the authorities.

(d) Surveys of Individual Firms: Notwithstanding such complexity and the absence of good firm-level data, methods are available for learning from firms themselves about the relative impact of various price and non-price regulatory constraints, and for setting out how the burden of these constraints varies by firm size-class. The methods in each

case are based on survey interviews and non-parametric statistical techniques.

(e) Non-regulatory constraints: Survey results from existing firms generally indicate that the regulatory environment is not the major constraint to business operation or expansion. Demand conditions, access to inputs and technical skills, information about markets, access to finance and infrastructure were dominant. (None of the studies try to control for the possibility that regulatory policies may be impinging on these dominant variables.) Nor did the investors surveyed in one study find the regulatory environment a principal concern. Taxation, credit, and demand were stated to be more significant.

In summary, the important lessons one learns from this work, are, first, that sorting out the major influences of the regulatory environment on enterprise start-up, operation, and expansion is highly complex and problematic in developing countries, and second, that the influence of regulatory policies may be of second-order importance in constraining private sector development to the influence of demand management policies, support services (finance, marketing, technical information), and infrastructure. However, once these problems have been settled, regulations may become the primary constraint to supply response.

Considering these findings, it is doubtful that one can ever precisely quantify the incidence of regulatory policies--all the direct and indirect effects of regulations. One should not, for example, expect that a precise measure of

"effective rate of burden" (ERB) for regulatory policy can be constructed similar to the measure of "effective rate of protection" (ERP) for trade policy. Quantification of direct, indirect, and net incidence of the complex array of existing regulations in various markets would simply be too complicated, given the lack of good micro-economic data. This being the case, the important question remains: in light of the complexities of measuring the net incidence of government regulations at the level of the firm, what can be done that is valid and moves us a step forward?

3. Problems in Identifying Transmission Mechanisms and Quantifying Incidence of Regulatory Policy

At least three difficulties arise in identifying and quantifying the incidence of regulatory policies:

A) the problem of regulatory enforcement;

B) the problem of identifying the transmission mechanisms by which regulations affect firm behavior and performance; and

C) the problem of sorting out the effects of regulatory policies from other policies.

A. Enforcement

Are the regulations actually enforced? How are they enforced? Are they enforced evenly throughout the size distribution of firms and across regions? Differences in the

administration and promulgation of regulations can influence the magnitude of incidence, the nature of impact across firms, and the spatial incidence at the level of the enterprise. In regard to spatial incidence, governments usually enforce regulations more vigorously in the city than in the rural areas. This may influence where firms decide to locate. As for cross-plant or inter-scale incidence, small firms can usually evade regulations more easily than large operations can. Larger firms, on the other hand, have more clout with the authorities. Whatever the case, cross-plant differentials in regulatory incidence can influence the indirect effects of regulation by affecting the size structure of enterprises and the relative cost advantages of firms.

B. Transmission Mechanisms

Regulatory policies in developing countries influence all of the following enterprise-level variables and their interaction:

(i) efficient production decisions;
(ii) efficient location decisions;
(iii) entry and exit in various industries;
(iv) new firm formation;
(v) the level and allocation of investment;
(vi) competition between enterprises;
(vii) growth of firms;
(viii) contracting modes and thus the efficiency of markets versus hierarchies;
(ix) the extent of vertical integration.

Clearly, regulations influence all aspects of the structure, conduct, and performance of industry.

The first problem that one confronts is sorting out the partial equilibrium (short-run) impacts of regulation from the general equilibrium (long-run) impacts. In the short-run, we can take the structure of enterprises as constant and assess the "direct" incidence of regulatory policy on enterprise cost structures. In the long run, structure, location, and resource allocation across sectors are all variable, and we must assess the "indirect" impact of regulation on all these factors. As we will discuss in more detail later, transmission mechanisms in partial equilibrium analysis run from regulations through enforcement authorities to firm cost structures. In general equilibrium analysis of indirect effects, transmission mechanisms are more complicated. Asymmetries in regulatory enforcement across plants or locations create differences in compliance costs among firms (differences in the direct effects) which, in turn, generate competitive advantages and disadvantages for particular enterprises. The final impact of changes in competitive advantage will depend on the industry and the specific set of competitive conditions prevailing in it.

C. Sorting Out the Effects of Non-Regulatory Policies

A further complication involves isolating the influence of the regulatory environment from the influence of other policies. How do we distinguish the impact of regulatory policies from the impact of macroeconomic and sector policies?

How do we control for their interaction? Clearly, controlling for most of these problems will require judicious sampling. The study must select countries on the basis of their trade and fiscal policy regimes. One key questions is whether or not regulatory policies continue to constrain the supply response of private enterprises after stabilization and traditional structural adjustment policies have run their course.

In view of the aforementioned problems in identifying and quantifying the incidence of regulatory policy, it would seem that the best hope for success in estimating impact is to deal with the regulatory environment on a policy-by-policy, industry-by-industry, country-by-country basis. With a series of such cross-country case studies (holding the industry constant across countries), patterns and trends are likely to emerge that help clarify the confusion that surrounds the impact of regulation. The factors that the study tries to hold constant should determine its choice of sectors and countries.

4. Parallel Markets Mitigate the Costs of Regulation

When opportunities exist to make profits, regulations tend to be evaded. Business practices in Africa and other parts of the world illustrate that parallel markets and other "informal" mechanisms emerge when regulations impinge on economic activity. There are costs to such evasion, but in

many countries the benefits gained from reducing the stifling effects of regulations overwhelm the cost associated with the "informal" mechanisms of evasion. Italy, for example, has all sorts of regulatory policies, as well as an inefficient, government-controlled banking system. Yet, for the last two decades, Italy has been one of the world's most successful exporters (second only to Japan in export success, as measured by increases in world market shares), with significant participation by progressive small and medium enterprises in this export performance. Given the response of institutional structures (like informal financial systems) to regulatory policies, how can we judge when regulations produce a binding constraint? Further, how can we assess the cost of regulation?

An interesting example that helps to illuminate this problem is bank regulation in Taiwan. Banks in Taiwan are heavily regulated by government; in fact, the government owns all indigenous banks. Under such heavy regulation, bank officers are cautious about extending credit. Government examiners treat bank loans as if they were State investments. Loans gone bad are viewed as a misappropriation of state monies, and loan officers are often held personally responsible for their management. Having only limited information about borrowers (particularly about small and medium borrowers), banks in this heavily regulated environment made most of their loans to large enterprises.

Such credit rationing in Taiwan created an enormous excess demand for loans from small and medium enterprises. This excess demand spilled over into an informal financial market, the size of which probably exceeds that of most other developing countries. In the 1970s, more than half of the total financial assets of the economy resided in this informal (unregulated and illegal) sector. In essence, a dual financial market developed. Formal banks served the "full-information" borrowers (large manufacturers, trading houses, and non-bank financial institutions), and the informal lenders handled the "information-intensive" segment of the market (small and medium manufacturers and traders).

Two interesting points can be drawn from the case of Taiwan. The first is that fragmentation of the financial market, largely caused by government regulation, may have been an efficient (second-best) outcome in the presence of the high information costs that formal lenders faced as a result of Taiwan's industrial size structure. The government successfully controlled the money supply and inflation by direct control of the formal banking sector, while informal lenders intermediated and extended credit to information-intensive borrowers more efficiently than formal banks could have.

The second lesson is that the informal financial sector substantially reduced <u>the costs of regulation</u> by reallocating

credit away from lower-return projects favored by banks to higher-return projects in the "information intensive" sector.

No matter how a firm obtains credit in Taiwan, management always keeps a close eye on the informal sector's interest rate. Bank borrowers have to decide whether to invest in the various projects available to them or to re-lend the funds in informal markets. If the interest rate in the informal market exceeds the return on available projects, borrowers will re-lend the funds through informal credit intermediaries. By means of this reallocation, informal lenders reduced the potential allocative inefficiencies of bank credit that financial market regulation would have created. Thus, the fungibility of financial resources, made possible by informal lenders, inevitably reduces the costs of such regulations. Similarly, by extending small loans, the informal sector reduced the costs of intermediation to the "information-intensive" borrowers who were so important to Taiwan's industrial growth.

One can cite examples of informal institutions rising up to reduce the distortions created by government regulation: for instance, parallel markets for foreign exchange and for various commodities arise in the presence of foreign exchange restrictions and price controls. Given these parallel markets, how do we assess the true cost of regulation?

5. The Productivity Growth Question

The following questions pertaining to the regulatory environment remain:

(a) Does the regulatory environment continue to constrain the supply response after stabilization and structural adjustment programs have been put in place?

(b) If the regulatory environment is constraining, can we rank regulatory policies according to level of incidence (magnitude of burden)?

(c) Will one be able to specify that removal of regulation x or y will increase firm productivity and new firm formation?

This last issue is of primary importance. A question posed by regulatory reform, like trade policy liberalization, is whether or not it will spur the long-run rate of productivity growth. We know that lifting certain regulatory restraints should produce a one-time jump in productivity, simply by allowing firms to use a cheaper resource bundle. But will deregulation induce an increase in the rate of productivity growth? Despite much theorizing and an enormous effort in empirical research, researchers in the area of trade policy have still not satisfactorily answered this question. One problem involves identifying how trade liberalization can lead to continuous productivity growth. Does the growth rate of productivity increase because increased competition causes a continuous decline in x-inefficiency? Or does the growth come from continuous increases in economies of scale that occur as the market widens with the opening to trade?

Perhaps, the rate of productivity rises from inducements to modernize plants and learning curve externalities that result from contacts with the world market? Similar questions surface in evaluating deregulation. Because of the vast array of regulatory policies, precisely specifying the transmission mechanisms and producing statistical evidence of the link between deregulation and productivity growth should be even more difficult. This type of analysis might yield results if we restrict the scope of the investigation to individual regulations in specific industries, and use time-series data for countries, covering periods before and after regulation or deregulation.

6. Efficient Structural Transformation and "Progressive" Small and Medium Firms

The principal economic goal of a nation's industrial policies should be to produce a high and rising standard of living for its people. The ability of a country to do so depends on how productively it uses its resources. A local firm's productivity depends on its products' quality and features (these factors determine the product's price) and the firm's efficiency in producing the items. Thus, a rising standard of living ultimately depends on the capacity of a country's firms to achieve high levels of productivity (i.e. to produce high quality products at low cost) and to raise productivity over time. Therefore, the aim of industrial

policy should be to create an environment that supports <u>firms with high productivity</u>.

Achieving this goal requires that policy-makers pay particular attention to those "progressive" firms which can significantly raise their productivity over time and generate substantial increases in the number of more productive jobs. Therefore, those interested in the development of small firms should focus on the "dynamic" segment of the small and medium enterprise (SME) sector.

Historical evidence from most developed and developing countries indicates that small and medium factories largely displace very small enterprises--cottage or micro enterprises--as industrialization proceeds (see Tables 1). Some, but very few, of these micro-enterprises can upgrade their technologies and expand production under pressures from market forces. Studies from several countries indicate that perhaps only four percent of these firms grow to the point where they generate significant increases in productive employment. Over time, most of the workers from this sub-sector will move into more productive jobs in larger factories. This negative correlation between the level of development (as measured by per-capital income) and the relative importance of very small producers in manufacturing is evidence of a continuous structural transformation in the organization of production during the course of development: an evolutionary process, whereby the competitiveness of traditional cottage producers

gradually diminishes in different industries at different stages of development. This dynamic process argues for industrial policies that support efficient structural transformation, i.e. "performance-based" policies that help the "winners" make efficient structural changes, thereby shifting workers up to more productive jobs. Government policies, therefore, should focus, as much as possible, on promoting efficient structural change at the firm-level. Studies should concentrate on those factors that constrain development of medium-size firms--the "dynamic middle" of the enterprise size distribution. Government should help those small- and medium-sized factories that have the potential to grow and produce significant increases in productivity and employment.

Table 1: Summary of the Cross-Sectional Distribution of Employment by Establishment Size

Countries by Level of Per Capital Income	Number of Countries	Cottage-Shop (1-4)	Small 5-19	Small 20-99	Large (100+)
I	6	64	7	4	25
II	7	41	12	10	37
III	7	11	13	10	37
IV	9	8	11	17	64
V	5	4	6	20	70

[a] Stages of per capita income are I ($100-500), II($501-1000), III ($1001-2000), IV ($2001-5000), V ($5001).

Based on industrial census date from 34 developed and developing countries.

Source: Tyler Biggs, "The Transformation of Firms in the Tropics", Forthcoming 1991, Harvard University.

II. THE ANALYSIS OF THE IMPACT OF REGULATORY POLICIES

1. Industry Distortions Caused by Regulation

Regulations that alter relative factor and product prices, input quality and availabilities, and choice of commercial location can influence the economic performance of firms in a variety of ways. For convenience, we can categorize these influences as "direct" (the isolated partial equilibrium effects on single firms) and "indirect" (the additional, general equilibrium effects). Direct effects result from the regulation-induced changes in firms' efficiency that increase manufacturing costs. Indirect effects arise from the asymmetrical impact of regulations on different groups of firms, thereby creating variations in interfirm cost advantage. For example, if the cost burden of certain regulations falls heavily on one group of firms and lightly on a second group, then these regulations indirectly provide a cost advantage to the second group of firms. The wide variety of firms within a given sector is an important cause of the asymmetrical impact of regulation.

A. Direct Effects of Regulation

When regulations alter relative prices and the availability of inputs, they distort the firms' production decisions (such as input bundles and product mix). Firms generally choose the cheapest possible way to produce their output: in other words, they minimize costs. If market prices

reflect marginal social costs (shadow prices), this implies that firms will minimize the social cost of producing its output.[1]

If regulatory restrictions alter the firm's factor prices from market levels, the bundle of inputs chosen by the firm to minimize its expenditures will no longer minimize the social cost of production. The difference between the lowest cost at which production can be achieved and the cost of the resources actually chosen by the firm (given the regulatory regime) represents the "production distortion" caused by the regulation.[2]

Measured against the social costs of regulation are the social benefits that motivated the government policy in the first place. By definition, good policies require that these social benefits outweigh the social costs.

One can evaluate the distortion in production caused by various regulations by assessing how each regulation influences the use or cost of individual factors (i=1,....n) in the firm's input bundle. As an illustration, consider a firm which faces market prices, P^m, for inputs. At these

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[1] Market prices paid by firms for inputs reflect only the private cost of those inputs. If there are no externalities in the use of the inputs, and no market imperfections such as monopsony power of input sellers, then private costs equal social costs.

[2] If regulations enable firms to pass along cost increases to consumers, the regulations will also entail a cost to consumers in the form of reduced consumer's surplus.

prices it would choose inputs X^o. If input prices paid by the firm were altered by the regulatory policy, however, it would choose a different bundle of inputs, X^R. For example, a new labor regulation raising the firm's labor cost would induce the firm to use less labor and more of some other inputs. The true value of the resources used by the firm under regulation would be:

$$\sum_{i=1}^{n} P_i^m X_i^R$$

that is, their cost measured at shadow prices. But the output could have been produced for as little as

$$\sum_{i=1}^{n} P_i^m X_i^o$$

or, in other words, the costs the firm would have incurred for different inputs if it had faced shadow prices. Consequently, the social cost of the production distortion would be:

$$SC = \sum_{i=1}^{n} P_i^m X_i^R - \sum_{i=1}^{n} P_i^m X_i^o$$

Similarly, one can evaluate the direct impact of regulation on the optimal product mix of a firm. Because of regulation, the movement away from the optimal product mix,

when evaluated at shadow prices, would indicate lower social returns from the firm's output.

The direct effects of regulation consist of two distinct components: distortion in allocative efficiency and distortion in technical efficiency. Regulations introduce allocative inefficiency when firms move, or are forced to move, to inefficient points on a given production function, or equivalently, on a given cost function, or when firms shift capacity towards an economically inefficient output mix. For example, price regulation of output can create excess capacity by inducing firms to engage in various forms of competition or by constraining output levels of existing plants. Minimum wage laws, health and safety legislation, and various kinds of work rules can influence the availability, mobility, and price of labor, inducing firms to use a sub-optimal mix of inputs. Differences in regulations governing access to various markets can cause producers to bias their output mixes across products and markets, such that a product composition results which is economically inefficient (by the standards of comparative advantage or domestic resource costs).

Regulations introduce technical inefficiency when firms are induced to reduce their innovativeness or their managerial effectiveness, or when the regulations reduce the quality of their inputs. All such effects generate a downward shift in the firm's production function, or equivalently, an upward shift in its cost function. For example, price regulations,

or regulations governing market access, can induce firms to lower expenditures on research and development. Various forms of labor legislation can also lead to inefficient ways of allocating tasks to employees (eg. restrictive work rules) such that the production of a given output or provision of a service now requires more employees. Lifting such a regulation, in effect, would increase the quality of a critical input and lead to enhanced technical efficiency. A measure of the distortion in production caused by regulation will equal the combined influence of the increased allocative and technical inefficiencies.

B. The Location Distortion

All regulations that induce a firm to locate in a place other than the location that it would have chosen in the absence of regulations distort the location outcomes of the free market. Such location distortions involve private and social costs. Firms have reasons for initially preferring one site over others: either revenues would be higher at the preferred site (consumers there would value the firm's products more), or costs would be lower (the firm's output would absorb fewer of the country's resources: i.e., domestic resource costs would be higher). In either case, the reduction in profits (valued at shadow prices) in going from the preferred location to the policy-induced location reflects a real social cost of locating at the one site rather than at

the other. This social cost is a "location distortion" caused by regulation.

The social benefits of having a firm at a particular site offset the social cost of the regulation's having induced the choice of that site. There may be, for example, reduced congestion costs that motivate the government's regulatory policy. These benefits must be weighed together with the costs to establish the net social effect of regulation.

C. The Technology Distortion

Technology consists of both tangible and intangible factors. The tangibles are the machinery and equipment required to manufacture, package, and test products. The intangibles are the skills required to choose, use, maintain, modify, and upgrade the machinery and equipment.

Increasingly, manufacturing anything requires technology. In a less developed country, manufacturing simple products for domestic consumption can require only a modest degree of technology. This is because quantities can be small, and quality standards are typically modest. Manufacturing for export, however, typically requires world-class or near world-class quality and larger quantities. Export manufacturing also requires meeting, or more likely, beating world prices.

Becoming a world-class manufacturer, even in a so-called labor intensive industry, requires technologically sophisticated machinery and equipment and the skills that go

along with them. It is not simply that such machinery makes the enterprise more productive economically. Using technologically sophisticated machinery usually results in a more uniform product, and one of overall higher quality. This is true even when producing a simple item such as mixed cotton and synthetic cloth for men's shirts.

Selecting and applying the "best" or "right" technology is critical to the competitive success of an individual enterprise whether it is competing in the domestic market or in the export market. (Here we define best or right as the technology most able to meet the economic efficiency and product quality standards to compete successfully in the enterprises' chosen market.) Lessons first from Japan and subsequently from the newly industrialized countries confirm the critical importance of selecting the right technology; increasingly, technology is an important component of competitive advantage.

In a country just beginning to industrialize, there is likely to be very little available domestically in the way of machinery and equipment or technical skill. Thus an erstwhile entrepreneur will have to import them. Freedom to import machinery, equipment, and spare parts is critical to establishing a viable manufacturing sector in a developing country.

Regulation can either impede or encourage the import of technology. Clearly, regulations that make it difficult for

an entrepreneur to travel abroad to shop for technology, to import machinery, or to hire foreign technicians impede industrialization. Regulations that entrepreneurs perceive will make it difficult to import replacement parts when needed will raise entrepreneurs' perception of the risks involved in keeping the business viable once started.

Ideally, to encourage industrialization, the needed machinery, equipment, spare parts, and technical assistance should be available domestically. To make this happen, the producers and providers, who are foreign firms, will have to establish local subsidiaries that inventory machinery and parts and that can provide technical assistance.

Domestic availability of technology strongly encourages would-be entrepreneurs to go into business. It provides a "security blanket" that lowers the perceived risk of entering a business. If the technology is imported, its presence is a signal from the government that its use is being encouraged. Moreover, foreign technology suppliers who want to enter the market are likely to undertake significant demand building activities, the result of which will be faster industry growth.

Regulation can not only permit foreign investment, but by providing proper incentives it can also encourage such investment. An incentive driven program should focus on both lowering the perceived risk for the foreign investor and on providing demand prospects that the potential investor will

perceive as favorable. Risk-lowering regulations include removing import restrictions on machinery and parts, providing work permits for technical advisors, and allowing currency convertibility and profit repatriation, and in some cases, protecting trademarks and intellectual property. Potential foreign investors will perceive favorable demand prospects when they see an economic and regulatory climate that encourages local entrepreneurs to start manufacturing businesses.

D. Indirect Effects of Regulation

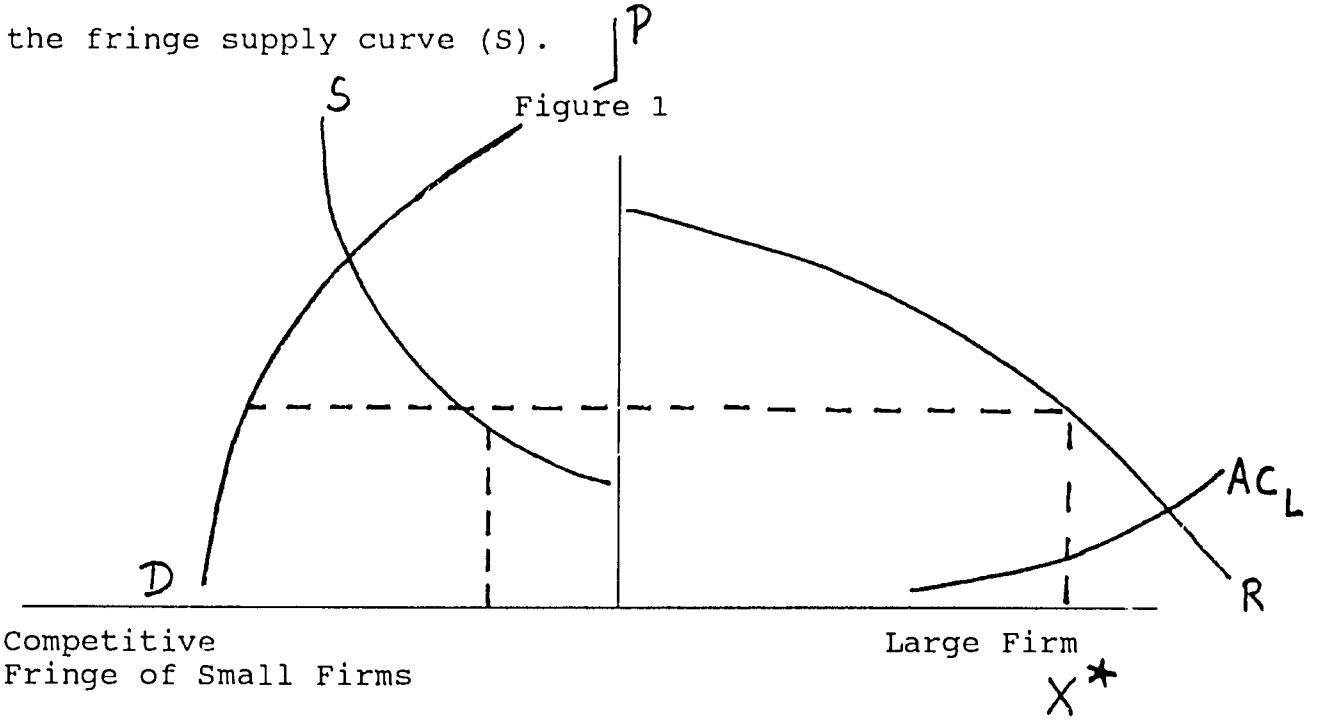
The heterogeneity of firms (eg. intra-industry variations in scale, factor proportions, productivity location, etc.) gives rise to additional, general equilibrium effects of regulation that can be called "indirect effects". Firm heterogeneity often results in differing effects of regulations across firms. For example, the costs of regulations may be greater for labor-intensive firms than for capital-intensive firms, or small firms may have higher compliance costs than big firms. With such differences in cross-plant compliance costs, regulations provide cost advantages to one group of firms over another. It is important to recognize that for many firms and workers, the indirect effects of regulation can outweigh the direct effects in terms of economic importance. Sufficiently large indirect effects could provide a competitive advantage that more than

offsets any direct compliance costs, thereby producing a net benefit for some regulated firms and their workers.

Even though regulation increases the production costs of all firms, the offsetting indirect effects may actually cause some firms to benefit from the regulation: the costs of these firms rise less than that of their competitors, which gives them an incentive to use regulation as a business strategy. Hindering competitors by promoting regulation can provide benefits that outweigh the costs if the strategy allows the dominant firm to increase its prices or market share. Figures 1, 2, and 3 below illustrate these indirect effects of regulation.

Consider an industry consisting of a large firm and a competitive fringe of smaller firms. In such an industry, a lower-cost, larger firm acts as a price leader. Competitive fringe firms follow by collectively setting some output y on the fringe supply curve (S).

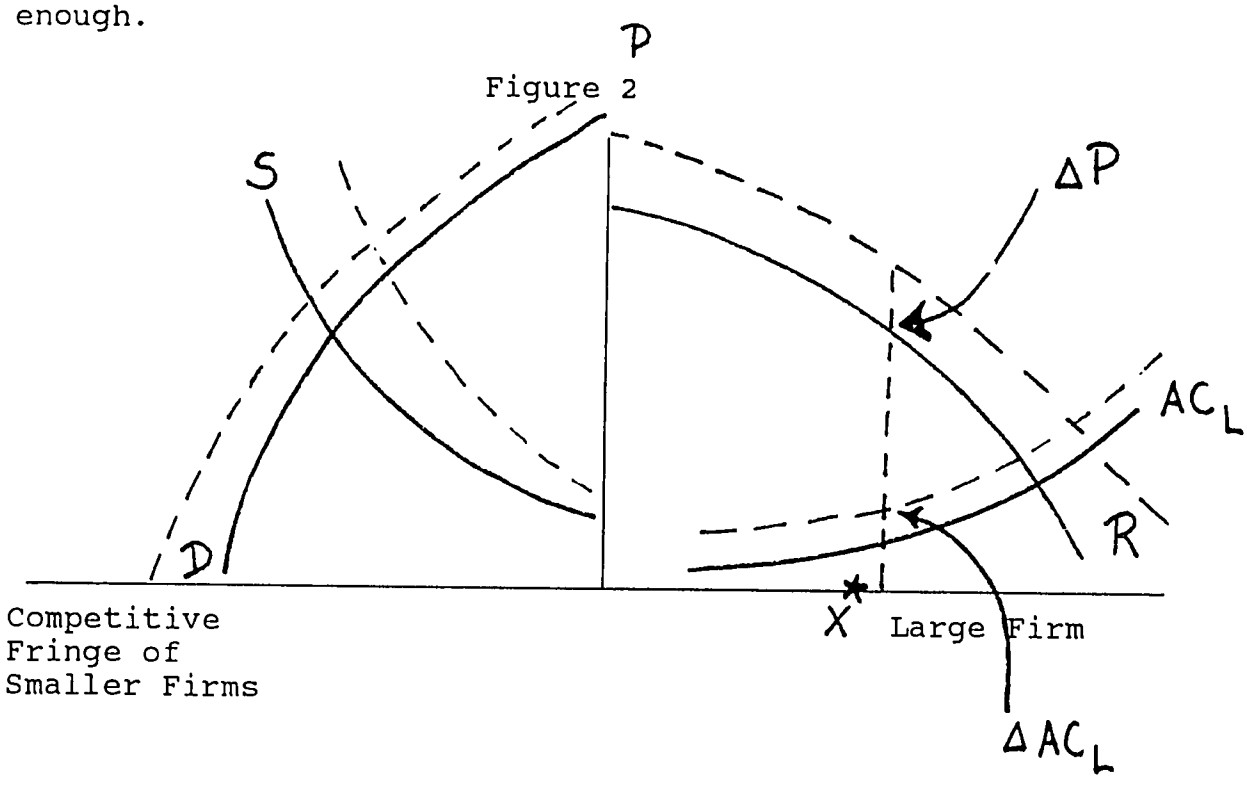
Figure 1



Since each firm is small, it produces until price equals marginal cost. For analytic simplicity, assume that the supply curve arises from the representative firms' marginal cost curve. At equilibrium, the large firm produces at the profit-maximizing point (X*) on its residual demand curve (R). The industry demand curve (D) and the fringe supply curve are shown in the left quadrant of figure 1. The large firms' residual demand (R) and average cost (AC_L) curves are located in the right quadrant. The large firm's profits equal ($P - AC_L$) X*.

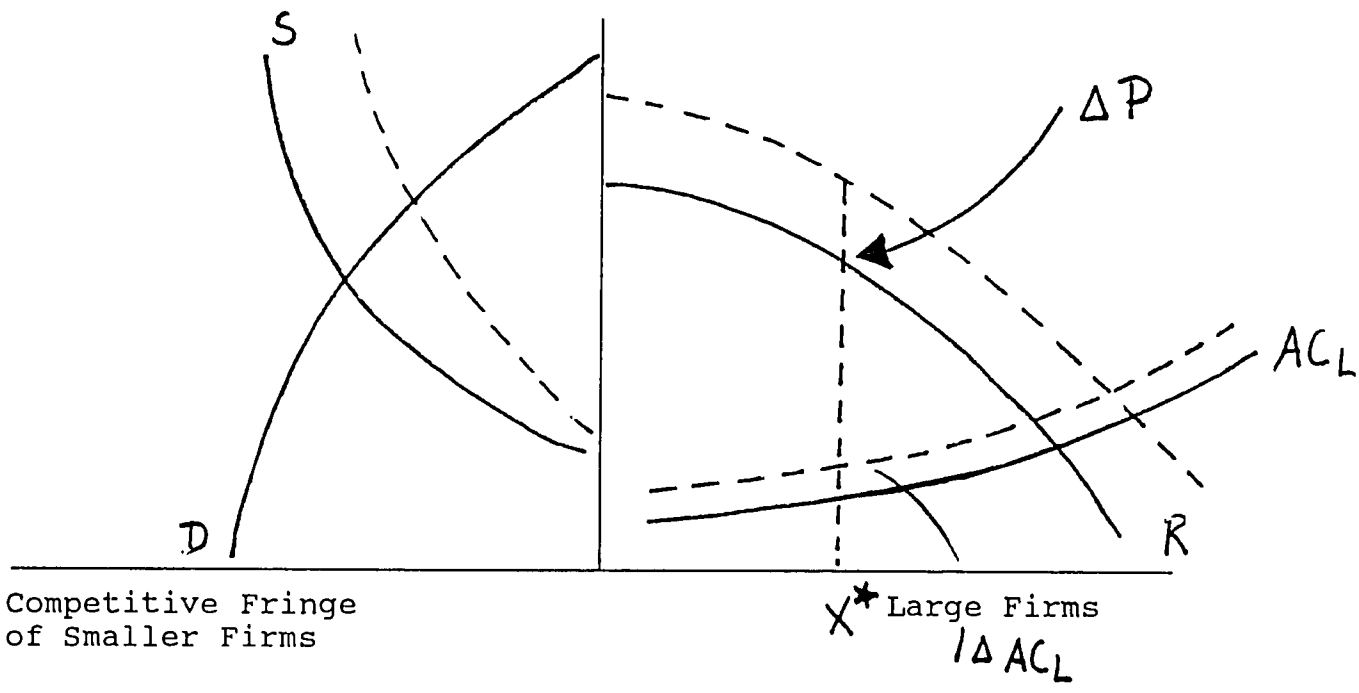
Suppose the large firm can select a second business strategy (other than price leadership) to which the smaller fringe firms must react. A large, rent-seeking firm could enter the political arena to inflict costly regulations on its rivals, and on itself, if the indirect benefits were great enough.

Figure 2



As illustrated in Figure 2, a sufficient condition for such a profitable strategy is that the strategy shift up the large firms' residual demand curve by more than it shifts up its average cost curve at the original output X*. Even if the large firm were to keep its output constant, the increased margin of price over cost would raise its profits. But the firm could raise its profits still further by adjusting its output. When market demand is unaffected by the change in regulations (as in figure 3), increases in marginal costs can reduce smaller firms' output and/or raise their price. Significant increases in average costs can cause some smaller firms to exit the industry and others to forego entry. So regulations can be used by a dominant firm to erect entry barriers for would-be competitors.

Figure 3



The shift in the residual demand curve (R) depends on the elasticity of demand as well as the elasticity and shift of the smaller rival's supply curve. (The shift is a function of the impact of regulation.) The less elastic the demand, the greater the increase in residual demand. As demand elasticity decreases, a given reduction in supply from smaller firms causes a larger price increase.

The indirect effects of regulation arise from two possible sources: (a) compliance asymmetry, whereby one firm suffers a greater cost burden per unit of output even when regulations are equally enforced across firms; or (b) an asymmetry in enforcement, whereby regulations are more vigorously enforced against certain firms.

E. Compliance Asymmetries

The sources of differences in compliance vary depending on the type of regulation, but two major determinants stand out. First, to the extent that there are economies of scale in compliance, smaller firms suffer a larger effect per unit cost and, in fact, may be sufficiently disadvantaged that they exit the industry or do not enter. Second, the age and location of plants may raise the compliance costs of firms even when regulations are evenly enforced.

F. Enforcement Asymmetries

Differences in enforcement arise from the fact that legislation, promulgation, and administration of regulation may be systematically skewed against particular groups of firms or workers. Such imbalances will raise manufacturing costs of these groups versus others and thereby reduce their competitive advantage. For example, government may enforce regulations more strictly against large firms because smaller firms are invisible to authorities. Some regulations are notoriously riddled with discrepancies in enforcement: requirements that new plants meet higher standards than older plants; or that plants in areas of the country that are cleaner than national standards must meet tougher standards than plants in dirty areas.

Compliance and enforcement asymmetries may be reinforcing or offsetting depending on the particular case. For example, they may be reinforcing in the case of plant size - smaller firms or larger firms may be favored - and offsetting in the case of their locational effects.

2. Measuring the Direct and Indirect Effects of Regulation at the Industry Level

We can calculate the direct and indirect effects of regulations with time series data on industry profits. Total industry profits can be written as an expression for the industry profit margin:

$$\frac{\Pi}{Q} = P - \sum_{i} AC_i d_i$$

where Π = accounting profits (revenue-costs)

Q = total output

P = product price

ACi = the ith firm's average cost

d_i = the ith firm's share of total output

Values of variables after regulation are designated (r). The direct effect of regulation on production costs of the ith firm cab be written as:

$$X_i = Ac_i^r - AC_i$$

We assume that, because of firm heterogeneity and differences in compliance and enforcement, the cost of regulation (X_i) differs across firms in the industry. The regulation will raise the industry's costs and price, but price changes will be driven by the high-cost or marginal firm. Prices will tend to rise by less than the increase in average cost for the marginal firms, in part because of economies of scale in compliance and in part because of delays in adjustment. In addition to some of the factors outlined in figures 1, 2, and 3, an important constraint on price increases due to

regulation is the extent to which the industry faces import competition. If the elasticity of import supply is high, then the increase in domestic price will be dampened.

The change in industry price owing to regulation can thus be written as follows:

$$P^{r} - P = \beta X^{mar}(1 - \alpha IMP)$$

$$0 < \beta < 1 \ , \ 0 < \alpha < 1$$

where X_{mar} = the increase in average cost for the marginal (or high cost) firm. And the change in average industry profits can be written as:

$$\frac{\Pi^{r}}{Q} - \frac{\Pi}{Q} = \beta X_{mar}(1-\alpha IMP) - \sum_{i} X_i d_i$$

$$= -(1-\beta) X_{mar} - \beta\alpha L_{mar} IMP$$

$$+ \sum_{i} (X_{mar} - X_i) di$$

where di = the ith firm's share of total output. This expression indicates that the effects of regulation on industry profits can be separated into three components:

(i) a pass-through effect, which is negative, arising because prices do not increase fully with regulation-imposed costs;

(ii) a trade effect, which is negative, caused by the dampening influence of imports on industry price; and

(iii) indirect effects, of indeterminate sign, based on the heterogeneity of regulation cost burdens.

If we assume that the magnitude of indirect effects based on firm size is the same at all locations and that the magnitude of indirect effects based on location is the same for all firm sizes, then the total indirect effects for individual firms will be the simple sum of separable firm size and regional indirect effects. Given these assumptions, changes in average industry profits can be written:

$$\frac{\Pi^r}{Q} - \frac{\Pi}{Q} = -(1-\beta)X_{mar} - \beta\alpha X_{mar} IMP + (X_{mar} - X_{large})\, d_{large} + (X_{mar} - X_{urban})\, d_{urban}$$

where d_{large} and d_{urban} = the percentage of industry output from large and urban firms. The third term defines the indirect effects of regulation based on the diverging impact across different sized firms. The fourth term indicates the indirect effects based on diverging impact across different locations (rural and urban). While the direct impacts of regulation on industry profits are negative in the first two terms, the indirect effects on industry profits can be positive. In this particular instance, if the regulation-induced costs of large firms are lower than small firms' costs and the regulation-

induced costs of urban firms are lower than rural firms' costs, then indirect impacts will be positive.

A. Econometric Estimate of Regulation on Industry Profits

We can estimate the regulation-induced transfers of wealth that affect average industry profits by using econometric techniques. Time-series data on profits in three-digit SIC manufacturing industries suffice for such an investigation. In the absence of such time-series information, we could substitute cross-sectional data for individual industries across countries, while making special efforts to hold constant country-specific differences that might influence variations in profits.

In the econometric model, we would measure profits as the price-cost margin, defined as value-added, less labor and other input costs, all divided by the value of total output or sales. To estimate the wealth effects of regulation, we require measures of annual or cross-sectional (cross-country) compliance costs for firms in the industry. We then divide these compliance-cost estimates for each regulation or set of regulations by the value of total output or sales to derive the independent variables. As in the above equation showing change in average profits, our econometric model will show how to segregate into four terms the effects of regulation on industry profits: a pass-through effect, a trade effect, a firm-size indirect effect, and a locational indirect effect.

To measure the trade effect, we can multiply the variables for compliance costs by the ratio of the industry's net imports to its total value of output. We can measure the wealth transfers resulting from the asymmetries due to plant size by multiplying the regulation variables by the percentage of workers in the industry who are in large establishments (defined as, say, more than 200 workers). Finally, we measure wealth transfers owing to locational asymmetries by multiplying the regulation variables by the percentage of the industry's employment located in various regions (say, rural and urban, or in different parts of the country).

Such an econometric study has one limitation. By taking as given the terms for firm size and locational distribution, we ignore changes in these distributions caused by regulation. The output effects due to changes in firm size and locational distributions can have as much impact as the price and profit effects estimated in our econometric model. By ignoring output effects, the model understates the firm-size and locational effects of regulations. (The next section will address the longer-run changes in the size distribution of firms.)

The price-cost margin econometric model should also include the following variables:

(a) a set of variables that measure those expenses not already deducted from total revenues - advertizing per unit of output, R & D per unit of output, value

of inventories per unit of assets, and new capital expenditures per unit of output;

(b) the value of assets (plant and equipment) as a ratio to value of output;

(c) average establishment size and its square;

(d) the concentration ratio (because of the widely hypothesized relationship between concentration and profits);

(e) industry output growth and growth in the cost of material inputs (to hold these variables constant);

(f) the trade variable, as defined earlier;

(g) a set of year or country dummy variables; and

(h) various cross-country policy variables (if cross-sectional data is used).

B. Measuring the Direct Effects of Regulation Using Cost Functions

The direct effect of regulation on the performance of firms can also be assessed using cost functions. Cost functions allow us to separate direct effects into the effect on the firm's allocative efficiency and the effect on the firm's technical efficiency (or total factor productivity). Remember that the effect of regulation on allocative efficiency is measured as a movement along the cost function away from the most efficient input bundle, and the effect on

technical efficiency is measured as a shift in the cost function.

Cost functions are also flexible enough to handle realistic characterizations of firms and industries, such as multiple outputs and inputs and special aspects of market conditions and changes in input productivities.

The data required for the cost function analysis is best described as panel data for groups of firms (say, large firms and small firms) for a time period covering changes in regulation (before and after regulation, or a period of deregulation). The central idea is to control for as many variables as possible in the cost functions, such that the residuals of the eocnometric analysis can be used to measure pure shifts in technical efficiency and can be related to changes in the regulatory environment. When cost functions for groups of firms are specified, they can be used to make comparisons of the impact of regulation on the efficiency of each group. Because cost functions enable us to estimate the cost effects of capacity utilization, economies of scale and scope, and technical efficiency, we can assess the impact of regulation on all these elements.

C. Estimation of the Cost Function

The starting point for the specification of a multiple-output total cost function is as follows:

$$C = C(Y_1, Y2, \ldots Y_m, W^*)$$

C = total input costs

Y_i = output of class i, $i = 1,2,\ldots,m$

$W^* = [W_1^*, W_2^*, \ldots, W_n^*]$

$W_i^* = W_i \exp(\alpha_i t)$ price of input i adjusted for quality changes over time, or across firms or across countries in the case of cross section data.

W_i = observed price of input i

t = time (or countries)

We can modify this general specification to account for the impact on cost of technological and market conditions, conditions which vary over time and between firms, or across countries and between firms in the cross-sectional case. One can accomplish this modification by replacing the Y_i's in the equations by "hedonic output functions", $\phi_i\ (Y_i, q_i)$, where q_i is a vector of market variables or "attributes" describing the nature of the ith output class. With this modification, the cost function takes the following form:

$$C = C[\phi_1\ (Y_1, q_1), \phi_2(Y_2, q_2) \ldots, \phi_m(Y_m, q_m), W_1^*]$$

Using panel data for large and small firms over a relevant period, we can estimate the cost function of the specific firm class. This type of data for groups of firms allows one to specify intercept shifts for each firm (class of firms) and each country. The inclusion of such dummy variables or shift factors controls for bias in the coefficients of included explanatory variables that may arise

because of the omission of unmeasurable variables. The unmeasurable variables may vary by firm (or class of firm) and/or country but are constant over time for a given firm or country. The dummy variable specific to each firm is referred to as "firm effects" and each dummy specific to a country is referred to as "country effects." The following equation shows the general form of the cost function, including firm effects (F), number of consumers or markets served (P), and hedonic output functions:

$$C = C[F, P, \phi_1(Y_1, q_1) \ldots \phi_m(Y_m, q_m), W^*]$$

To estimate the cost function and the embedded hedonic output functions, we must assume a specific functional form. Most researchers choose the translog form for its flexibility and relative ease of estimation:

$$
\begin{aligned}
\ln C(F,P,\phi,W,t) = \; & \alpha_o + \sum_k f_k D_k + \alpha_p \ln P \\
& + \sum_i^m \alpha_i \ln\theta_i + \sum_i^n b_i \ln W_i^* \\
& + 1/2 \sum_i^m \sum_i^m \alpha_{ij} \ln\theta_i \ln\theta_j \\
& + 1/2 \sum_i^m \sum_j^n b_{ij} \ln W_i^* \ln W_j^* \\
& + 1/2\, C_{pp} (\ln P)^2 \\
& + \sum_i^m d_i \ln\theta_i \ln P \\
& + \sum_j^n e_j \ln W_j^* \ln P \\
& + \sum_i^n \sum_j^m g_{ij} \ln W_i^* \ln\theta_j
\end{aligned}
$$

C = total costs

P = market size

D_k = the dummy for firm k (class)

W_i^* = the adjusted price for input i

t = the time trend variable (with time series data)

f_k = a "firm effect" coefficient associated with dummy D_k

The remaining notation represents parameters of the translog function.

If one believes that the production technology of firms (or firm classes) has changed over time or across countries and affected the productivity of each input differently from that of other inputs, one can specify these differential impacts of technical change on inputs in the following non-neutrally input-augmenting form:

$$W_i^* = W_i \cdot \alpha_{it}$$

W_i = price of input i

α_i's = parameters of factor price adjustment function representing non-neutral technical change over time t (or across countries in cross-sector data).

Researchers normally assume a log-linear specification for the hedonic output functions:

$$\theta_i = Y_i \cdot \prod_{l=1}^{Y_i} q_{il}^{\beta_{il}}$$

q_{il} = the lth attribute of output i

Y_i = the observed output i

β_{il}'s = the parameters of the hedonic output function for output class i.

We choose this specification because the micro-aggregators imbedded in the translog function must be log-linear when the overall cost function has a translog form. Since the parameters of the ϕ_i's are unknown, we can imbed the hedonic functions themselves into the macro translog function to

estimate the parameters of both the cost function and the hedonic functions simultaneously.

A cost function must be linearly homogeneous in input prices. This implies that we must impose the following restrictions on the translog cost function:

$$\left.\begin{aligned} &\sum_{j}^{n} b_j = 1 \\ &\sum_{j}^{n} b_{ij} = 0 \\ &\sum_{j}^{n} e_j = 0 \\ &\sum_{i}^{n} g_{ij} = 0 \end{aligned}\right] \quad i = 1,\ldots,m$$

To obtain the final form of the estimating equation, we take and substitute the logs of

$$W^* = W_i e^{\alpha_{it}} \qquad \text{and} \qquad \theta_i = Y_i \cdot \prod_{l=i}^{\alpha i} q_{il}^{\beta_{il}}$$

into the translog cost function and impose the restrictions.

With this final form of the cost function, we can estimate the partial elasticity of substitution, the

compensated price elasticity of input demand and the Marshallian (ordinary) price elasticity of demand. We can also estimate the economics of scale and scope. We measure returns to scale as:

$$\text{RTS} = \left[\sum_{i}^{m} \frac{\partial \ln C}{\partial \ln Y_i} \right]^{-1}$$

Returns are said to be increasing, constant, or decreasing as RTS is greater than, equal to, or less than unity. We assess economics of scope by identifying the degree of cost relationship between pairs of output. We can evaluate this by the following second-order derivatives of each data point of the translog function:

$$\frac{\partial^2 C}{\partial \phi_i \partial \phi_j} =$$

If this derivative is negative, then cost complementarity exists between outputs i and j.

D. Capital Formation and Allocative Efficiency of Investment

Regulatory policies affect both the level and pattern of investment through their impact on the structure of incentives and barriers to entry. By doing so, they also influence the

rate of industrial growth. The opportunity cost of "pulling" resources into projects with a lower rate of return measures the allocative impact of regulation on investment. We can calculate the opportunity cost by subtracting the growth rate under regulation from the growth rate with no regulation present. In addition, regulated industries can have lower rates of entry and of new firm formation. These factors will ultimately lower the level of capital formation and reduce competition. The resulting increase in imperfect competition can mean added costs in "X-inefficiency" and "dead-weight losses" to society.

The difficulty in calculating a measure of foregone growth through lower growth rates under regulation necessitates the use of ad hoc methods at the enterprise level to determine the influence of regulation on investment. Within industries, we could evaluate firms after assuming first the existence, and then the absence of the regulation. The evaluation asks whether or not the firm would be profitable in the given industry if regulatory policy were changed. This, of course, does not deal with the problem of fewer firms entering the industry, but does give some indication of the constraints of regulation on potential output and investment at the level of the existing firms.

3. Dynamics of Industry Structure

Thus far, the analysis has assumed that the structure of firms within industries remains constant in the presence of regulation. We now drop this assumption. Regulations may influence the ratios of entry and exit in an industry, new firm formation, and the relative growth rates of different sized enterprises, all of which cause shifts in industry structure. To understand the mechanics of this process, one needs to know how the size structures of firms evolve as industrialization advances and to sort out the main structural determinants of the evolutionary path. Of specific interest is how small enterprises fit into the process of structural change - defined as the process whereby capital and labor shift into more productive uses during development. In the structuralist view of the growth process, structural change (i.e. gains from the reallocation of factors of production across sectors and between firms) is one of the chief sources of productivity growth and economic welfare. Other sources include:

- capital accumulation;
- increases in labor force and labor quality; and
- growth in total factor productivity (TFP).

If regulation alters the efficiency of structural change at the level of the firm, it can significantly influence productivity growth.

A. Stylized Facts: Shift in Average Firms Size

Two "stylized facts" or uniform features characterize structural change at the firm level. First, as income per capita rises, average establishment size (as measured by the number of workers) increases. This rise in average firm size takes two forms: (a) within industries, average firm size increases as the market widens and technology diffuses from larger to smaller firms; (b) between industries, average size increases as the product mix shifts toward heavy industry. Second, in early stages of development, one finds extensive and widening disequilibrium among firms and sectors, as measured by inter-industry and intra-industry differences in wages and economic performance. These differentials in wages, productivity, and profit rates narrow as income per capita increases. At high levels of development, differentials narrow to a steady-state equilibrium such that small enterprises, even in highly concentrated industries, earn about the same profit rates as large firms and have similar levels of productivity.

1. A Closer Look at the Rise in Average Establishment Size

Many studies show a negative correlation between a country's level of development (per-capita income) and the relative importance of small firms. This negative correlation presents evidence of a continuous transformation in the organization of manufacturing as income rises: an

evolutionary process, whereby the competitiveness of smaller firms' technologies (usually traditional technologies) gradually diminishes in different industries at different stages of development. Comparative studies have established some uniform trends:

- At about $200 per capita incomes, cottage or household manufacturing predominates (1-4 workers).
- As income per capita rises, these micro-firms are displaced, first by small factories (less than 100 workers), then by large scale production units.
- At advanced country levels of income per capita ($8,000-$12,000), large and giant firms begin to predominate.

Hence, small firms play a relatively large role early on and then diminish.

2. Structural Determinants of the Evolving Size Structure

A cursory inspection of data shows that in virtually all cases the size distribution of firms is highly skewed: few large firms, more medium-sized, and many small. Such skewed distributions have a common feature. They can be generated by stochastic or random processes in which the variate (firm size) is subjected to cumulative random shocks or historical events over time. This type of skewed distribution implies that the size distribution at any point in time results in part from a series of random growth patterns in the history of the market, and in part from structural variables. Considering these influences, we can write the growth equation for a firm in size class (i) at initial time (t_o) as:

$$\frac{X_{i,tF+1}}{X_{i,t}} = f(S_i, \ldots S_{ik} \; x \; U_{it}) \cdot U_{it}$$

The size structure of firms would evolve over time in response to the structural variables $S_1 \ldots\ldots S_ik$ and the random process or stochastic term U_it. One might try to control for all the historical random process possibilities that increase the average firm size and include them in the model such that the error term U_it would be eliminated. But doing so would make the model too complicated. We therefore lump all of these possibilities into an error term. Six variables and their interaction can be distinguished from among the structural variables that determine the progressive dominance of large firms:

- technological factors;
- changes in market size;
- institutional factors;
- firm strategies;
- the extent of disequilibrium; and
- policy.

Below is a brief discussion of each of these structural variables and its influence on the evolving size distribution of firms.

3. Technological Factors

In the most elementary theory of the firm, technology (as reflected in the shape of the firm's cost curves) is the sole determinant of firm size if one abstracts from problems of

imperfect competition, fluctuating demand, barriers to entry, market imperfections, and transportation costs. Given U-shaped cost curves (i.e. diminishing returns), the optimal establishment size in any branch industry is the industry-specific minimum efficient scale (MES). Profit maximization and competition ensure that establishment sizes above or below the MES will not survive. With the MES established, the size of the market determines the number of establishments.

Note that this theory does not allow a distribution of different sized firms to remain at equilibrium <u>within</u> a given branch industry. Because each branch industry will normally have its own technology-determined MES, there will be a distribution of different sized establishments at only the <u>aggregate level</u> of manufacturing.

In this neoclassical model, changes in the branch industry's composition of output (its product mix) cause the changes in the average firm size. Since composition of output varies systematically with changes in per-capita income (due to, for example, income elasticities), changes in the average establishment size can be attributed to changes in the level of development.

Specifically, what factors influence the composition of output as income changes? Four elements come into play:

(i) increases in income (and income elasticities) shift the pattern of intermediate and final demands;

(ii) new opportunities for international trade are offered;

(iii) capital and labor accumulate changing factor prices;

(iv) government policy changes.

As the nature and relative importance of these factors shift at each stage of a country's economic development, the conditions of profit maximization imply a continuous reallocation of resources into new industrial activities. Empirical evidence (see Chenery, Syrquin and Robinson) clearly indicates that as per-capita income rises, the composition of output shifts from light to heavy industry.

Allowing for alternative technologies introduces into the equation the size distribution of firms within industries. If the underlying technology does not conform to diminishing returns and U-shaped cost curves, the model explaining rising average firm size becomes more complicated. Bain showed that technology in some industries produced L-shaped costs (increasing returns up to some MES, followed by constant returns). Such cost curves make possible a size distributions of firms within an industry, in steady-state equilibrium, having as possible extremes a distribution where the smallest firm is at the MES or an alternative distribution where the largest firm serves the entire market. Such cost conditions, however, do not explain <u>why</u> smaller-than-MES firms might exist.

Scherer found that L-shaped cost curves, plus other factors such as limited market size, high outbound transportation costs, and structural differentiation of

products caused establishments within industries to be both above and below the MES. Thus, in addition to inter-industry (production mix) determinants for changes in average firm size as development advances, Scherer's findings point to intra-industry determinants:

(i) market size (although market size influences both inter- and intra-industry determinants);

(ii) transportation costs and other infrastructure costs (communications, etc.);

(iii) firm strategy (product differentiation, product innovation, production flexibility);

(iv) international trade.

Under certain conditions these intra-industry factors can offset technical requirements and influence the weighted aggregate average of firm sizes. We briefly discuss the influence of each of these factors below.

4. Intra-industry Determinants in Conjunction with Technology

Market size (or a proxy being the level of Gross National Product/population) can limit establishments to less than the MES and can influence the product mix (small countries, for example, tend to specialize in what they produce). When we focus on firms rather than plants, another influence of market size arises: the extent of multi-plant operations. Scherer found that size of the national market strongly influenced the extent of multi-plant operations. Moreover, Pryor found that multi-plant firms had establishments one third larger in

employment size than single establishment firms. He attributes this to economies of administration and coordination.

International Trade, empirical evidence confirms, affects firm size structures. Access to export markets increases opportunities to fully attain economics of scale, which national boundaries and domestic rivals may otherwise prevent. In addition, the existence of high fixed costs of exporting often raises a barrier to entry for small firms. Everywhere, except in East Asia, large firms do most of the exporting. Opening up a country to trade also puts pressure on domestic firms that operate at an inefficient scale. Two situations may develop. First, where there are high tariffs, the domestic price of the tariff becomes a natural focal point for price setting, and (depending on entry barriers) domestic producers can "crowd into" the market at sub-optimal scales until further entry produces negative profits. Second, protection may increase vertical integration in industry and induce a rise in average firm size. This phenomenon occurs because of the absence of competition which might have forced the firms to specialize in various aspects of production.

Transport and Other Infrastructure Costs also have a substantial impact on average firm size, as Chandler argued. When a national market's demand is fragmented by barriers like high transport (or other infrastructure) costs, growth of specialized establishments can be constrained below the MES

with detrimental effects on the industry's technical efficiency. For the entire system of interrelated markets in an economy, the lowering of transport costs expands markets and has historically been the main technical force to increase the division of labor and complexity of production.

Firm Strategy is yet another structural determinant of intra-industry firm size. Scherer's finding that structural differentiation of products leads to different intra-industry firm sizes above and below MES highlights the fact that strategy plays a role in the evolving size structure of enterprises within an industry. The need for economies of scale and scope calls into question the long-run viability of small firms in competitive situations unless they possess other offsetting competitive advantages or unless market distortions exist. Economies of scale and scope are more pervasive in some industries than in others. Hence, small firms may follow a strategy of concentrating in fragmented industries where scale economies are less important to achieving or maintaining a competitive advantage. In products where demand is highly variable and where there are viable tradeoffs in using different technologies, small firms can also adopt competitive strategies to offset the disadvantages of higher costs by taking up more flexible technologies of production and absorbing more of the volatility in demand than larger firms would. By specializing in segments of the market

with high fluctuations in demand, they can earn about the same rates of profit as large rivals.

5. Institutional Factors and Average Intra-industry Firm Size

Another determinant of the evolution of the size distribution of firms is the institutional setting. The time that entrepreneurs spend managing and coordinating the activities of economic agents is costly, and the magnitude of these "transaction costs" will affect the way a firm is organized. Transaction-cost problems affect the size distribution of firms in two ways. First, entrepreneurs have differing abilities to perform their roles and deal with transaction costs. Therefore, in combination with the given production technology, the dispersion of these entrepreneurial abilities determines the different sizes and organizational structures of firms in any industry. These differences have supply-side implications for growing average firm size. As human capital increases (with increased investment in education) and as entrepreneurial ability (to manage larger operations) improves, so will average firm size. Individuals can choose to be either employees or entrepreneurs. Entrepreneurial talent is distributed unevenly among individuals. The opportunity cost of using labor in the entrepreneurial role governs the process of selection into self-employment. As the real wage increases with the level of development (because of technical advances that raise labor

productivity and real wages), the opportunity cost of using labor in the entrepreneurial role increases. This higher real wage induces marginal entrepreneurs to become workers, and the number of small establishments declines.

The second way transaction costs influence the size distribution of firms is through problems in organizing transactions via spot markets. The boundary between the firm and the market (the extent of vertical integration) occurs at a given point because of the transaction-cost advantages that may attach to either the market or the firm as allocators of resources. Actual boundaries of firms are drawn in a Darwinian process by which the most efficient production unit displaces the least productive. Darwinian competition does not work the same way in every country because the transaction cost efficiencies of firms and markets are not independent of:

- level of development;
- laws;
- cultural traits; and
- other country-specific influences.

In the end, it is difficult to say precisely how transaction costs will affect changes in average firm size, given these country-specific differences in laws, culture, and so on. Although many outcomes are possible, empirical studies suggest that market imperfections in financial markets, commodity markets, and labor markets in less developed countries (LDCs) influence the firms' choice of operating size. For example, firms increase in size to internalize transactions through vertical integration when transactions on spot markets are

costly. Another inducement for firms to expand in size comes when legal systems and other institutions increase the problems of post-contract opportunism. Under such circumstances, businessmen tend to keep management control in the firm. Such difficulties may also keep firm sizes artificially small if businessmen decide to keep control within the family.

6. Sorting Out Inter-industry Influences from Intra-industry Influences

Which has more impact on the growth of the average firm size - the mix of products produced (inter-industry effects) or the intra-industry effects listed above? Using pooled time-series and cross-sectional data from industrial censuses of countries at different levels of income, researchers find that changing output mix accounts for only about twenty percent of the growth in average firm size across the range of countries with incomes from $200 per capita to about $5000-$6000 per capita income. The remainder can be attributed to intra-industry effects. Though it is extremely difficult to sort out these intertwined determinants of average firm size, this result does point to the importance of factors other than technology in determining the evolution of the size structure of firms as development proceeds.

7. Disequilibrium

So far all the structural variables in our model of the evolution of the size structure of firms involve conditions of long-run equilibrium. However, widespread and persistent inter-scale and inter-industry disequilibrium characterize developing countries, as shown by the extreme inter-scale heterogeneity among enterprises in size, wages, productivity, and profit rates, and extreme inter-industry differences in rates of return. The principal causes of this persistent disequilibrium are technical change, factor- and product-market distortions, pervasive structural change, policy shocks, and external shocks.

The story of how technical change works in LDCs indicates why disequilibrium is so persistent and pervasive. LDCs, for the most part, import technical change. The diffusion of new techniques generally progresses from larger domestic or multinational firms to smaller firms. The speed and incidence of diffusion depend on a combination of factors: firms differ in their ability to adopt and use new techniques, while significant factor- and product-market imperfections, as well as policy-induced distortions, can slow the pace of diffusion. As a result, it can take considerable time for new techniques to spread to most firms in an industry. Consequently, at any given period, one observes considerable variation among firms in their vintage of technology.

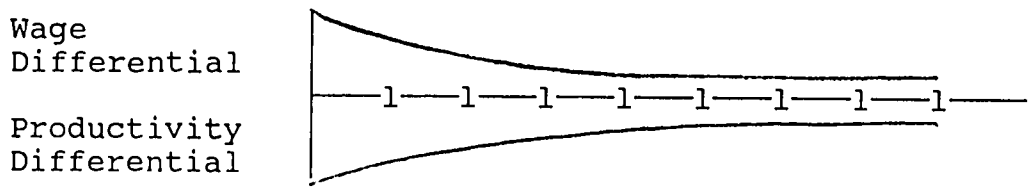
The process of adjustment to technical change is not benign. It puts a "double development squeeze" on the less efficient production technologies of small traditional firms: rising real wages (due to increased output and demand for labor) raise their costs while falling product prices (due to the downward sloping demand functions for goods and services) lower their revenue. The speed and extent of the technology's diffusion will depend on the ability of traditional technology to survive. Survival space depends, inter alia, on shortages of skilled managers and technicians, who can often limit the pace of adoption, and on factor- and product-market distortions, which can slow or misdirect adjustment.

8. Disequilibrium in Developed and Developing Countries

Disequilibrium explanations for intra-industry (or inter-scale) differences in size and performance of firms set developing countries apart from developed countries. In developed countries, small firms take up strategic positions in various industries and earn profit rates equal to those of large firms. Inter-scale differentials in wages and productivities that do arise in high-income countries are quite stable over time. Thus, any disequilibrium is temporary and short-lived. It is important to remember that because of this lack of disequilibrium, small firms in developed countries differ from small firms in LDCs. Those interested in small-firm development often overlook this fact.

B. Stylized Fact Two: Decline of Disequilibrium

The second stylized fact that can be noted during the course of development is the decline in inter-scale disequilibrium. Inter-scale differentials in wages and productivity narrow as per-capita income rises (see figure).



Market forces generally tend to move the economic system toward equilibrium, but these forces can be weakened by:

- market imperfections;
- system inflexibility and high adjustment costs; and
- policy-imposed distortions in factor and product markets.

If LDCs could adjust instantaneously to various shocks, one would learn little from an analysis of the gains from structural change. Because developing countries have pervasive problems with economic shocks and adjustment, and because disequilibrium tends to persist, the speed and direction of structural change can account for crucial differences in the growth rate of aggregate productivity between countries.

The mechanisms of adjustment that reduce the disequilibrium between firms during the course of development do so by lessening factor- and product-market distortions. Hence, we are concerned with the size distribution of firms as a market phenomenon: its relation to conditions in factor and product markets, and the extent to which it represents a

problem of poor market performance. Inter-scale distortions in capital markets run against small firms. Inter-scale distortions in labor markets are in their favor. Wage differentials, thus accord survival space to smaller firms operating at less than the MES with less efficient technology. As the labor market "turning point" is reached in the course of development, the wage differential begins to close (as small firms compete with large firms for labor). Unless smaller, less efficient producers can increase productivity (revenues), their increased costs (wages) will squeeze profits until they must exit from the market. Also, in product markets, as technological change increases supplies, declining prices squeeze the profits of small enterprises.

The contraction of small firms' "survival space", as a result of narrowing inter-scale wage differentials and product market prices, causes the distribution of the labor force to shift toward larger firms. A process of natural selection weeds out smaller firms. The structural change that occurs takes three forms:

- increased allocation of new labor-market entrants to more productive segments of industry;
- transfer of workers from lower- to higher-productivity production units;
- upgrading of the productivity of workers in pre-modern, low-productivity units through the adoption of superior technology, and through the expansion and shift to higher-value products.

1. The Direction of Adjustment

A theme in economics over the past century has been the convergence thesis, which states that as a country develops, the path of adjustment of the inter-scale employment structure will converge on the developed country pattern. The convergence thesis maintains that the constraints of modern mass technology of production and consumer tastes (the assumed engines of change) gradually make industrial societies indistinguishable. It is assumed that, since human nature is the same everywhere, the same technology and similar tastes are likely to produce the same sort of institutions. The institutions most dependent on technology and therefore most likely to move toward international conformity should be those associated with the organization of work. Except in a few cases like that of Japan, historical experience has largely supported this theory.

2. Persistence of Small Firms Along the Convergence Path

The elimination of factor market distortions and falling product prices squeezes the survival space. To determine which industries will be under the most pressure one must look at:

- income and price elasticities of various products;
- factors that protect products in small batches; and
- average capital-to-labor ratios in various industries.

3. Income and Price Elasticities

Basic wage goods, like simple clothing, footwear, processed food, and soap products have relatively low income elasticities and high price elasticities. In the early stages of development, these goods are produced in small batches in villages. As incomes increase and transport costs fall, the natural protection of the small, local producers is stripped away. Production from larger domestic factories and imports penetrate these markets and displace traditional small batch producers.

4. Capital/Labor Ratios

Average capital/labor (K/L) ratios are significantly less sensitive to rising relative wages in some industries than in others. Assembly industries (e.g. textiles and metal products) are less sensitive to relative wage increases than process industries (such as food stuffs, pulp and paper, chemicals). Assembly industries are less sensitive to changes in factor prices because they are less able to substitute capital for labor. In addition, the assembly industries are less capital-intensive so they are hurt more by increases in relative wage rates. When inter-scale, factor-market differentials begin to narrow, the more the distortion has caused small firms to substitute labor for capital, the more its removal will leave these firms stranded with average costs

higher than those of firms that currently use "efficient" combinations of inputs. Hence, one would expect a decline in price differentials to cause less retrenchment in assembly industries than in process industries. The small firms that do persist along the convergence path will have to have relatively high productivity and pay high wages, so wage differentials will be much smaller.

What determines the success of those small firms that do persist in raising their productivity? The principal determinants are:

- management capability;
- access to superior technology;
- the flexibility to devise and take up new strategic positions; and
- access to finance.

Connections with large firms as subcontractors have enabled small firms in many countries to upgrade. Large parent companies often finance and give technical assistance to their subcontractors (as in, for example, Japan). Operating in "clusters" has also been important for the "force draft" upgrading of small producers (as in Italy and Taiwan). Clusters help to spread technology and market information faster and help to balance cooperation and competition among firms. All of these elements enable small enterprises to upgrade their technological skills.

5. Diversity Along the Convergence Path

There are exceptions to the convergence pattern of adjustment. In some countries (such as Japan, Italy, and Taiwan), the inter-scale differentials have narrowed, but the inter-scale pattern of employment has not. Adjustment lags in rapidly growing countries partially account for this discrepancy. Nevertheless, the narrowing of inter-scale wage and productivity differentials in these countries indicates that they are not just suffering from a prolonged form of industrial backwardness.

The convergence thesis assumes the existence of limited tradeoffs in technology space and perfect competition. However, if technological tradeoffs do exist and imperfect competition prevails, strategy becomes important for firms because many industries will provide alternatives for smaller producers to take up strategic positions that can offset the competitive advantages of mass producers. In this case, differences in strategic outlook may explain the structural anomalies of the different countries. Four interacting factors in each of the divergent countries mentioned above had a major influence on the evolution of enterprise strategy and organizational structure:

- trade orientation (all the countries were outward-oriented);
- factor market distortions (all were subject to major distortions);
- prevailing supporting institutions and contracting modes; and
- state intervention.

6. <u>What About Small Firm Policy?</u>

First, any policies to promote small firms should be directed toward promoting efficient structural change, i.e. the policies must be "performance-based" so that "winners" get the benefits. Second, subsidies to small firms may cause a "growth trap" in that small firms may not want to "grow up" and lose the benefits. Also, promoting minor firms with relatively low technology can reduce overall welfare. Third, countries without many mid-sized firms may need policies to help restructure the size distribution and promote competition.

Lastly, policy-imposed and other factor- and product-market distortions frequently protect small firms. Often, because of these distortions, countries have "too many" small firms, not "too little". Removing these distortions will help to shift labor and capital to more productive uses, but it will also cause the decline of many small firms. In countries where government policy, trade orientation, factor markets, and supporting institutions are such that small firms follow "flexible specialization" systems of production, the inter-scale structure of employment may diverge from the convergence path as happened in Japan and Italy. Yet, without the all-important institutional support, this divergence will not occur.

7. Effects of Regulation on the Size Distribution of Firms

Regulations can influence the size distribution of firms (a) if compliance costs change the optimal plant size, (b) if compliance costs change the range of optimum plant sizes or, (c) if regulations influence the speed or direction of structural adjustment at the firm level or raise costs of adjustment, thereby affecting the degree of existing inter-scale disequilibrium.

8. Increase in Optimal Firm Size

As we noted earlier, if production technology is such that long-run average cost curves are flat over a range of output, small and large firms can coexist (in equilibrium) in an industry. In this case, any regulations that have economies of scale in compliance will create cost disadvantages for small firms. Mandated cost increases will then raise the market share of large plants because competition will force small firms with higher costs to exit the market or to expand. Regulation can thus raise the average size of firms.

But even if there are no economies of scale in compliance, regulation can disadvantage small enterprises more than larger firms if the elasticity of the small firms' supply is less than the elasticity of the large firms' supply. Suppose compliance with regulation raises the marginal cost of small and large firms and shifts the supply curve of each

group to the left. The effect on the combined market share of small plants depends on (a) the percentage shift in the supply curve (at a given price) for each group and (b) the elasticity of supply of each group. Consider what can happen. Suppose regulations cause the supply curves of each group to shift to the left by the same percentage; the reduced supply at the original equilibrium price causes the equilibrium price to rise. The combined market share of small firms will decline if the elasticity of supply of small firms is less than the elasticity of supply of large firms. Also, the per unit and marginal cost rise by the same absolute amount for both large firms and small, but the supply curve of small firms will usually decrease by a larger percentage amount because small firms as a group often supply less than 50 percent of output.

Regulation could benefit large firms even more if those firms were politically important and obtained exemptions or were subject to less stringent enforcement. If large firms are treated less harshly, regulation will increase their market share as small firms leave the industry or shrink in size. In developing countries with extensive disequilibrium, the more likely outcome would be exit (or barriers to entry) of competitive firms in the middle of the size distribution. Very small firms at the bottom end of the size distribution would be unaffected (because they are largely invisible to regulators). Regulation is one of the causes of the "missing

middle" --the paucity of mid-sized firms in many developing countries.

Regulations may change not only the size distribution of firms but also the distribution of factor shares between labor and capital. First, features of regulations that promote a particular technology or constrain its adoption can favor more (or less) capital-intensive methods of production. Second, policies that delay entry or that raise the cost for new or enlarged plants can increase the rents of existing plants. Third, mandated compliance costs can cause short-run losses.

4. Methodology for Measuring the Effects of Regulation on Firm Size

As a first approximation of the potential effects of regulation on firm size, differences in compliance costs across industries (the output mix or inter-industry effects) and across plants or firms within industries (intra-industry effects) must be estimated. Such time-series estimates of mean per-unit inter-industry and intra-industry compliance costs, together with data on changes in the size distribution of firms in each industry, would allow us to make statistical inferences about industry-wide trends in size structure and regulation. As in the other cases where we are trying to measure the effects of regulation, we require data spanning the pre-regulation and post-regulation period. If there is a pervasive industry-wide trend toward large or small plants, we would detect this trend from changes in the size of both the

control group and of the high-cost groups of firms and industries. We would notice effects of regulation by observing larger changes during the regulatory period in the "high-cost" groups of industries and firms than in the "low-cost" group and during the regulatory period compared with the pre-regulatory period. The difficulty involves getting accurate measures of compliance costs. We have already discussed the problems of obtaining such measures in the beginning of this paper.

III. STUDY DESIGN AND DATA REQUIREMENTS

1. Data Requirements

As noted earlier, studies of the impact of regulation require an analysis in both partial and general equilibrium. Since we do not have adequate time-series data for an African country where deregulation has occurred, a study of the regulatory environment will have to collect cross-sectional information. Hence the analysis will have to deal with the dynamic variables by the following methods:

(a) Available census data and interviews with knowledgeable industry analysts and businessmen can form the basis of historical "maps" of the development of industries.

(b) Cross-country data should come from countries and industries at different levels of development to facilitate the use of the data in a dynamic analysis.

Using such techniques, one will be able to construct a crude picture of the evolution of an industry's structure and performance and perhaps highlight the major affects of changes in regulatory policy.

2. Industry Selection

To make relevant comparisons, the study should assess regulatory policies by holding the industries constant across

all countries examined. The selection of industries should be based on the following criteria:

(a) Industries where the potential for comparative advantage exists. This requires a focus on early-stage industries (see Chenery and Syrquin "Patterns of Development");

(b) Industries where "progressive" small and medium firms can enter and participate successfully, i.e. fragmented industries where economies of scale are not so important;

(c) Industries where the technology allows expansion incrementally to larger size.

These criteria point to industries like:

(i) textiles and garments;
(ii) leather products and shoes;
(iii) metal working and parts and components of machinery;
(iv) food processing;
(v) furniture;
(vi) construction materials.

3. Country Selection

A study of the dynamic influence of regulations within a general equilibrium should look at a country that had gone through a significant deregulation, but Africa seems to present few, if any, such cases. Hence, the study should select candidates for country studies according to the following criteria:

(a) countries with significantly different levels of development;

(b) countries with differences in regulatory policies;

(c) countries with differences in macro- and trade-policy regimes; and

(d) countries with stabilization and structural adjustment programs underway or completed.

Research should investigate the incidence of regulation within an industry, holding constant the levels of development and other intervening economic policies. Later research can examine the incidence of regulation within an industry at different levels of development.

Appendix A

How does regulation affect an entrepreneur's decision to start-up, manage, or expand a manufacturing firm?

Before a manager decides to enter (or expand within) the manufacturing sector, he conducts a risk/return analysis on the manufacturing sector and other options. In assessing the options, he considers both the external factors and the internal attributes that will make the new organization successful.

The external considerations include the customers, the competitors, the characteristics of the industry, and the environment. The internal attributes include the distinct characteristics that give the company its competitive advantage, including: costs, brand reputation, product quality, distribution network, promotional effectiveness, and response time. As part of the risk/return analysis, the business owner assesses the impact of the regulatory environment on each of the external factors and internal attributes.

The manager could be the employee of a government or multinational corporation, or an entrepreneur. The following discussion on the effect of regulation will focus on the decision making process of the entrepreneur in West Africa.

Many of the entrepreneurs in the manufacturing sector in West Africa were formerly traders who switched to the manufacturing sector in response to changes in the operating environment. An example of such a response is an entrepreneur who previously imported spare parts, now manufacturing the parts locally because devaluation made domestic production cheaper. However, other factors besides policy changes can influence an entrepreneur's decision to begin manufacturing. Possible reasons for opening a manufacturing operation include: an entrepreneurs need to increase his income base, or his desire to have more tangible assets that will make him more visible in the community. In addition, entrepreneurs who previously were traders usually have accumulated wealth that provides security if the manufacturing venture fails.

Other business owners are former employees of companies in the manufacturing sector. These entrepreneurs tend to enter the same industry that they were employed in or a related or supporting industry, thereby benefiting form their accumulated know-how and/or capital.

Our hypothesis is that regulation can influence the decision to enter or expand within the manufacturing sector because it affects both the attractiveness of the industry and the competitiveness of the players.

The effect of regulation on industry attractiveness and competitive position:

Let us go back to our example of the imported spare parts trader, but assume that this time the entrepreneur wants to expand his income base. His alternatives are to expand his product offering, expand the volume of his current product line, or consider a new activity. Possible new activities range from risk averse options such as investing in treasury bills to options for which returns are not guaranteed, such as manufacturing. The regulations that affect his decision can be grouped into: investment and ownership, specific sub-sector regulations, trade, income, monetary, and fiscal regulations.

a) **Investment and ownership regulations.** Regulations in this category include ownership requirements, private property rights, technology transfer laws, capital flow regulations, and incentives. This category influences his decision to start the new venture, since it affects all the functional areas of the business including finance, production, marketing and organization. For example, regulations relating to ownership requirements such as indigenization laws would affect the nature and amount of foreign involvement. Similarly, restrictions on the type of technology, such as specifications that favor labor-intensive technologies, could affect production configuration, including the sophistication and vintage of his technology.

His choice of foreign partners will be limited to those that offer technology that complies with the current

regulation. Established foreign relationship that do not conform to this regulation may have to be discontinued.

For new manufacturers, regulation pertaining to private property becomes more significant because the level of tangible assets will rise with the switch from trading to manufacturing. Additionally, trading assets are more liquid than assets associated with manufacturing.

b) **Specific sub-sector regulations** are regulations that are unique to a particular sub-sector and thus can influence a manager's decision to enter, remain in, or exit a particular sub-sector. Examples are government subsidies, local content and capacity level requirements. A requirement that companies source a fixed percentage of their inputs locally affects input costs, product quality, and procurement activities. Additionally, regulations may cause business owners to invest in manufacturing inputs in order to control quality and ensure availability. This will have financial and organizational implications.

c) **Trade regulations** include foreign exchange rates and regulations, import and export controls. If the entrepreneur is planning to operate on a sizable scale, trade regulations will affect his business. The business may need to use imported inputs, including capital equipment and raw materials, or the business may export products. Foreign

exchange regulations and import licensing could affect the cost and possible sources of inputs.

d) **Income regulations** include wage and price regulations. Minimum wage laws, regulation of the timing of employee termination, and levels of severance payments may make the entrepreneur use a more capital-intensive production technology. Price controls shift competition from price to other attributes of a product: service, quality, brand reputation and delivery schedule. Additionally, price regulations may allow inefficient producers to remain in the industry.

e) **Monetary regulations** include money supply, interest rates, and credit. Access to credit can be a competitive weapon in an environment where government regulates interest rates. Some entrepreneurs can get bank credit at low rates relative to the cost of unregulated non-bank credit.

f) **Fiscal regulations** include taxation, public expenditures, and borrowing. Taxation influences an entrepreneur in many ways including the decision to either remain in the informal sector or expand into the formal sector. In the informal sector, the business owner can evade taxes because his operations are less visible.

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