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THE DETERMINANTS OF MANUFACTURING PROTECTION IN TAIWAN

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I. INTRODUCTION

SINCE the early 1980s an alternative view has emerged to challenge what is known as the neoclassical (market forces) interpretation of East Asian industrialization. The "structuralist" model of East Asian development, most notably associated with Amsden (1989) and Wade (1990) in the context of Korean and Taiwan industrialization, has sought to explain their economic success as depending on the active involvement of government. Under this view, states in East Asia anticipated shifts in comparative advantage and intervened aggressively to develop new export industries (Wade 1990). By acting as the central agent, the government's role in selectively intervening to promote industries is interpreted as having successfully overcome market failures caused by imperfect knowledge and capital market imperfection by being directly involved in investment decisions, through allocating credit as well as through establishing public enterprises in a deliberate effort to adapt technology.

Neoclassicists, on the other hand, stressed that East Asian economies had by and large "got their prices right" and had not greatly inhibited market signals driving resource allocation. While interventionist at various stages, these economies ensured their trade regimes were more neutral between import-substitution and export activities than most economies. Government interventions are not the sine qua non. Instead, great importance is attached to the ongoing process of trade liberalization and strengthening of the market mechanism in maintaining the growth momentum. Reservations within neoclassical economics about the ability of governments to successfully identify industries that may become internationally competitive in the future derive their legitimacy from a well-developed theory of government failure. Interventionist states are subject to government failure because sector-specific interventions create "rents." Societal groups in turn divert scarce resources in order to capture these rents. "The normative implication of this line of theorizing is that the incidence of rent-seeking can be reduced if the state reduces

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its interventionist stance and exposes domestic industries to international competition" (Islam 1992, p. 70).

This article focuses on the period of the 1980s when government strategies in Taiwan began to focus on the development of technology-intensive industries in order to upgrade the industrial structure. The Taiwan government's adoption of a "strategic industrial policy" in 1982, in providing preferential incentives to high-technology sectors, provides an ideal case in which to test the propositions put forth by the competing models. This is because the competing hypotheses presented by the models are readily transferable into testable propositions about the structure of incentives and their relationship to economic performance. But while different in their conclusions, the competing hypotheses are similar in one important respect—the incentives received by an industry are seen as a function of that industry's structural characteristics.

In testing the validity of these contrasting propositions, I employ cross-sectional regression analysis to determine the relationship between government industrial incentives and industry structural characteristics as represented by various proxy variables. These are used to determine which (or if either) of the competing interpretations and the associated hypotheses are causally significant. Were incentives designed primarily to redistribute income, as indicated by past studies of this nature, or were they part of a forward-looking, strategic, national-welfare-maximizing industrial policy? Have incentives been designed for strategic industries with a perceived potential and future comparative advantage?

The article is structured as follows. Section II briefly discusses the competing models of protection. It also discusses trade and industry policy reform in Taiwan in the 1980s. Section III discusses the hypotheses raised by the competing models concerning the role of interventions in Taiwan's industrialization. Section IV uses multivariate regression analysis to determine the relationship between industrial policy incentives and industry comparative advantage. Section V presents conclusions.

II. THE ROLE OF INTEREST GROUPS IN POLICY MAKING

In surveying the political economy of tariff protection literature, Baldwin (1984) notes that several distinct (though not necessarily incompatible) models or hypotheses of political behavior can be discerned from within this literature. All receive some empirical support, although there is no general agreement on just which model best explains the structure of protection within industrial democracies.

A. *Interest-Group Model*

As the most commonly employed model in quantitative studies, the interest-group model assumes that in a democratic economy, the political system is com-

petitive to the extent that various different interest groups work in the mechanism and then reach an equilibrium state in much the same way as the forces of demand and supply work in the market. In this scenario, political decisions depend on the preferences of voters and interest groups, with the state having little independent influence. This view is exemplified in Olson (1965) and Brock and Magee (1978). Empirical studies confirm the public choice theory of political groups, which suggests that large numbers in a beneficiary group will reduce the group's capacity for collective action, due to the incentive for each actor to "free ride" on the efforts of others (Olson 1965). Such coalitions of self-interested persons are likely to attempt to redistribute income towards themselves instead of working to raise efficiency and national income. "Efficient resource allocation will be inhibited and, by extension, there will be no incentives for Schumpeterian entrepreneurs to seek out technical innovations that might speed overall growth" (Shapiro and Taylor 1990, p. 864). On the supply side, politicians are prone to grant protection to industries where the expected returns are larger, such that they are likely to be concerned with the voting strength of an industry.

Since the early 1970s, a large number of studies have sought to analyze in quantitative terms the relationship between the level of protection (or a change in the level) afforded different industries and various political and economic characteristics of sectors or groups that appear to influence the level of protection. Evidence presented by quantitative studies centered around these various models offers consistent support for the proposition that in industrial economies protection tends to be directed towards industries at a low and decreasing international comparative advantage. It has little to do with the promotion of industries which are expected to become internationally competitive in the future.

"The interest-group model, while originally developed around a pluralist-democratic framework is not confined to Western-type democratic systems. Tullock (1986, 1987) found that under authoritarian rule small and exclusive interest groups become even more effective than under a democratic system because authoritarian rulers are much more dependent on these small groups. Moreover, Olson (1982) assesses that the uneven income distribution in many developing countries can be attributed to the dominance of small but powerful groups, while large groups are less successful in exerting pressures on politicians. Since protection benefits small groups of producers against large groups of consumers, the interest-group model should be of special relevance for the explanation of protection in developing countries" (Amelung 1989, p. 518).

B. *National-Interest Model*

In direct contrast to the interest-group model, the national-interest model claims that the state has its own preference function for handling economic policy. The implicit assumption is that the state has its own logic or rationality in pursuing a

particular development objective. This "national interest" may cover broad areas such as national security, price stability, rapid economic growth, equity, and the nurturing of infant industries. The two models thus represent two contrasting styles of policy making. In the interest-group model, the government responds to the demands of pressure groups, with the sensitivity of response in line with the groups political leverage. In the national-interest model, the government "behave(s) according to certain 'principles' which it applies irrespective of the amount of pressure" (Lavergne 1983, p. 3) and fits well with that of an authoritative regime or the "bureaucratic authoritarian" model by Findlay and Wellisz (1982). Moreover, the notion of social welfare is defined as being identical to national income. Hence incentives nurture infant/strategic industries that will sometime in the future gain an international comparative advantage.

According to the structuralist literature, East Asian industrialization has resulted from "state deployment of a range of industrial promotion policies, including ones to intensify the growth of selected industries" (Wade 1990, p. 370). In turn, sector-specific interventions are supported by a certain kind of organization of the state and the private sector. In particular, the corporatist and authoritarian political arrangements of East Asia are said to have provided the basis for market guidance. Haggard (1990) stresses that the reason why the newly industrializing economies (NIEs) have not in the past fallen prey to rent-seeking proclivities of societal groups can be related to the particular institutional arrangements employed to insulate the state from such groups. At the same time, well-trained bureaucrats and political leaders are motivated by an ideology of rapid growth. "Consequently, it makes no sense in these countries ... to see public policy as the vector of particular interests bearing on the state, or to see government agencies as the fiefdoms of particular private interests" (Wade 1988, pp. 158–59).

While the structuralist literature asserts that the object of industry policy has been quite different in each development phase, in general, the object has been to change comparative advantage in anticipation of changing market conditions. In the 1980s, Taiwan's government is considered to have continued their role as facilitator of industrial growth in response to the pressures of technological upgrading. Implicit then is a rejection of the notion that government became less dirigiste as industrialization proceeded, at least at this stage of development. Under this view, an emphasis on trade considerations is secondary to technological ones in searching for an understanding of industrialization that is relevant to policy making. "When technological change rather than trade is emphasized as the centerpiece of industrialization, an economic rationale for selective industrial promotion follows from two propositions." (Wade 1988, pp. 152–53). Firstly, because "comparative advantage is not simply the result of given endowments ... but also ... rests on accumulated capital and skills ... which can be enhanced by a long-term national strategy." Secondly, "some sectors and products are more important to the econo-

my's future growth prospects than others" (Wade 1988, p. 153), especially those characterized as being technology-intensive, high wage, high value added, intensive in research and development, and having strong links to other industries. Industry policy interventions are thought to have been motivated by the belief that shifting the industrial structure towards increasingly sophisticated sectors would increase the opportunities for capturing dynamic scale economies that result from learning. The presence of externalities or "spillover" effects is thought to have provided the grounds for industry-specific interventions so that the incentive structure was correcting for such market failures. This literature suggests that there is likely to exist a systematic relationship between state structure and economic performance, and predicts a positive relationship between government industry policy incentives and industry structural characteristics thought to be associated with comparative advantage.

C. *Literature Survey*

The quantitative approach to analysis of industry-government interaction has been most frequently applied to the area of tariff policy making in developed countries. Despite the increased focus on East Asia by policy analysts during the 1980s, there have been few studies undertaken to examine the causal significance of government incentives and the performance of industries.[1]

In the case of Taiwan, Chang (1987) tests for the determinants of the rates of tariff protection for the years 1981 and 1985 and for nontariff barriers for the years 1966, 1972, and 1984. The two models used are the interest-group model (developed around an Olsonian view), and the national-policy model (based on the notion of the state as an autonomous decision-maker formulating policies in line with national-interest criteria). Chang finds that the national-policy model fares well statistically in explaining the determinants of protection, with the interest-group model exhibiting a low degree of statistical significance in explaining the level of nominal tariff rates. Neither model however is found to provide an adequate interpretation to explain the rate of tariff reduction during the early to mid-1980s. The structure of nontariff barriers is found to be explained by both the interest-group model and national-policy model, although the coefficients of determination in the former are stronger than in the latter. His overall conclusion is that the state in Taiwan formulated industry policy independently and did not play an intermediary role with regard to interest groups.

A similar study by Chen and Hou (1991) for the years 1981 and 1986 indicated that tariff and nontariff protection was not being directed towards "strategic" industries. Rather, strategic industries were likely to be low-tariff industries. Public

[1] See Findlay and Garnaut (1986) for ASEAN. For subsequent research see Basri and Hill (1996) on Indonesia and Thamavit (1994) on Thailand. For research on Northeast Asia see Miller (1987) on Japan and Yoo (1991) on the Republic of Korea.

enterprises were found to be a powerful interest group in lobbying for protection whereby they often benefited from being sole importers of goods which were directly substitutable for their own products or could be used to produce substitutes. The national-interest model is found to provide a better explanation of the structure of protection, especially with respect to tariffs, and again support can be found for the view that the Taiwan government has acted autonomously in the formulation of industry policy. Intermediate goods and capital equipment are found to be consistently favored imports, while labor was found not to benefit either from tariff or nontariff barrier protection.

Taiwan's economic history shows an authoritarian state which independently formulated industry policy, enabling it to implement policy with little resistance from domestic interest groups. Because the political environment for democracy was not yet mature, it seemed that an "autonomous" government would have relatively strong powers of policy formulation, given also that interest groups were not well organized (Amsden 1979). Towards the end of the 1980s this may have been changing given the movement to democracy, the labor reforms which were taking place, and the pressures facing declining industries over the period, such that domestic interest groups could have increasingly been able in some instances to influence the formulation of industry policy. Also in an apparently autonomous state like Taiwan, pressure groups may find ways and means to influence political decisions.

D. *Taiwan Industry Policy in the 1980s*

Despite rapid export expansion in the 1960s and 1970s, by the early 1980s the Taiwan economy was facing a number of structural pressures. Persistent trade surpluses were placing heavy upward pressure on the exchange value of the New Taiwan dollar (N.T.$) and intensifying trade friction with the United States. In addition, developing countries in Southeast Asia and mainland China began to move into producing light industrial products, placing pressure on Taiwan to upgrade its export composition. This in turn required Taiwan's export industries to increase competitiveness without the burden of protection and subsidies to inefficient industries. By the early 1980s the industrial sector was also subject to a number of domestic pressures. A labor shortage had become gradually apparent in the manufacturing sector since the late 1970s, and more so after the mid-1980s, resulting in firms relocating industrial activities offshore to mainland China and Southeast Asia. Labor costs rose as a result of this labor shortage following the introduction in 1984 of the Labor Standards Law which were designed to improve working conditions (Smith 1997).

In recognizing that structural adjustment of the economy required a more liberal environment, the government in 1984 announced its intention to promote a strategy of economic liberalization and internationalization of the economy. A trade

surplus reduction program was announced that included the relaxation of foreign exchange and interest rate controls, the lifting of foreign investment restrictions, tariff reductions, and relaxation of nontariff barriers.[2] In particular, the pace of trade liberalization accelerated after 1985 with the nominal tariff rate falling from 26.5 per cent in 1985 to 8.6 per cent by 1995. The percentage of permitted import items, or the import liberalization ratio, rose from 57.1 per cent in 1970 to 97.0 per cent by the late 1980s. In undertaking industrial restructuring, the government also announced in 1979 the adoption of a Science and Technology Development Program. The program, which was later integrated into the Eighth Four-Year Economic Development Plan (1982–85), sought to raise R&D expenditure and focus attention on private-sector technology development through the creation of several state-sponsored institutions. In particular, the government also established the Hsinchu Science and Industry Park in 1980 to attract high-technology industries with high-R&D content to capture spillovers from the presence of foreign firms in terms of training, technology transfer, and direct cooperation with local firms. Technology-intensive industries gradually replaced the role of traditional industries within Taiwan's export structure. Between 1982 and 1994, the share of technology-intensive exports in total merchandise exports increased from 25 per cent to 42 per cent, with the trend accelerating after 1986 (Smith 1997).

But while continuing to pursue ongoing trade liberalization through the reduction in tariffs and nontariff barriers, the government simultaneously adopted a sectoral industry policy of identifying and promoting "strategic" industries designed to shift the economy away from a reliance on labor-intensive industries towards the development of technology-intensive industries. Selection of strategic industries was based on the following six criteria, as identified by the government effects (ROC, CEPD, 1981): high technology intensity, high market potential, high rate of value added, low energy intensity, low pollution, and large linkage effects. The selected products were drawn from the machinery, information, and electronics industries in the original promulgation. The list was revised four times during the 1980s to also include the biotechnology and material technology industry.

Under the policy, "strategic" industries were eligible for preferential finance with the interest rate differential of 1.75–2.75 per cent between strategic loans and the prime rate. "Strategic" industries (as well as all other industries) were also eligible for the incentives contained under the Statute for the Encouragement of Investment (SEI). Under the statute, enterprises conforming to certain categories of and criteria for encouragement were eligible for preferential tax rates, tax holidays, accelerated depreciation on machinery and equipment and tax credits.

Estimates of nominal protection, effective protection, and effective rates of sub-

[2] Exporters were also eligible for duty reductions, duty exemptions, and duties payable in installments, although these rebates were wound back gradually during the 1980s in line with the overall rationalization of trade policy.

sidy along with the methodology employed in their estimation, have been prepared by Smith (1996) for the years 1981 and 1989 and are provided in Appendix Table I and Appendix A. Incentives that have been quantified are defined as to include those that bear directly upon imports and exports in the form of tariff and tariff-type measures and explicit subsidies in the form of credit and tax preferences. The results show that considerable rationalization of the tariff structure took place over the 1980s, as indicated by the reduction in the nominal rate of protection from an average of around 35 per cent in 1981 to around 10 per cent by 1989. The effective rate of protection (*ERP*) was uniformly high in the early 1980s, averaging over 100 per cent. While the average effective rate of protection was substantially reduced by 1989 to 60 per cent, the protection afforded to value added was considerably more variable and lacking in economic rationale.

Estimates of the effective rate of subsidy (*ERS*) to industry during the 1980s show subsidies to the manufacturing sector to be, on the whole, quite small and uniform in impact. While the subsidy amounts were small, the major recipients appeared to be those industries with declining comparative advantage (such as the textile and textile-processing industries). Industries exhibiting higher effective rates of protection and subsidy by 1989 were typically heavy and chemical industries (fertilizers, industrial chemicals, petroleum-refining products, etc.) characterized by a high degree of state ownership.[3] On the whole, those industries regarded as strategic (high-technology) industries exhibited low nominal and effective rates of protection and effective rates of subsidy. This was particularly the case by 1989 where the machinery, information, and electronics industries exhibited low rates of incentives relative to other industries.

III. IDENTIFYING PROXY VARIABLES

Past quantitative studies on the determinants of protection have drawn upon the following features: characteristics of the production process, the composition of the productive factors, the market, and the industrial organization and structure. In this study, the proxy variables used to reflect these characteristics are those that have been employed in past studies, and those thought to reflect various "strategic" industry considerations.

In this study the two competing models are defined in the sense of the interest-group model and national-interest model. This is possible because the two models place opposing emphasis on the importance of government industry policy interventions. If the incentive structure is in fact found to be associated with industries characterized by an emerging comparative advantage, then this would suggest that

[3] Note that from the modified *ERP* measure outlined in Appendix A, negative *ERP* and *ERS* indicate an industry which may be so highly assisted that it would not exist under free trade conditions.

the government had an economic rationale in designing the incentive structure. If, on the other hand, the incentive structure was biased towards industries with a declining comparative advantage, this would appear to suggest that the industrial structure was unrelated to objectives of promoting growth.

However, before proceeding it is important to highlight the limitations of studies of this nature. Most studies seeking to explain interindustry variation in incentives still have a sizable unexplained residuals. This is because the narrowly self-interested motivational assumptions of the political economy of protection literature are too simplistic to explain much government behavior, with an observed pattern of trade restraints being compatible with any number of hypotheses concerning the nature of the political process. Baldwin (1984) has also highlighted two additional concerns with quantitative studies of this nature, namely, the neglect in the majority of past studies of forms of industry protection other than tariffs. If subsidies or quotas, for example, are substitutes for tariffs, regression results based only on tariffs can be misleading. Problems of interpreting the results from the regression analysis also arise because of the high degree of correlation among some of the independent variables. Moreover, there is a problem of a two-way causal relationship between some of the variables employed.

As previously mentioned, estimates of nominal rates of protection (*NRP*) for sixty manufacturing sectors and effective rates of protection (*ERP*) and effective rates of subsidy (*ERS*) for fifty-nine manufacturing sectors for both 1981 and 1989, and their (proportionate) rates of change over time, are applied to proxies representing industry structural characteristics in an attempt to identify the determinants of the incentive structure to manufacturing in Taiwan during the 1980s. The sources of the data used to estimate the proxy variables are given in Appendix B. This study is thus unique in its attempt to extend beyond the political economy of tariffs to incorporate financial and fiscal subsidies. The following industry structural characteristics used as explanatory (independent) variables are those that have been important in past studies of this nature and/or have been prominent within the context of the debate relating to the national-interest model.

A. *Value Added*

One major difference presented by the competing models concerns the relationship between industry performance and value added. Proponents of the national-interest model contend that governments have systematically sought to create an industrial structure by providing incentives to industries characterized by a high ratio of value added to total output. Past quantitative studies centered on the interest-group model contend the opposite relationship, whereby governments tend to supply protection to low-value-added industries.

A number of rationales for protecting industries with a low value added as a share of output (*VASO*) have been put forward. They range from a pure private interest

demand for protection, through to protection supplied for purely altruistic purposes (Miller 1987). "Anderson and Baldwin (1981) have hypothesized that, other things being equal, a lower *VASO* implies than a given tariff (a given change in the price an industry is able to charge for its output) will have a relatively larger impact on effective protection (that is, have a relatively larger tendency to promote an industry's value-adding activities) than it will in an industry with a higher *VASO*. As the industry *VASO* decreases, the relative benefit of a given tariff increases, and the relative cost of a given decrease in tariff protection increases. Hence, low-value-added industries have relatively greater incentive to lobby for protection than do higher-value-added industries" (Miller 1987, p. 141). This implies that interest in tariff protection will be high, and that lobbying will be relatively intense in low-value-added industries so that both nominal and effective tariffs should therefore be higher. While *VASO* is one of the most commonly tested, and often most statistically significant, variables employed in quantitative models of tariff policy, Lavergne (1983) notes that care is needed in interpreting such results, given *VASO* may simply be reflecting the tariff escalation phenomenon and the net effect of protecting inputs and outputs at different rates.

According to the national-interest model, as protection represented an attempt to shift resources towards high-value-added industries away from low-value-added industries, low-value-added industries would tend to suffer larger reductions in levels of protection than would high-value-added industries. A positive correlation between proportionate changes in incentives and *VASO* would thus be predicted on the basis that the largest reductions in incentives are associated with the industries adding the least value to the value of inputs, thereby encouraging the flow of resources into higher-value industries. The interest-group model draws the opposite conclusion on the basis that low-*VASO* industries facing potential reductions in protection generate political pressure for exemption, and thus predict a negative correlation between proportionate changes in protection and *VASO* on the basis that the smallest tariff reductions are associated with industries adding least value, thereby continuing to encourage these industries at the expense of high-value-added industries.

B. *Productivity*

The relationship across industries between incentives to industry and productivity is another of the major points of contrast between the two opposing views of the role of government in Taiwan's industrialization. According to the national-interest model, consistent with the infant industry argument for protection, the Taiwan government systematically protected import-competing industries in which productivity was anticipated to grow relatively rapidly. In contrast, the interest-group model predicts protection is typically directed to those industries in which productivity is low and increasing relatively slowly. In order to test this relation-

ship, a widely accepted measure of industry productivity, value of output per worker (*VOPW*) is employed. In addition, the relationship between the rate of change of *VOPW* and protection is also tested. This is useful in establishing whether productivity grew the slowest/fastest in those industries receiving the highest levels of protection.

A further proxy variable often employed to complement *VOPW* is the relationship across industries between protection received and value added per worker (*VAPW*). Again, both models make opposite predictions about the relationship between these variables. The national-interest model predicts that incentives are directed to highly skilled, technology-intensive industries in which comparative advantage is emerging. The interest-group model posits that incentives will be directed to industries characterized by low *VAPW*. Industries with low *VAPW* are likely to be low-wage, labor-intensive, low-technology industries; industries in which Taiwan may have been exhibiting a growing comparative disadvantage.

C. *Labor Intensity*

Many quantitative studies have tested the relationship between tariff protection and labor intensity based on the hypothesis that the demand for protection is positively correlated with labor intensity—as measured by labor's share of value added (*LSVA*) and/or labor's share of output (*LSO*) across industries. Taiwan was becoming increasingly more capital- and technology-intensive during the 1980s as traditional labor-intensive industries were losing comparative advantage. While the influence of labor unions until the mid-1980s can be discounted, this may have changed following the introduction of the Labor Standards Law. The government may also have been concerned about the displacement of labor and/or the restructuring of declining industries. Thus, according to the interest-group model, labor-intensive industries could be recipients of more protection because of the bureaucracy's concern about equity, adjustment costs or because of the collective power of labor unions through the mechanism of the adding machine or interest-group models.

In contrast, the national-interest model argues that government incentives accelerated the flow of resources into more capital- and technology-intensive sectors, and thus posits a negative relationship between incentives and labor intensity across industries. The interest-group model, on the other hand, posits that incentives have largely hindered this structural change by assisting industries with declining comparative advantage, and thus predicts a positive relationship between incentives and labor intensity.

D. *Wages*

This variable is used to determine the extent to which incentives may/may not have been biased towards industries paying high or low wages. Industry wages are

typically thought of as being highly correlated with human capital intensity. Thus the relationship between protection and wages (*WAGES*)[4] may indicate the extent to which policy serves to encourage or discourage the flow of resources into industries employing more highly skilled and educated workers. The national-interest model predicts that resources will be directed to sophisticated industries employing highly paid skilled workers, whereas the interest-group model posits that Taiwan increasingly came to protect industries characterized as lower skilled, employing lower-wage workers. But a positive correlation between wages and protection would be consistent with the national-interest model, but inconclusive, as the tariff protection may be the cause of higher wage rates. A negative correlation would support the interest-group model by demonstrating that assisted industries received lower wage rates, despite their protection.

On the other hand, high-technology industries such as computers and electronic components and accessories are not typically at the top end of the wage scale. A policy of supporting the highest-wage industries would not be fully congruent with a policy of supporting high-technology industries. In the case of Taiwan, those industries receiving the highest average earnings were not those typically characterized as being "strategic." Rather, those sectors with the highest average earnings in Taiwan in both the early and late 1980s (of which many were state-owned enterprises) were chemical fertilizers, petroleum-refining products, industrial chemicals, alcoholic beverages, tobacco, steel, cement, petrochemical raw materials, and sugar.

E. *Industry Health*

The national-interest model contends that the Taiwan government successfully nurtured infant industries to become internationally competitive. This model thus predicts a positive correlation between incentives and proxy variables representative of industry health. On the other hand, the interest-group model contends that government protection is often employed as a device for protecting the incomes of owners of factors of production dependent upon industries losing their international competitiveness, and thus predicts a negative correlation. This is based on past quantitative studies which show a positive relationship between declining industries and the protection they receive. Past proxy variables used include value added as a share of output, labor intensity, various indicators of industry stagnation such as a low rate of growth of output, and increases in import penetration.

The following variables have been employed in order to determine whether incentives were being directed to industries with increasing comparative disad-

[4] Average weekly earnings are defined to include total industry wages and salaries of regular and casual employees plus self-employed and family workers (but excluding wages of processing services of other families) divided by the total number of persons employed in the industry.

vantage: rate of growth of value added (*DVA*); rate of growth of output (*DOUTPUT*); rate of growth in industry employment (*DEMP*); proportionate increase in exports as a share of production (*DEXP*);[5] and the proportionate change in the import penetration ratio (*DIMP*). Two other variables, gross import penetration *IPGRS* (the share of gross imports in total demand) and net import penetration ratio *IPNET* (the share of net imports in total domestic demand), are also included. This latter proxy is employed by Chang (1987) on the basis that within Taiwan's manufacturing sector, a large quantity of products are both imported and exported within the same industry. Typically it is hypothesized that if import penetration has resulted in substantial damage to domestic producers, then the demand for protection comes either from producers or the government. Thus the higher import penetration ratio, the higher the tariff expected. In Taiwan's case though, one would anticipate a negative relationship given Taiwan's dependence on imports of intermediate inputs during the 1980s, in which the higher the import needs of an industry, the lower the tariff rates anticipated on that industry.

F. *Skill and Technology Intensity*

The national-interest model predicts government incentives can promote the exports of high-technology goods by encouraging the flow of resources into technology-intensive industries. This model predicts a positive relationship between government incentives and skill and technology intensity across industries. The interest-group model makes the opposite prediction, based on the view that incentives are directed to industries at a decreasing rather than increasing comparative advantage, characterized by low skill and low technology intensity. To test this proposition the following R&D indicators are employed as proxies of both skill and technology intensity: total R&D manpower as a share of total industry employment (*SC*); total R&D expenditure per industry (*RDE*); and R&D expenditure as a share of total sales (*SALES*).

G. *Economies of Scale*

The final characteristic cited by national-interest model is that industries exhibiting economies of scale have been major recipients of protection as governments have enabled domestic producers to capture the domestic market and reap the benefits associated with large-scale production. Similarly, proponents of the national-

[5] Industries with a comparative advantage will tend to lobby against tariffs on their product for fear of retaliation by their trading partners. Based on this reasoning, it has been suggested that protection will be negatively correlated with exports as a share of production (Anderson and Baldwin 1981). The higher this ratio, the more competitive are the goods in the world market, hence the lesser need for protection. Thus the change in the share of exports in domestic production could serve as a measurement of competitiveness. Moreover, if products within an industry are competitive relative to other countries, then protection afforded to these products becomes largely redundant.

interest model contend that the Taiwan government pursued a policy of reserving the domestic market for industries subject to economies of scale, predominantly state-owned enterprises. Together these models predict a positive correlation across industries between protection and economies of scale.

However, in Taiwan's case a different interpretation is warranted. Small and medium-sized enterprises (SMEs) still comprised a large proportion of Taiwan's domestic production in the 1980s, and in general were not the major recipients of government incentives. While the national-interest model predicts a positive relationship between economies of scale and industrial incentives, we anticipate this relationship may be positive in the case of Taiwan, but not overwhelmingly conclusive, given SMEs are generally acknowledged as the driving force behind Taiwan's industrialization. By 1989, SMEs constituted 98.5 per cent of all firms in the manufacturing sector, accounted for 68 per cent of total employment, with an output share in manufacturing of 48 per cent, and contributed to 47 per cent of total sales.

A comparison of export ratios of SMEs and large enterprises shows that between 1976 and 1988, large enterprises exported 37 per cent of their domestic production, while SMEs exporting 64 per cent of their domestic production over the same period. SMEs' share of exports in the manufacturing sector ranged from 62.5 per cent to 73.5 per cent between 1981 and 1988, while their shares in the trade sector were also significant, ranging from 53 per cent to 63 per cent during the same period (Lee 1992).[6]

The national-interest model argues that "because of an absence of pioneering innovation as a driver of manufacturing activity, late industrialization has tended to be driven to a great degree ... by state-owned enterprises" (Amsden 1992, pp. 48–49). Similarly, Wade (1990) has stressed the contribution of the large (state-assisted) firms to Taiwan's industrial development. Table I shows also that private enterprises have consistently produced the major part of output, increasing their contribution over time.

The definition and scope of what is classified as a SME have been revised several times. Since July 1982, SMEs have been classified as those enterprises with a paid-in capital of less than N.T.$40 million; or having total assets of not more than N.T.$120 million; or employing no more than 300 regular employees.

A number of proxy variables thought to reflect economies of scale have been employed in various studies with varying degrees of success.[7] But as discussed, given the importance of SMEs in Taiwan's industrial performance, what needs to be empirically established is whether these small-scale firms, in dominating the export sector, were not the major recipients of incentives.

[6] Data was obtained from ROC, MSBA (1988, 1989) and Bank of Taiwan (various years).
[7] See for example Hufbauer (1970), Baldwin (1971), Katrak (1973), and Deardorff (1984).

TABLE I

SHARE OF GROSS OUTPUT BY PUBLIC AND PRIVATE ENTERPRISES, TAIWAN

(%)

Year	Private Enterprises	Public Enterprises	General Government	Total
1951	67.1	22.1	10.8	100
1955	71.4	17.7	10.9	100
1960	71.2	18.4	10.4	100
1965	74.1	16.8	9.1	100
1970	76.7	14.7	8.6	100
1975	77.3	15.8	6.9	100
1980	76.8	16.9	6.3	100
1985	78.9	14.3	6.8	100
1989	80.9	11.9	7.2	100

Source: ROC, DGBAS (1990), Table 3, pp. 76–83.

The first proxy employed to reflect industry economies of scale is the number of firms (*NOF*). Following the logic of Olson (1965), small groups are thought more likely to gain trade protection, having lower costs of organization. They have an incentive to refrain from contributing to the cost of lobbying and organization, while they cannot be excluded from the gains of protection-seeking interest group. A smaller group is more likely to discipline these free riders, as they face lower costs of information and coordination. Similarly, Anderson (1980) points out that the free rider problem undermines the incentive for a rational, self-interested individual to contribute to an interest group's seeking of an protection policy which, if adopted, would benefit that individual regardless of whether the individual contributed. Unless a group has some purpose for forming other than to lobby, it is less likely to receive support from potential members as the number of individuals involved grows. Other things being equal, and subject to certain qualifications, it could be expected that the smaller the number of firms, the greater the industry's rate of protection.

The second proxy for economies of scale is the proportion of self-employed and family workers to total workers in each industry (*SELF*). Typically, the interest-group model predicts that those industries with the highest proportion of self-employed and family workers receive the most protection. This is because the more sophisticated, capital-intensive, highly skilled industries generally tend not to have a large proportion of these kinds of workers; employing instead mostly full-time employees. On the other hand, unsophisticated small-scale industries employing simple technology, smaller amounts of capital, and requiring lesser skills will tend to have a larger proportion of these workers.

Taiwan's industrial structure is predominantly composed of small-scale enterprises with a high proportion of self-employed and family workers. Because of the

importance of small-scale enterprises in Taiwan's industrial structure it is hypothesized that this proxy would not be significantly correlated with the incentive structure.

The third proxy for economies of scale is large-scale enterprises (*LSE*) and follows that of Baldwin (1971) in using the number of employees in establishments with 250 or more employees divided by total industry employment. In this study firms have been classified according to those firms employing more than 300 employees in 1981 and 1991. As firms with assets exceeding N.T.$120 million were classified as large enterprises, this proxy variable (*ASSETS*) may also provide an insight into the relationship between the incentives and economies of scale. However, because Taiwan's industrial census does not provide industry data for this amount, a classification based on assets exceeding N.T.$100 million is used instead.

IV. ANALYSIS OF RESULTS

The policy recommendations that emerge from the national-interest model are based on the view that the Taiwan government has promoted industries with emerging comparative advantage, with the government's focus during the 1980s shifting towards the development of high-technology industries. In assessing the competing hypotheses, if the variables thought to indicate comparative disadvantage are found on balance to be significant but with signs opposite to those found in similar studies of this nature, this would indicate that government policy formulation in Taiwan was in fact "different" to that of other industrial democracies. Moreover, if those variables thought to reflect strategic industry considerations are found to be positively significant in relation to the incentive structure, this would also be evidence that Taiwan had provided incentives to strategic winners rather than losers. On the other hand, if the comparative disadvantage variables are found significant and with the same sign as that of previous studies,[8] this would be evidence that government incentives in Taiwan protect declining industries with the aim of redistributing income.

Ordinary least squares regression (OLS) techniques are used in relating a range of dependent variables (incentives) to a series of independent variables reflecting proxies for industry structural characteristics. This is undertaken in order to determine the strength of the relationship and to compare the interaction between the variables. It is important to note that OLS may provide biased, inconsistent estimates if the relationship between some of the explanatory variables and incentives are interdependent. This was in fact the case with many of the proxy variables used

[8] Although it needs to be recognized that both "private interests" and "national interests" may have differing interindustry distributions to those of other countries.

in this study. Therefore, rank correlation coefficients were estimated first in order to determine the strength and direction of the relationship between incentives and individual industry structural characteristics.[9] Those independent variables showing a weak relationship are then excluded from the multivariate analysis.

The following results are based on a linear functional form. Other nonlinear formulations were attempted but these did not improve statistically on the reported results. While not particularly robust, the results as shown in Tables II and III are generally comparable in direction and strength with past studies of this nature in other economies. That is, incentives tended to be directed to industries with a declining comparative advantage, not to industries with emerging comparative advantage. Despite the reduced number of independent variables multicollinearity was still a problem, with all the independent variables associated with comparative (dis)advantage in international trade. To minimize the problem of multicollinearity different equations were estimated with different explanatory variables. As is usually the case with this form of cross-sectional analysis, the predictive power of the preferred regression equations was not high. The adjusted R^2 statistics are low (at best around 40 per cent), and the standard errors are high. Four of the estimated equations were found to exhibit heteroscedasticity. In these cases White's heteroscedastic-consistent covariance matrix estimation has been carried out in order to correct the estimates for unknown forms of heteroscedasticity.

(i) *Nominal rates of protection in 1981* (*NRP*81). The best explanators of nominal protection in 1981 were found to be indicators of comparative disadvantage. Equation (1) in Table II shows that nominal protection in 1981 was positively and significantly influenced by labor's share of value added (*LSVA*) and negatively correlated with average earnings per worker (*WAGES*), and the gross import penetration ratio (*IPGRS*). Equation (2) shows that nominal protection in 1981 was positively correlated with value added as a share of output (*VASO*). Just like in equation (1), nominal tariffs seem to be negatively correlated with *WAGES* and *IPGRS*.

(ii) *Effective rates of protection and effective rates of subsidy in 1981* (*ERP*81 and *ERS*81). Equations (3) and (4) in Table II show that both effective rates of protection and effective rates of subsidy in 1981 were showing a declining trend with a unit increase in economy-of-scale variables as measured by the proportion of self-employed and family workers (*SELF*), the number of firms (*NOF*), and the proportionate change in exports (*DEXP*), and that both are indicating an increasing tendency with large-scale enterprises (*LSE*). Some support is then found that large-scale industries had the highest effective rates of protection and subsidy in 1981. Alternatively, small-scale industries as major exporters were not the major recipients of incentives.

(iii) *Nominal rates of protection in 1989* (*NRP*89). Equation (1) in Table III pro-

[9] These results are available from the author upon request.

TABLE II

DETERMINANTS OF NOMINAL, EFFECTIVE RATES OF PROTECTION, AND EFFECTIVE RATES OF SUBSIDY, TAIWAN: 1981

Independent Variables	Dependent Variables			
	*NRP*81		*ERP*81	*ERS*81
	(1)	(2)	(3)	(4)
*VASO*81		0.662		
		(4.054)***		
*WAGES*81	–0.004	–0.002		
	(–3.918)***	(–2.519)**		
*LSVA*81	0.002			
	(3.377)***			
*IPGRS*81	–0.391	–0.457		
	(–2.870)***	(–4.125)***		
*SELF*81	–0.576		–1.255	–1.218
	(–2.378)**		(–3.542)***	(–3.468)***
*ASSETS*81			–4.432	–4.548
			(–2.106)**	(–2.198)**
*NOF*81			–0.004	–0.004
			(–1.763)*	(–1.743)*
*LSE*81			4.402	4.570
			(1.888)*	(1.979)*
*DEXP*81	–0.208		–0.690	–0.613
	(–1.419)		(–2.201)**	(–2.076)**
Intercept	77.56	45.63	138.30	137.71
Adjusted R^2	0.39	0.38	0.37	0.36
F-statistic	8.61	12.99	7.77	7.57
Chi-square	3.36	6.79[a]	21.09[a]	21.13[a]
No. of observations	60	60	59	59

Notes: 1. *t*-values are shown in parentheses.

2. Heteroscedasticity is measured as $E = f(\hat{y})$ and distributed as a chi-square with 1 degree of freedom.

[a] Rejects the null hypothesis at 5 per cent. In these cases heteroscedasticity has been corrected for using White's heteroscedastic-consistent covariance matrix estimation.

*** Significant at 0.01 level.

** Significant at 0.05 level.

* Significant at 0.10 level.

vides some support to suggest that the best explanators of nominal protection by the late 1980s were indicators of comparative disadvantage. Nominal protection in 1989 was positively influenced by *LSVA* and the proportion of firms with more than 300 employees (*LSE*); and negatively correlated with *IPGRS*, *DEXP*, the rate of growth in industry employment (*DEMP*), *SELF*, and *WAGES*. However, strong statistical support is also found to suggest that nominal rates of protection are posi-

TABLE III

DETERMINANTS OF NOMINAL, EFFECTIVE RATES OF PROTECTION, EFFECTIVE RATES OF SUBSIDY AND PROPORTIONATE CHANGES IN EFFECTIVE RATES OF PROTECTION AND SUBSIDY, TAIWAN: 1989 AND 1981–89

Independent Variables	Dependent Variables										
	*NRP*89	*ERP*89			*ERS*89			*DERP*81–89		*DERS*81–89	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
*LSVA*89	0.031	0.391			0.088						
	(0.374)	(0.153)			(0.034)						
*IPGRS*89	–0.079	–2.013			–2.016						
	(–0.968)	(–1.090)			(–1.043)						
*DEXP*81–89	–0.0031	–0.830			–0.868						
	(–0.048)	(–0.593)			(–0.565)						
*VASO*89	0.409										
	(3.227)***										
*LSE*91	0.093	1.054			0.0728						
	(0.919)	(0.400)			(0.263)						
*DEMP*81–89	–0.026	0.700			0.073						
	(–1.126)	(1.406)			(1.430)						
*SELF*91	–0.003	–0.0005			–1.289						
	(–0.135)	(–0.076)			(–0.261)						
*WAGES*89	–0.003	–0.0002			–0.002						
	(–0.860)	(–0.033)			(–0.247)						
*VAPW*89		0.0007			0.0008						
		(0.837)			(1.007)						
*VOPW*89		–0.0307			–0.036						
		(–4.765)***			(–5.325)***						
*SC*89			–0.236	–0.183		–0.242	–0.188	–0.263	–0.219	–0.267	–0.222
			(–1.844)*	(–1.369)		(–1.870)*	(–1.394)	(–2.442)**	(–1.960)*	(–2.464)***	(–1.980)*
*RDE*89			–22.590			–22.788		–20.768		–20.842	
			(–2.472)**			(–2.465)**		(–2.697)***		(–2.695)***	
*SALES*89				–162.460			–163.630		–164.050		–164.430
				(–1.715)*			(–1.708)*		(–2.073)*		(–2.068)**
Intercept	2.06	128.9	239.42	195.32	178.07	241.55	196.90	142.76	111.63	143.79	112.43
Adjusted R^2	0.19	0.32	0.22	0.10	0.37	0.22	0.10	0.30	0.20	0.30	0.20
F-statistic	2.67	4.02	3.69	2.02	4.76	3.70	2.03	4.10	3.34	5.09	3.41
Chi-squaré	4.03[a]	0.03	2.35	2.45	0.004	2.46	2.58	0.61	0.78	0.64	0.83
No. of observations	60	59	20	20	59	20	20	20	20	20	20

Notes: 1. *t*-values are shown in parentheses.

2. Heteroscedasticity is measured as $E = f(\hat{y})$ and distributed as a chi-square with 1 degree of freedom.

[a] Rejects the null hypothesis at 5 per cent.

*** Significant at 0.01 level. ** Significant at 0.05 level. * Significant at 0.10 level.

tively and significantly influenced by *VASO* indicating that industries with higher *VASO* received the highest share of nominal protection.[10]

(iv) *Effective rates of protection and subsidy in 1989* (*ERP*89 and *ERS*89). Although most of the variables are not statistically significant, there exists some support that the best explanators of effective rates of protection and subsidy in 1989 were indicators associated with low productivity, large-scale intensity, high labor intensity, and low technology intensity. Equations (2) and (5) (Table III) indicate that effective rates of protection and subsidy in 1989 were strongly negatively influenced by the value of output per worker (*VOPW*). Industries characterized by a higher *VOPW* were likely to have received larger reductions in effective rates of subsidy than were industries characterized by low *VOPW*. Effective rates of protection and subsidy in 1989 were also negatively influenced by *IPGRS*, *DEXP*, *SELF*, and *WAGES*; and positively determined by *LSVA* and *LSE*. However, some support is also found that effective protection and subsidy in 1989 was positively influenced by *DEMP* and value added per worker (*VAPW*).

Equations (3)–(7) show that technology intensity as measured by R&D expenditure (*RDE*) and total R&D manpower (*SC*) significantly reduces effective rates of protection given in 1989. Therefore technology-intensive industries were likely to receive the greatest reductions in effective rates of protection, or alternatively, the highest effective rates of protection in 1989 were being directed to industries at a decreasing rather than an increasing comparative advantage, characterized by low skill and technology intensity. Some support was also found for the proposition that those industries characterized by high skill and technology intensity had the lowest effective rate of subsidy in 1989. Equation (6) indicates that effective subsidy rates in 1989 were negatively correlated with technology intensity as measured by *RDE* and *SC*. Equation (7) shows that effective rates of protection in 1989 were negatively (although not significantly) correlated with R&D expenditure as a percentage of total sales (*SALES*) and *SC*.

(v) *Rates of change in effective rates of protection and effective rates of subsidy in 1981–89* (*DERP*81–89 and *DERS*81–89).[11] Equations (8) and (10) indicate that the best explanators of proportionate changes in effective rates of protection and effective rates of subsidy are not those associated with increasing comparative advantage. Technology-intensive industries were thus likely to receive the greatest reductions in both effective rates of protection and effective rates of subsidy over the 1980s. Equations (9) and (11) also show that effective rates of protection and effective rates of subsidy are negatively correlated with *SALES* and *SC*. Thus, those

[10] Although the earlier discussion of the conflicting interpretations that can be applied to this variable needs to be kept in mind.

[11] There was no equation involving proportionate changes in nominal rates of protection that warrants discussion.

industries characterized by high skill and technology intensity had the lowest rates of protection and subsidy in 1989 and over the ten-year period.

The above results would suggest that most of the changes in the incentive structure over this period were not concerned with the promotion of strategic industries. In this sense it is important to distinguish the economic impact due to changes in Taiwan's internal economic environment in the 1980s—such as the policy of economic liberalization including reductions in tariffs and import controls and industrial upgrading through government provision of technological infrastructure—from the impacts caused by the selective fiscal and financial incentives and measures. The former provided the opportunity for the mechanism of comparative advantage to operate and is the crucial factor explaining the industrialization and structural change over this period. The latter, in discriminating between traded goods industries, led to the distortion of resource allocation (Smith 1997).

In fact, the considerable progress in trade liberalization that took place after 1985 suggests that industrial upgrading appeared to be driven largely by economic forces (both internal and external) rather than by industry policy initiatives. The high standard deviations for effective rates of protection and subsidy for the 1980s indicate that the structure of incentives was unrelated to announced industrial objectives. Such high variability cannot be attributed to the result of deliberate decisions, but could reflect the results of actions taken at different times in response to the prevailing situation and pressures exerted by special interest groups.

V. CONCLUSION

This paper employed quantitative techniques to compare the validity of the national-interest model versus an interest-group model interpretation of the role of government industrial policy interventions in Taiwan's industrialization over the 1980s. The results offer little conclusive support for the strong relationships advanced by the national-interest model. While the levels of statistical significance are not uniformly high, and in some cases neither model is significant, on balance it appears that government incentives were not directed to industries with perceived current and future comparative advantage. Instead, incentives tended to be directed towards industries at an increasing comparative disadvantage. These results are, with the exception of some of the productivity variables, similar in direction to previous studies of this nature.

Specifically, it could be said that the results provide some support for the proposition that the incentive structure during the 1980s discriminated in favor of industries which were labor-intensive (*LSO*, *LSVA*) with low value added per worker (*VAPW*), low average earnings (*WAGES*), low levels of skill and technology intensity, low rates of growth (as measured by *DEMP* and *DVA*), and low international competitiveness (as measured by *DEXP* and *DIMP*). The results pertaining to

export share and skill and technology intensity present some of the strongest results in support of the interest-group model. This lack of association between the incentive structure and export growth and indicators of technology intensity indicates that the policy regime was not significant in contributing to sustained industrial and export growth over this period. The relationship between the incentive structure and the economies-of-scale variable is a special one in the case of Taiwan, where it is found the incentive structure discriminated against SMEs which were important contributors to Taiwan's industrialization performance. Some support is found for the new trade/governed market view that incentives favored industries in which productivity was growing rapidly (as measured by *VOPW*), although the evidence is not overwhelmingly conclusive and is subject to conflicting interpretation.

Overall, the fundamental determinant of incentives to Taiwan's manufacturing industry during the 1980s appears not to have been its potential for developing international competitiveness in the future. Instead, as predicted by the interest-group model, the incentive structure appeared to be designed to assist industries at an increasing comparative disadvantage.

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APPENDIX A

METHODOLOGY

The nominal rate of protection (*NRP*) of a particular commodity is defined as

$$NRP_{(i)} = \frac{p_i - p_i^*}{p_i^*},$$

where p_i is the domestic price of commodity i under existing government policy and p_i^* is the free trade price in the absence of government intervention.

The effective rate of protection (*ERP*) is defined as

$$Z_i = \frac{W_i - V_i^*}{V_i^*},$$

where Z_i = effective rate of protection of value added; W_i = value added in domestic prices; and V_i^*= value added in world market prices. As W_i is always positive, the *ERP* in the above equation is negative, when either $V_i^*$is positive and greater than W_i, or when V_i^* is negative. The first case occurs when the protection structure is biased against an industry. In the second case, misleading results will be obtained when an industry which may be so highly assisted that value added at world prices

is negative, indicating little protection when in fact an industry may be so highly assisted that it would not exist under free trade conditions. "To avoid this problem of interpretation, an alternative measure of effective rate of protection (Z') has been used in this study and is defined as the ratio of the difference between domestic and world market value added to domestic value added. This measure reports negative values only in the event of genuine negative protection, having a value greater than one if world market value added is negative" (Balassa 1971, p. 318).

$$Z_i' = \frac{W_i - V_i^*}{W_i},$$

The effective rate of subsidy (*ERS*) is defined as the percentage excess of adjusted domestic value added over world market value added. In the numerator of the equation below, the second term refers to the value of tax preferences (differential rates of corporate income tax) and the third to that of interest preferences (differential interest rates).

$$S_i = \frac{-V_i^* - (T_c^n - T_c)Q_i + (i^n - i)B_i}{W_i} + 1,$$

where V_i^* = value added in world market prices; W_i = value added in domestic prices; T_c = rate of corporate income tax; i = interest rate; i (subscript) = output; Q = gross profit in domestic prices; B = value of borrowed capital in domestic prices; n = weighted average of relevant variable; and S = effective rate of subsidy to value added.

APPENDIX B

DATA SOURCES

Data was obtained from: Directorate-General of Budget, Accounting and Statistics, *The Report on Industrial and Commercial Census, Taiwan-Fukien Area, The Republic of China*, Vol. 3, *Manufacturing*, 1981 and 1991 editions; idem, *Yearbook of Earnings and Productivity Statistics, Taiwan Area, Republic of China, 1989*; and idem, *Input-Output Tables, Taiwan Area, Republic of China*, 1981 and 1989 editions. Data relating to science and technology indicators was obtained from: National Science Council, *Indicators of Science and Technology, Republic of China, 1991* and Ministry of Economic Affairs, *Statistical Yearbook of Patent and Trademark, 1990*. Data relating to science and technology indicators is available on an industry basis for twenty industrial sectors. Thus the limited degrees of freedom need to be taken into account when interpreting these results.

APPENDIX TABLE I

NOMINAL RATE OF PROTECTION, EFFECTIVE RATE OF PROTECTION, AND EFFECTIVE RATE OF SUBSIDY BY INDUSTRY, TAIWAN: 1981 AND 1989

(%)

	Trade Classif.	Industry	1981				Trade Classif.	Industry	1989		
			NRP	*ERP*	*ERS*				*NRP*	*ERP*	*ERS*
1	NIC	Slaughtering & by-products	44	127	128	1	IC	Slaughtering & by-products	30	102	102
2	NIC	Rice milling	0	61	62	2	NIC	Rice milling	5	63	64
3	NIC	Grained-mill products	25	65	66	3	NIC	Grained-mill products	2	120	120
4	X	Sugar	68	200	200	4	NIC	Sugar	35	200	200
5	X	Canned foods	68	134	135	5	X	Canned foods	32	112	113
6	NIC	Edible vegetable oils & by-products	20	55	56	6	NIC	Edible vegetable oils & by-products	7	66	66
7	X	Monosodium glutamate	35	86	86	7	X	Monosodium glutamate	15	376	377
8	XIC	Frozen food	61	126	126	8	XIC	Frozen food	31	127	127
9	XIC	Misc. food products	52	100	100	9	XIC	Misc. food products	27	–18	–19
10	NIC	Animal feeds	20	66	66	10	IC	Animal feeds	5	46	46
11	NIC	Nonalcoholic beverages	54	66	66	11	NIC	Nonalcoholic beverages	16	–37	–38
12	IC	Alcoholic beverages	75	134	135	12	IC	Alcoholic beverages	47	11	12
13	NIC	Tobacco	75	76	76	13	IC	Tobacco	44	93	93
14	X	Cotton & cotton fabrics	35	128	128	14	X	Cotton & cotton fabrics	7	244	244
15	X	Wool & worsted fabrics	38	85	86	15	XIC	Wool & worsted fabrics	6	–26	–30
16	X	Artificial fabrics	45	142	143	16	XIC	Artificial fabrics	6	229	229
17	X	Knitted garments	80	135	135	17	XIC	Knitted garments	12	291	292
18	IC	Other fabrics & fabric products	70	100	101	18	XIC	Other fabrics & fabric products	12	645	637
19	NIC	Dyeing of textiles	11	n.a.	n.a.	19	NIC	Dyeing of textiles	6	n.a.	n.a.
20	XIC	Leather & leather products	56	85	86	20	XIC	Leather & leather products	5	46	47
21	IC	Lumber	18	89	89	21	IC	Lumber	0	33	34
22	X	Plywood	40	118	118	22	XIC	Plywood	19	60	61
23	X	Wood, bamboo & rattan products	37	119	119	23	X	Wood, bamboo & rattan products	8	19	20
24	X	Nonmetallic furniture	99	132	133	24	XIC	Nonmetallic furniture	10	126	126
25	IC	Pulp & paper	39	–220	–220	25	IC	Pulp & paper	5	199	200
26	NIC	Paper products	41	104	105	26	NIC	Paper products	8	78	79
27	NIC	Printing	41	99	99	27	NIC	Printing	21	612	612
28	XIC	Rubber & rubber products	42	107	107	28	XIC	Rubber & rubber products	10	117	117
29	NIC	Petrochemical raw materials	19	55	46	29	NIC	Petrochemical raw materials	3	44	44
30	IC	Other industrial chemicals	19	130	22	30	XIC	Other industrial chemicals	2	–1,119	–1,305
31	IC	Chemical fertilizers	5	61	131	31	IC	Chemical fertilizers	4	–320	–445
32	X	Synthetic fibers	33	62	63	32	X	Synthetic fibers	1	11	11
33	X	Other artificial fibers	35	70	71	33	XIC	Other artificial fibers	1	–125	–147
34	IC	Plastics	26	89	89	34	XIC	Plastics (synthetic resins)	3	34	34

APPENDIX TABLE I (Continued)

(%)

	Trade Classif.	Industry	1981 NRP	1981 ERP	1981 ERS	Trade Classif.	Industry	1989 NRP	1989 ERP	1989 ERS
35	X	Plastic products	53	97	98	35	X	5	51	51
36	IC	Medicines	21	140	141	36	IC	10	–107	–117
37	IC	Misc. chemical manufactures	31	117	117	37	XIC	7	40	40
38	IC	Petroleum-refining products	25	236	236	38	IC	7	218	218
39	NIC	Cement	8	133	133	39	NIC	4	289	290
40	NIC	Cement products	37	44	44	40	NIC	12	–45	–46
41	XIC	Glass & glass products	31	96	97	41	XIC	11	91	91
42	XIC	Misc. nonmetallic mineral products	32	125	126	42	XIC	12	11	11
43	IC	Pig iron & crude steel	8	146	146	43	IC	1	174	175
44	XIC	Primary iron & steel products	16	88	88	44	IC	10	136	137
45	X	Iron & steel products	36	107	107	45	XIC	12	20	20
46	XIC	Aluminum	27	133	133	46	XIC	11	104	105
47	X	Aluminum products	39	109	110	47	X	11	46	46
48	IC	Misc. metals	21	118	118	48	XIC	4	179	180
49	XIC	Misc. metallic products	28	129	130	49	XIC	3	132	132
50	XIC	General industrial machinery	18	116	117	50	XIC	10	85	85
51	XIC	Industrial machinery	11	105	105	51	XIC	7	45	45
52	XIC	Other machinery	14	118	118	52	XIC	6	6	4
53	XIC	Machinery parts, repairs, etc.	14	95	95	53	XIC	6	78	79
54	XIC	Household electrical appliances	29	109	110	54	XIC	9	96	96
55	XIC	Electronic products	27	114	114	55	XIC	7	31	31
56	XIC	Electrical machinery & apparatus	22	104	105	56	XIC	8	50	50
57	XIC	Shipbuilding	23	98	98	57	XIC	6	157	158
58	IC	Motor vehicles	42	117	118	58	XIC	27	–71	–72
59	XIC	Other transport equipment	34	108	109	59	XIC	13	–8	–9
60	XIC	Precision instruments & apparatus	24	136	137	60	XIC	6	–278	–292
76	XIC	Other manufactures	6	129	130	76	XIC	6	–512	–516
Average			34.4	100.8	101			11.1	57	51
Standard deviation			(20.4)	(54.8)	(55.7)			(10.3)	(229.8)	(250.6)

Sources: Republic of China, Inspectorate General of Customs, *Custom Import Tariff of the Republic of China*, 1980 and 1989 editions; ROC, DGBAS, *Input-Output Tables*, 1981 and 1989 editions; Smith (1996).

Notes: 1. "Average" is the unweighted manufacturing mean.

2. n.a. = not applicable.