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# Openness and trade policy in China An industrial analysis☆

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**Abstract**

This paper analyzes the tariff structure and its determinants in China, with our research conducted under the rubric of endogenous policy theory. We study the tariff rates for 95 industries in China in 1996. The potential determinants of tariff rates are collected from an array of variables characterizing industries in 1995. A principal component method is used to reduce these variables into four major dimensions. The first component comprises the information on the composition of employees broken down by age, education, and job classification. The second component is underlined by the profitability of the industry. The third component consists of those variables not picked up with high salience in the first two components. More closely resembling those in the second component than the first, these variables include gross product, foreign capital, inventory, sales revenue, and total loss. The fourth component receives high loadings from two variables: the number of firms in the industry and the number of firms that incur net losses in their operation. Using variables identified by the principal component analysis and postulated by the variants of the endogenous trade theory, regression analysis finds that the trade policy in China is mainly defined by an industrial policy favoring high-tech industries and a social policy minimizing social instability. The implications for China's entry into the World Trade Organization (WTO) are also provided in the paper. 

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## 1. Introduction

This paper analyzes the tariff structure and its determinants in China. The research is conducted under the rubric of endogenous policy theory. This theory assumes that government policy is a function of the interaction between the government — which wants to maximize its likelihood to remain in office or its legitimacy to rule — and various interest groups that seek to affect government policy to their advantage. We study the tariff rates for 95 industries in China in 1996, collecting the potential determinants of tariff rates from an array of variables characterizing industries in 1995. A principal component method is used to reduce these variables into four major dimensions, then regression is run using variables identified by the principal component analysis and postulated by the variants of the endogenous trade theory.

We find that trade policy in China is largely determined by two concerns of the government. The first has to do with the protection of high-value-added and high-tech industries. This industrial policy may be inconsistent with China's open-door policy, but such an industrial policy may help develop the country's high-value-added industry in the long run if it can overcome the inefficiency problem ensuing from the lack of international competition. The second concern stems from the government's need to protect industries that incur financial losses. Such industries are typically state-owned enterprises (SOEs). Removing protections for these industries implies that massive layoffs will occur in inefficiently run factories, leading to social chaos and political unrest. Therefore, trade policy in China is mainly defined by an industrial policy favoring high-tech industries and a social policy minimizing social instability.

Section 2 of the essay discusses variants of the endogenous trade policy, followed by their implications in the context of China. Section 3 provides an overview of the major changes in Chinese tariff policy since 1949. Section 4 examines the data that may account for the country's tariff policy, and we conduct a principal component analysis to identify major components of potential policy determinants. Section 5 investigates the causal structure of China's industrial tariffs through regression analysis. Section 6 concludes the essay by discussing the policy implications of our findings for China's decision to join the World Trade Organization (WTO).

## 2. Endogenous trade policy and the Chinese context

How a tariff level is determined in a nation has been under empirical scrutiny since the 1970s, which has led to the emergence of endogenous policy theory. Such a theory assumes that trade policies are endogenously determined by the relationship between private agents and politicians. There are five variants of this theory.

### *2.1. The interest group model*

The interest group model argues that a tariff level is a function of pressure imposed by various interest groups as they calculate their benefits and losses from a tariff and

consequently lobby the political party to raise a tariff (Caves, 1976). The key assumption is that an industry's ability to overcome the free-rider problem and organize effectively depends on the size of the firms within the industry and the degree of their concentration in terms of output and geography. Other factors considered in the model include low or negative growth rates of employment and output, low or declining profit rates, rising import penetration ratios, and low-value-added share of output (Baldwin, 1985). Similarly, Pincus (1975) shows that the geographic and structural concentration of an industry, as well as a substantial presence in Congress that represents the industry's constituency, can lead to a rise in tariffs.

### *2.2. The adding machine model*

By contrast, the adding machine model assumes that an industry's workers and management vote together to promote their short-run economic interests. Therefore, under this model, the number of employees in the industry has a positive effect on the protection of the industry by the government through tariffs. Other factors include labor–output ratio and dispersion of small firms (Baldwin, 1985; Caves, 1976).

### *2.3. The status quo model*

The status quo model postulates that voters and government together oppose any significant reductions in real incomes of any significant interest groups. Thus, the government minimizes short-run adjustment costs. This model implies relatively high tariffs to protect the industry when adjustment costs are large, which is typically true of unskilled labor, older employees, rural areas, and industries with low growth rates (Baldwin, 1985).

Alternatively, Hillman (1982) challenges the notion that a government provides protection for the sake of social insurance, fairness, and altruism. He argues that government protection is based upon its calculation of the political support it can generate by protecting declining industries in the face of world competition. Through various levels of tariff rates, a government may retard or accelerate the decline of an inefficient industry, depending upon the marginal support the government garners from society through the chosen level of protection.

### *2.4. The social change model*

The social change model postulates that government officials and voters promote social goals that go beyond the maintenance of the status quo through changing the distribution of income and other socioeconomic relationships. For example, even if there are no differences among the workers in their ability to find new jobs, voters and the government would still desire to protect low-income, unskilled workers from job displacement in order to maintain equity and social justice (Baldwin, 1985). Cassing, McKeown, and Ochs (1986) examine the political economy of a tariff cycle. Their theory predicts that during economic downturns, the old import-competing sector benefits from tariff increases. As a result, the old import-competing industry has more incentive for protection at the downturn than at the peak compared to the new region import-competing industry, with the underlying reason that it suffers from economic hardship.

### 2.5. The foreign policy model

Finally, the national or foreign policy model assumes that government officials and voters regard the state as an entity whose economic welfare they wish to promote together (Baldwin, 1985) or that the government sets a tariff for nationalistic preferences (Caves, 1976). Kaempfer and Willet (1989) argue that foreign lobby, foreign relations, and concerns for retaliation play important roles in setting tariff levels.

A few other works examine tariff structures in the view of strategic interactions between voters and government. Magee, Brock and Young (1989) explain tariff levels as a result of a political party's desire to secure office through strategizing a tariff level to maximize votes. The strategy of the protectionist lobby is to maximize its revenue by its choice of contributions to political parties, and the strategy of the protectionist party is to choose its tariff so as to maximize its probability of winning the election.

McKeown (1989) studies the causes of the repeal of the British corn laws. The substantial change in voting in the House of Commons leading to the repeal of the corn laws in 1842–1846 was viewed as a victory of the constituents' political and economic interests, as well as the result of Parliament members' private economic gains.

In a somewhat different perspective, James and Lake (1989) posit that the capital and labor interests in Britain formed a coalition to push through the repeal of corn laws. These interest groups wanted to open the US market, and the price they were willing to pay was to open the grain market to the US. Before taking action on corn laws, they knew that if they opened their grain market to the US, they would win over the farmers in the mid-west. A new coalition would form between the planters in the south and farmers in the west, and both sectors would promote trade with Britain. This is exactly what happened. The South and the West united themselves against the eastern protectionists, and won free trade.

In summary, endogenous trade theory examines trade and protection as an outcome of the relationship between government and interest groups. It stipulates that government policy maximizes the net support it can obtain from the populace by adopting a certain level of protection, and that interest groups lobby for protection or export promotion only when the marginal benefit from the policy they lobby for equals the marginal cost incurred in lobbying activities. The various models discussed above have been tested on the data for the US, Britain, and Canada — but have never been tested on countries not in the Western Hemisphere.

This study proposes to test these models on data in the People's Republic of China. Since the open-door policy was initiated in 1978, the Chinese economy has been moving in the direction of marketization and integration with the world market. Various interest groups have emerged in the process of economic decentralization. Some of them have gained from the export-oriented economic regime, while others have had to seek government protection. The proposed project argues that various Chinese industries function as rational private economic agents trying to seek economic rents through political influence. The difficulty of applying endogenous trade theory in China lies in the lack of political competition among parties in the country. The incumbent government officials do not face a serious threat of being pressured out of office, and new political entrepreneurs do not have to seek popular support to gain political office to the degree that their Western counterparts do.

However, it is possible to examine China's trade policy in the endogenous context for at least three reasons. First, the Chinese government tries to legitimize its power through normative social goals. One such goal is economic growth. The high-performance record of China's economic reform has strengthened the legitimacy of the government as it endeavors to adopt a national policy to accelerate growth. Trade policy is an important tool that the government can use strategically to ensure the success of economic reforms and, therefore, its own legitimacy.

Second, China's economic reform creates both winners and losers. A large presence of losers certainly will cause social unrest and political instability. While the government may want to maximize economic growth through marketization and privatization, massive layoffs and inflation that ensue from rapid transformation may result. When it comes to trade policy, the government may have to consider the factors emphasized by the status quo/social change model in order to preserve political stability and economic equity.

Third, some recent works have found government policy in China to be the outcome of compromise between subgovernmental or intergovernmental players. The political centralization of the Party and the political capacity of the government have weakened and the power of the local governments has escalated (Montinola, Qian, & Weingast, 1995; Shirk, 1993) As economic and political decentralization continues, interest groups will gain financial and political power over the central government.

This paper attempts to identify patterns of influence of various industrial groups on government trade policies. The findings of the determinants of protection will confirm or discredit the endogenous policy theory in a Chinese context. As this will be one of the first empirical analyses in terms of endogenous trade policies that has ever been conducted on a developing or nondemocratic nation, it will provide important nuances for model construction and refinement under the rubric of the endogenous policy theory.

Additionally, the essay's findings will be relevant to China's strategy to join the WTO. China has been persistently negotiating its membership for the past 3 years, and our findings should shed light on China's negotiation strategy with its Western counterparts. Additionally, the identification of winners and losers in China's trade policy will directly affect our understanding of the next-phase economic reform in the country, particularly regarding the restructuring of SOEs. Lastly, our findings regarding the relationship between government and interest groups will provide an insight into the progression of political liberalization in the country. It has been argued that new forces released by marketization will seek political representation, thus weakening government control.

In summary, our study will be the first empirical test of endogenous theory on a formally centrally planned economy, the reform of which has fueled both economic change and informed political transformation.

## 3. Tariff reduction in China

This section provides an overview of major changes in China's tariff policy over the years. Tariffs in China have been determined largely by the priorities in the nation's political and economic agenda, which have differed substantially over time. After the founding of the

People's Republic of China in 1949, the nation adopted an import-substitution strategy. The purpose of the tariffs was to protect the infant industries in China. After economic reform was initiated in 1978, the tariff policy in favor of an autarchy was then transformed into one oriented toward an outward-looking and open economy.

China significantly reduced its tariff rates in 1992 and 1996. By the early 1990s, the reform of China's export sectors was far ahead of its reform for its import-competing industries. For instance, export subsidies had been suspended and the extent to which permits were required for exported goods had been reduced, but imports remained largely state-controlled. In addition to high tariffs, severe non-tariff barriers (NTBs) existed, such as import quotas, exchange control, and permit authorization. The imports subject to quotas, permits, and import control numbered 1247, or about 20% of total imported items. The enterprises' losses due to imports were also subsidized by the state (Yang, 1997). The inconsistency between the deregulation of the exporting and the protection of importing industries ran counter to the establishment of price mechanisms. In this context, the reduction of tariffs in 1992 and 1996 marked a turning point in China's trade liberalization.

By 1992, China reduced tariffs for 3371 items, with an average tariff reduction of 7.6%. By 1993, China cut tariffs on another 2898 items, with an average reduction of 8.8%. In 1994, the tariffs for automobiles were significantly reduced, and tariffs on cigarettes, liquors, videotapes, and buses all decreased in 1995. On April 1, 1996, China launched a major tariff reduction that involved 4900 items, or 76.3% of all existing tariff items. The average reduction in tariff levels reached 35%, the largest by that time. The following provides some highlights of the 1996 tariff reduction in China.

Tariffs for industrial raw materials were reduced significantly. For instance, tariffs for metal materials decreased on average by 47.7%, to the level of 8.15%, on 161 nonferrous metals and 179 ferrous metals. The tariffs for textile materials were reduced by 50.7%, leading to an average tariff level of 18.8%. Raw materials for mineral and forestry products were reduced to below 3%. Raw materials for inorganic chemical products were reduced by 52.7% to an average level of 9.5%, and for organic products by 44.1%, to 10.5%.

China significantly reduced tariffs on raw materials as it intended to protect its own natural resources, particularly those that were nongenerative or lacking in reproductive capabilities, such as raw materials used in mineral and forestry products. It is also plausible that China reduced these tariff rates to lower the cost of the finished products (e.g., textile products) so as to increase their competitiveness in the international market.

In 1996, China also reduced tariff levels for electrical machinery by 36.5%, to the level of 13.65%. The reduction in the tariffs for electrical machinery was supposed to lower the cost of technological innovation in China. Consumer electrical products experienced a tariff reduction by 43.5%, to the 28.2% level. Tariffs on automobiles also decreased. The reduction in tariffs for passenger cars ranged from 150% to 90%, and from 100% to 90% for vans. For motorcycles, the reduction was from 120% to 70%. No reduction was given to buses, specialized vehicles, and tractors, which stood at 55%, 3–20%, and 15%, respectively.

China enjoyed a large international market for textile products. In 1996, the tariff level for cotton apparel was reduced from 60% to 40%, and from 45% to 20% for other cotton products. Similarly, China was competitive in light industry products and tariffs were reduced on these products by 31.6%, to the level of 41.8%.

In tandem with the gradual openness of its current account, China has reduced its mean tariff rate from 47.2% in 1991 to 17.8% in 1997, with an annual average reduction rate of 5% (Fig. 1).

It has been projected that China will reduce its average tariff rate to 15% by 2000 and to 10% by 2005. The effort to reduce protection also extends to NTBs. For instance, about 2000 items were subject to import permits in 1992. By contrast, only 300 items were required to have permits in 1998 (Yang, 1999).

From these examples, it can be seen that China changed the goal of its tariff policy from protectionism to coordination with its open economy. Tariff reduction in China, particularly in 1996, was conducive to technological transformation by importing advanced machinery and equipment from abroad. It also decreased the cost of production by lowering the tariffs for raw materials, thus increasing the competitiveness of these products in the world market. Natural resources in China also stood a better chance of being preserved since the tariffs on these products were reduced to close to zero. Besides, tariff reductions also benefited consumers by increasing possible purchases of international products or by lowering the price of domestic products. More importantly, tariff reductions increased the competition pressure on China's industries and therefore improved their efficiency. As implied by Hillman (1982), a government may accelerate the decline of certain industries by reducing protection. In China's context, such industries may include those inefficiently run and insolvent — particularly, certain SOEs where the employees tend to be low-skilled, industry-specific labor, making it even harder for them to find other jobs (the social change model). A tariff reduction for the products of the failing SOEs will further provoke the problems mentioned above and accelerate the enterprises' continued decline. If the endogenous tariff theory is correct, we could find the China evidence consistent with the status quo, social change, and interest group models.

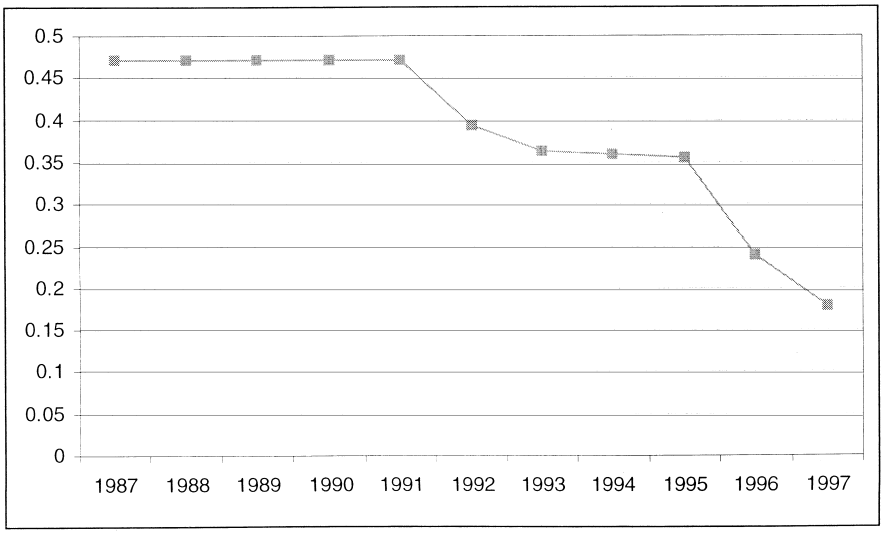


Fig. 1. Mean tariff rates in China, 1987–1997.

## 4. Data

In this section, we analyze the data on the factors that may affect tariffs in China in light of the endogenous trade policy. In an effort to identify the underlying factors that account for the variation of tariffs across the economy, we collected information on 95 industries (See Appendix A). These industries include excavation, food, textile, clothing, building materials, furniture and household goods, energy, chemical, transportation, metallurgy, machinery equipment, communications, electronics, electrical equipment, retail, whole sale and material supply, paper, publishing, and stationary supply, etc. While the sample is not random, it certainly reflects the main components of Chinese industries.

As discussed previously, 1996 marks a major transformation of the tariff structure in China. In Section 5, we use the tariff rates for these 95 industries in the year 1996 as our dependent variable in cross-section regression. In terms of the predetermined variables, we examine a wide array of variables measured in 1995 to reduce endogeneity problems. These variables include the number of firms, the number of firms in the red, gross product, value added, gross fixed capital, net fixed capital, foreign capital, total assets, inventory, total debt, long-term debt, revenue, taxes, profit, investment returns, total loss, net profit, the number of full-time employees, professionals, managers, and technicians, employees aged 51 and over, employees' educational attainment, the size of the industry, wages, and retirement. (See Appendix B for full list). The sources for these variables are *The Data of the Third National Industrial Census of the People Republic of China in 1995 by Ownership Type* (Office of the Third National Industrial Census, 1995a) and *The Data of the Third National Industrial Census of the People Republic of China in 1995 by Industry* (Office of the Third National Industrial Census, 1995b).

We utilize the principal component analysis to explore the general dimensions of the tariff structure in China. A principal component can be defined as a linear combination of optimally weighted observed variables. The first component extracted in a principal component analysis accounts for a maximal amount of total variance in the observed variables. The second extracted component has two important characteristics. First, this component accounts for a maximal amount of variance in the data that was not accounted for by the first component. Second, this component is made orthogonal to the first component. In turn, the rest of components possess the same two characteristics. As the correlation among all components will be zero, it is convenient to interpret these components as different dimensions that may have impacts on tariff levels.

As a variable reduction procedure, the principal component analysis is useful in ascertaining the dimensions of the variables that affect tariffs and in building a meaningful context on the basis of the selected variables in the survey.

As we focus on the main components only, we choose those that have an eigenvalue larger than 1. The eigenvalue one criterion, or the Kaiser criterion, yields the first four components that are shown in Table 1. They are marked in italics. The rationale for this criterion is straightforward: Each observed variable comprises one unit of standardized variance to the total variance in the data set. The component that has an eigenvalue larger than 1, contributes more to the variance of the data than normally assumed. Therefore, the

Table 1
Eigenvalues of the correlation matrix

| Factor | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Eigenvalue | *21.4899* | *4.5521* | *2.3592* | *1.3142* | 0.8717 | 0.6176 | 0.3855 |
| Difference | *16.9378* | *2.1929* | *1.045* | *0.4425* | 0.2541 | 0.2321 | 0.0476 |
| Proportion | *0.6512* | *0.1379* | *0.0715* | *0.0398* | 0.0264 | 0.0187 | 0.0117 |
| Cumulative | *0.6512* | *0.7892* | *0.8606* | *0.9005* | 0.9269 | 0.9456 | 0.9573 |

| Factor | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|
| Eigenvalue | 0.3379 | 0.2685 | 0.2056 | 0.1383 | 0.094 | 0.0705 | 0.0637 |
| Difference | 0.0694 | 0.0628 | 0.0673 | 0.0443 | 0.0235 | 0.0068 | 0.0163 |
| Proportion | 0.0102 | 0.0081 | 0.0062 | 0.0042 | 0.0028 | 0.0021 | 0.0019 |
| Cumulative | 0.9675 | 0.9757 | 0.9819 | 0.9861 | 0.9889 | 0.9911 | 0.993 |

| Factor | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|
| Eigenvalue | 0.0473 | 0.0422 | 0.0323 | 0.0237 | 0.0211 | 0.0164 | 0.0139 |
| Difference | 0.0051 | 0.0099 | 0.0086 | 0.0025 | 0.0048 | 0.0025 | 0.0027 |
| Proportion | 0.0014 | 0.0013 | 0.001 | 0.0007 | 0.0006 | 0.0005 | 0.0004 |
| Cumulative | 0.9944 | 0.9957 | 0.9967 | 0.9974 | 0.998 | 0.9985 | 0.999 |

| Factor | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|---|---|---|---|---|---|---|---|
| Eigenvalue | 0.0112 | 0.0065 | 0.0044 | 0.0031 | 0.003 | 0.0021 | 0.0014 |
| Difference | 0.0046 | 0.0021 | 0.0013 | 0.0002 | 0.0009 | 0.0007 | 0.0003 |
| Proportion | 0.0003 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0 |
| Cumulative | 0.9993 | 0.9995 | 0.9996 | 0.9997 | 0.9998 | 0.9999 | 0.9999 |

| Factor | 29 | 30 | 31 | 32 | 33 |
|---|---|---|---|---|---|
| Eigenvalue | 0.0011 | 0.0008 | 0.0004 | 0.0003 | 0 |
| Difference | 0.0003 | 0.0004 | 0.0002 | 0.0003 | |
| Proportion | 0 | 0 | 0 | 0 | 0 |
| Cumulative | 1 | 1 | 1 | 1 | 1 |

Total = 33, average = 1.

components with their eigenvalues larger than 1 are retained for further analysis. They contain 90% of the total variance of the data. The use of a scree test, that is, a graphic presentation of the decreasing eigenvalues, easily yields support for the selection of the number of components (Fig. 2).

Consistent with the principal component analysis, we adopt a varimax rotation to render components orthogonal to each other. Compared to other types of rotations, a varimax rotation tends to maximize the variance of a column of the factor pattern matrix rather than a row of the matrix. The variables that have a factor loading exceeding 60 in its absolute value are displayed (Table 2). Notably at the threshold of 60, the variables do not load on more than one component, which makes the interpretation of the components convenient. When examined together with the components, these variables provide us with a conceptual foundation for thinking about the underlying structure of the components on which they load.

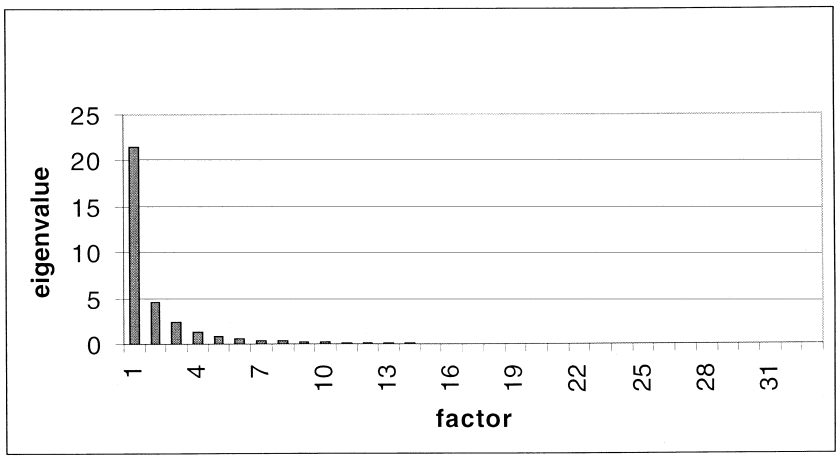


Fig. 2. Eigenvalues and factors: a scree test.

As Table 3 indicates, the first component comprises the information on the size of the industry and employees characterized by age, wages, education, and job classification. It also contains information on the industry's assets characterized by fixed capital and debt. Basically, the first component, which accounts for 65% of the total variance in the data, indicates the fundamentals of the industry. We would like to find out if the information in this component will affect the tariff structure as predicted by the adding machine model, the interest group model, and the status quo/social change model.

The second component is underlined by the profitability of the industry. The variables that have high loadings in this component include value added, sales taxes, income taxes, sales profits, total profits, net profits, and investment returns. These variables relate to the thesis by Hillman (1982), which posits that the government will gain political support by facilitating the industry that has been able to make high profits. We would like to see if the tariff structure does favor those industries that have done well. Evidence in favor of the Hillman thesis will also be consistent with the national policy model in Caves (1976).

The third component consists of the variables that are not picked up with high salience in the first two components. More similar to those in the second component than the first, they include gross product, foreign capital, inventory, sales revenue, and total loss. The one variable that is particularly interesting in this component is the presence of direct foreign investment in industry and inventory. According to the foreign policy model in Caves (1976), a government will determine a tariff level for a product based upon its foreign policy. In our context, those industries that receive a large amount of direct foreign investment tend to be protected because the government wants to attract foreign capitals.

The fourth component receives high loadings from two variables only: the number of firms in the industry and the number of firms that incur net losses in their operation. The information here complements that of the first three components. Its focus is on the size of an industry in terms of number of firms. Therefore, it captures the essence of the pressure

Table 2
Rotated factor pattern

| Variable | Factor 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Number of firms | 31 | 0 | 17 | 88* |
| Number of firms in the red | 30 | −7 | 43 | 81* |
| Gross product | 37 | 39 | 78* | 19 |
| Value added | 55 | 75* | 30 | 2 |
| Gross capital | 69* | 45 | 47 | 14 |
| Foreign capital | 2 | 3 | 82* | 38 |
| Total assets | 65* | 53 | 53 | −3 |
| Inventory | 41 | 44 | 74* | 6 |
| Net fixed capital | 76* | 49 | 33 | −7 |
| Total debt | 64* | 47 | 59 | −2 |
| Long-term debt | 71* | 49 | 31 | −15 |
| Sales revenue | 48 | 52 | 65* | 6 |
| Sales taxes | −9 | 80* | −9 | 14 |
| Sales profits | 58 | 63* | 46 | −3 |
| Investment return | 24 | 65* | 47 | −4 |
| Total loss | 49 | 3 | 76* | 22 |
| Total profits | 1 | 68* | 14 | −1 |
| Income taxes | 22 | 93* | 21 | −4 |
| Net profit | 14 | 93* | 2 | −6 |
| Number of full-time employees | 87* | 6 | 29 | 36 |
| Number of technical staff | 76* | 29 | 43 | 19 |
| Number of managers | 85* | 16 | 33 | 34 |
| Employees aged 36–50 | 92* | 9 | 18 | 30 |
| Employees aged 51 and above | 93* | 12 | 6 | 25 |
| Employees with college education | 81* | 40 | 30 | −15 |
| Employees with professional education | 93* | 25 | 20 | 3 |
| Number of technicians | 89* | 33 | 23 | −3 |
| Employees with secondary education | 81* | 6 | 42 | 34 |
| Employees with primary education | 80* | 4 | −5 | 54 |
| Total workforce | 87* | 7 | 29 | 36 |
| Total wages | 90* | 22 | 28 | 19 |
| Number of retirees | 91* | 1 | 26 | 16 |
| Retirement pension and welfare | 84* | 5 | 10 | 0 |

Rotation method: varimax.

group or interest group model. The smaller the number of firms in the industry, the more powerful the industry will be in its lobbying capacity since the free-ridership problem is reduced. The interest group model can be better tested with the number of firms that incur operational losses. Combining the arguments in Baldwin (1985), Cassing et al. (1986) and Caves (1976), we can infer that a powerful lobby can form when the industry does not have a lot of firms and when it incurs heavy losses.

The principal component helps us summarize the data into a few dimensions, therefore providing us with a general picture of the components that may underline the tariff structure in China. By linking these underlying aspects to tariff levels, we can test various models

Table 3
Component contents

| | |
|---|---|
| Component 1: size of industry | Gross fixed capital |
| | Net fixed capital |
| | Total assets |
| | Total debt |
| | Long-term debt |
| | Total work force |
| | Total wages |
| | Number of full-time employees |
| | Number of technical staff |
| | Number of managers |
| | Employees aged 36–50 |
| | Employees aged 51 and above |
| | Employees with college education |
| | Employees with professional education |
| | Number of technicians |
| | Employees with secondary education |
| | Employees with primary education |
| | Number of retirees |
| | Retirement pension and welfare |
| Component 2: profit and taxes | Value added |
| | Sales taxes |
| | Sales profits |
| | Investment return |
| | Total profit |
| | Income taxes |
| | Net profits |
| Component 3: product and foreign capital | Gross product |
| | Foreign capital |
| | Inventory |
| | Sales revenue |
| | Total loss |
| Component 4: firms and bad firms | Number of firms |
| | Firms in the red |

under the endogenous tariff theory. Section 5 focuses on regression analyses of the determinants of the tariff structure in China.

## 5. Regression analysis

In this section, we create component scores as regressors on tariffs, based upon the variables that load on the four components. In principal component analysis, a component score is a linear composite of the optimally weighted observed variables. The SAS procedure automatically determines the optimal regression weights, multiplies the original variables by these weights, and sums the products. The resulting sum becomes a given industry's score on the component of interest.

Table 4
Regression using factor scores as regressors

| Variable | Parameter | *t*-statistic | *P* value |
|---|---|---|---|
| Intercept | 62.948 | 15.124 | .0001 |
| Factor 1 | − 12.416 | − 2.966 | .004 |
| Factor 2 | 5.574 | 1.331 | .1868 |
| Factor 3 | 11.901 | 2.843 | .0057 |
| Factor 4 | 11.891 | 2.84 | .0057 |

Dependent variable: industrial tariff rates, 1996.
$\bar{R}^2$=.211, $\sigma$ = 38.598.

Then, we run a regression of these component scores on the tariff level of each industry. The result is reported in Table 4. Three out of four component scores — the first, the third, and the fourth — are statistically significant at the 0.01 error level in a two-tailed test. The second component is statistically significant at the 0.20 error level in a two-tailed test. These findings show that tariff levels in China are likely to be affected by the fundamentals of an industry, particularly the characteristics of employees, indebtedness, revenues, losses, and capital, including foreign investment. The goodness of fit is not very high, as the sample contains quite heterogeneous observations.

Since the component scores do not tell us a great deal about the effect of an individual variable on tariffs, we select some variables as regressors based upon the principal component analysis as well as upon various versions of the endogenous tariff theory. Table 5 presents the variables that are used as regressors, and their expected signs under various models we summarized in Section 2.

The variables included are the number of firms in the industry, the number of firms that incur losses in the industry, the amount of total losses, value added per worker, the number of employees, foreign direct investment as a percentage of total capital, inventory, percentage of employees with primary education or lower, sales taxes, and average industry wages. The use of these variables presents an approach toward a parsimonious statistical model. Many variables in Appendix B are highly correlated with each other — for instance, sales revenue,

Table 5
Variables and models

| | Interest group | Adding machine | Status quo/ social change | Foreign/ national policy |
|---|---|---|---|---|
| Number of firms | − | + | | |
| Number of losing firms | + | | + | |
| Total loss | + | | + | |
| Value added per worker | − | | | + |
| Number of employees | | + | | |
| FDI share of capital | | | | + |
| Inventory | | | + | |
| % employees with primary education or lower | | | + | |
| Sales taxes | | | | + |
| Average industry wages | | | − | |

Table 6
Regression analysis: dependent variable — industrial tariff rates, 1996

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Intercept | 40.66 | 61.6 | 40.53 | 53.58 |
| | (2.00**) | (2.93*) | (2.00**) | (2.82*) |
| | | | | |
| | 0 | 0 | 0 | 0 |
| Number of firms | **0.001** | **0.001** | – | **0.001** |
| | (0.39) | (0.17) | | (0.31) |
| | *0.1* | *0.1* | | *0.53* |
| | *9.67* | *9.64* | | *1.9* |
| Number of losing firms | **−0.003** | **−0.001** | **0.001** | – |
| | (−0.24) | (−0.04) | (0.25) | |
| | *0.08* | *0.08* | *0.4* | |
| | *12.7* | *12.7* | *2.51* | |
| Total loss | **1.987** | **1.408** | **1.825** | **1.73** |
| | (2.19**) | (1.47) | (2.27**) | (2.17**) |
| | *0.15* | *0.16* | *0.19* | *0.2* |
| | *6.55* | *6.36* | *5.2* | *4.97* |
| Value added/worker | **−10.1** | **8.054** | **−9.93** | – |
| | (−1.9***) | (3.49*) | (−1.9***) | |
| | *0.08* | *0.5* | *0.08* | |
| | *12.3* | *1.99* | *12.3* | |
| Number of workers | **−0.197** | **−0.134** | **−0.189** | **−0.158** |
| | (−2.7*) | (−1.8***) | (−2.7*) | (−2.2**) |
| | *0.28* | *0.29* | *0.3* | *0.3* |
| | *3.63* | *3.43* | *3.34* | *3.32* |
| FDI | **139.9** | **125.9** | **137.7** | **133.9** |
| | (5.32*) | (4.51*) | (5.40*) | (5.28*) |
| | 0.78 | 0.79 | 0.82 | 0.85 |
| | 1.29 | 1.26 | 1.22 | 1.17 |
| Inventory | **0.041** | **0.082** | **0.043** | **0.047** |
| | (0.59) | (1.11) | (0.62) | (0.67) |
| | *0.21* | *0.22* | *0.21* | *0.21* |
| | *4.73* | *4.61* | *4.71* | *4.72* |
| Primary education | **45.63** | **53.75** | **49.93** | **48.45** |
| | (0.85) | (0.94) | (0.96) | (0.91) |
| | *0.78* | *0.78* | *0.82* | *0.81* |
| | *1.28* | *1.27* | *1.22* | *1.24* |
| Sales tax | **0.825** | – | **0.82** | **0.44** |
| | (3.70*) | | (3.70*) | (4.87*) |
| | *0.12* | | *0.12* | *0.76* |
| | *8.2* | | *8.18* | *1.32* |
| Wages | **−14.4** | **−116** | **−14.7** | **−74.2** |
| | (−0.32) | (−3.0*) | (−0.33) | (−2.3**) |
| | *0.25* | *0.4* | *0.25* | *0.53* |
| | *3.93* | *2.49* | *3.93* | *1.87* |
| Adjusted $R^2$ | 44.0 | 35.4 | 44.6 | 43.0 |
| σ | 31.9 | 34.3 | 31.8 | 32.2 |

sales taxes, and total and net profits. The selection of variables is made with a view to reduce the number of variables that significantly overlap with others.

Table 6 displays regression results. Asterisks *, **, and *** represent the 0.01, 0.05 and 0.10 error levels, respectively, and all in a two-tailed test. The number in the parentheses is *t*-statistics. As some variables here are interrelated and have high correlation, the multicollinearity problem can be serious. Therefore, we include some tests specially designed to diagnose multicollinearity. The third row for each variable is the tolerance index and the fourth row is the variance inflation factor, both providing diagnostic information on multicollinearity. Marquardt (1980) suggests that a variance inflation factor greater than 10 indicates the presence of strong multicollinearity. As a rule of thumb, a tolerance value less than 0.10 may indicate the presence of multicollinearity.

The regression results support variants of all the models presented at the beginning of the paper. The national and foreign policy model comes out strongly. The firms that have a large presence of foreign capital are better protected than other firms, keeping everything else constant. Some previous studies (e.g., Feng and Zhang, 1999) find that an open economy is conducive to the acquisition of direct foreign investment. The contrary result here provides new evidence at the level of the industry, rather than at the level of the economy. In order to attract foreign capital, the government may set up a protective tariff for a particular industry to ensure the profitability of foreign investment.

Additionally, the government tends to protect those industries that have generated larger tax income for the government. The tax base of the central government in China has been weakened as a result of political and economic decentralization. Setting a higher tariff for an industry that is able to generate higher taxable income is a win–win game for the central government and the industry. The government benefits from both the tariffs on imported goods and the excise taxes on domestic products; the industry enjoys the rent from protection.

It is also found that those industries with a higher level of per worker value added tend to enjoy a higher level of protection. While exercising an open-door policy, the government still has an incentive to protect high-value-added industries. Such an industrial policy may benefit the long-run development of these high-tech industries. In the short-run, the government benefits from tariff revenues and excise taxes generated by these products.

This result was not clear in the beginning, as Table 6 shows that value added per worker takes both positive and negative signs beyond the conventional level of statistical significance. Further examination of the tolerance index and the variance inflation factor shows that value added, together with several other variables — namely sales taxes, the number of firms, and the number of firms that incur losses — potentially suffers from multicollinearity. It can be speculated that value added and sales taxes are interrelated; higher value added leads to higher taxes. As it turns out, the correlation between the two is .88. While high correlation is not a sufficient condition for multicollinearity, the tolerance index and the variance inflation factor point to the strong likelihood of multicollinearity. After sales taxes are removed from

**Notes to Table 6:**

For each variable, the first row is the parameter estimate; the second is *t*-statistic; the third is the tolerance value; and the fourth is variance inflation factors (VIF). According to Marquardt (1980), a VIF greater than 10 or a tolerance value less than 0.10 indicates strong multicollinearity.

the regressors, value added takes the positive sign and remains highly significant, which is consistent with our inference.

Among the three other models — the interest group, the adding machine, and the status quo/social change models — the regression result seems to confirm the last one. All the relevant variables have signs consistent with the status quo/social change perspective. Losses of the industry, inventory of products, and the lack of education among employees are all positively related to tariff levels, although only loss is statistically significant. The government does appear to protect those industries that suffer from losses. Such industries, as discussed in Section 3, are likely to be SOEs. While it will prove futile to protect inefficient industries in the long run, the rationale to extend protection to them is that it provides political stability. Such policy is consistent with the gradual approach that China's reform has undertaken.

One variable that does not agree with the status quo/social change model is wages, which are found to have a negative effect on tariffs. The government tends to impose a lower tariff for those industries in which the average salary is higher. This may be another version of the evidence in favor of the national policy model, which says that government tend to support those industry that have high levels of value added and yield large tax receipts. More importantly, China has a comparative advantage in labor-intensive products, and therefore may not need to protect its industries that use intensively low-skilled, low-wage earning labor.

Finally, the evidence favoring the interest group model or the adding machine model is not strong. The multicollinearity problem appears to exist for the number of firms and the number of firms that have losses. The removal of one of them does not, however, improve the statistical significance of the other. Our findings seem to confirm the national/foreign policy model and the status quo/social change model.

## 6. Concluding remarks

This study finds evidence of some variants of an endogenous tariff policy in China's context. The level of tariffs has been found to be related to some variables prescribed by the national/foreign policy model and the status quo/social change model. The direction and trajectory of China's economic reform are between these two models. The government launched a far-reaching reform that transformed the political and economic life of the nation, ushering in a protracted economic boom. Such transformation has had disrupting effects on the social status quo, and the inefficiency of SOEs has worsened the social aspects of the economic reforms. It has been and will continue to be a great challenge for the government to strike a balance between a national policy positing economic transformation and the destabilizing forces released from such a policy. The litmus test for the success of the two-decade long period of reform now focuses on the transformation of the failing SOE.

This dilemma exposes the double-edged sword of China's decision to enter the WTO. Since China's initiation of its open-door policy, international trade has become an integral part of its modernization drive. The percentage of its exports in GDP increased from below 5% in 1979 to 19% in 1997. Sustained growth requires that China join the WTO. However, China has been very reluctant to accept the terms demanded by Western nations. The

ramifications of China's entry in the WTO involve both positive and negative consequences in light of our findings in this paper.

China has comparative advantage in labor-intensive products, such as textile, clothing, toys, electric fans, leather products, bicycles, and footgear. It is catching up in battery, refrigerators, clocks, and watches. But entry into the WTO will create problems for China's industries that produce printers, air conditioners, computers, automobiles, and ships, and high-tech industries, such as precision-processing machinery, aerospace, and sophisticated medical equipment would suffer from international competition (Yang, 1999).

A recent report also finds that while joining WTO improves economic efficiency in China, structural unemployment will ensue (Yu et al., 2000). Using a dynamic computable general equilibrium model, the report finds that in the short term, China's agriculture, telecommunications, steel, petroleum and petrochemical industry, machinery, automotive industry, and financial services will face stiff international competition. At the same time, China has comparative advantage in clothing and stationery industries as well as some intermediate product sectors, such as electricity and chemical industries (Yu et al., 2000).

Our finding shows that China's national policy tends to extend protection to those industries with relatively high average wages and high value added per worker. The government also has made efforts to shield firms that incur losses in their operations. A radical liberalization approach is sacrificed for the sake of political stability that, in the view of the government, will provide better circumstances under which the goal of its economic policy will be preserved. Therefore, China's tariff policy has so far reflected a balance of an industrial policy that favors high-tech industries and a social policy that aims at political stability characterized by a gradual phase-out of the protection of its declining industries.

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## Appendix A. List of industries

Coal, petroleum, natural gas, oil shale, stone, nonmetal, timber, sugar, meat processing, aquatic product, bakery, diary product, canned food, yeast product, spice, alcohol, soft drink, tea, tobacco, raw fabric processing, cotton, woolen, linen, silk, knitting, apparel, headgear, footgear, tanning, leather, tan product, feather product, wood piece, board, woodwork, bamboo work, furniture, pulp, paper, stationary, athletic product, music, toy, game, crude oil, oil product, coking, fertilizer, organic chemical, cosmetics, pharmaceuticals, synthetic fabrics, fishery equipment, tires, power tire, crude rubber, rubber footgear, daily-used rubber product, crude plastic, plastic footgear, daily-used plastics, cement product, tiles and lime, glass, pottery, fire-proof material, graphite, mineral product, iron, steel, light nonferrous metal, rare metal and rare earth metal, cast iron pipe, container, construction metal, daily-used

metal, furnace and motor, metal processing, bearing and valve, casting and forging, light industry equipment, railway equipment, car, motorcycle, bicycle, ship building, airplane, electrical machinery, control and automation, daily-used electrical, lighting equipment, communications equipment, radar electronics, and daily-used electronics.

## Appendix B. Variables in the principal component analysis

| Variable |
|---|
| Number of firms |
| Number of firms in the red |
| Gross product |
| Value added |
| Gross fixed capital |
| Foreign capital |
| Total assets |
| Inventory |
| Net fixed capital |
| Total debt |
| Long-term debt |
| Sales revenue |
| Sales taxes |
| Sales profits |
| Investment return |
| Total loss |
| Total profits |
| Income taxes |
| Net profit |
| Number of full-time employees |
| Number of professionals |
| Number of managers |
| Number of technicians |
| Number of employees aged 36–50 |
| Number of employees aged 51 and above |
| Number of employees with college education |
| Number employees with professional education |
| Number employees with secondary education |
| Number employees with primary education |
| Total work force |
| Total wages |
| Number of retirees |
| Retirement pension and welfare |

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