Monopoly Power and Trade Protection: Cross-Industry Evidence.[*]

Pedro Cavalcanti Ferreira[†]
Graduate School of Economics
Fundação Getulio Vargas

Abstract

This paper investigates the impact of industry concentration on trade policy. Annual panel-databases of Brazilian industries for the years 1988 through 1994 were used. The regressions reported here are robust to openness indicator, concentration index, control variables and sample size, and suggest that the higher the concentration of a given industry the higher its level of trade protection. In the period of study the country experienced a major trade liberalization, but the results in the paper show that the reduction in protection was smaller in more concentrated sectors. Assuming that concentration is a good proxy for monopoly power as it reduces the free rider problem in coordinating a lobby the results in this paper indicates that interest groups with control over specific markets in fact are able to obtain policy advantages that reduce (international) competition.

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[†]Praia de Botafogo, 190, Rio de Janeiro, RJ, Brasil, 22253-900. Email: ferreira@fgv.br

1 Introduction

The link between monopoly power and growth performance has been attracting the attention of an increasing number of economists in recent years. Of course the idea that the organized action of interest groups may have a long-term impact on income levels and growth rates is not new, being present in works on economic history such as Mokyr(1990) and Jones(1988). The last author states that in "all or most large societies the impulse for growth was apparent all along but had to be unchained and allowed to come to fruition. These so called obstacles [to growth] took the form of unhelpful values and institutions, especially religious values, the guilds and the Indian caste system." Noteworthy examples in the recent (theoretical) growth literature are Parente and Prescott(1998), Prescott(1998), Holmes and Schmitz(1995) and Teixeira(1999).

In one way or another, all these papers include a sector or sectors with some degree of monopoly power over the supply of some factor that can impose prices and block adoption of new technology. In Parente and Prescott (1998), for instance, a coalition of factor suppliers is the monopoly seller of its input services. The coalition can dictate work practices and member's wages and the monopoly right is protected by law, which makes it costly to enter with more productive technology. In Holmes and Schmitz(1995), trade between two areas and the extension of markets - or free movement of goods between these areas - reduces the resistance to new technology. Again, the sources of resistance are interest groups who stand to lose rents if a new technology is adopted.

A corollary of the last article is that barriers to trade such as tariffs, quotas or any non-tariff barriers imposed by those interest groups affect the country total factor productivity (TFP) level and growth prospects. This is exactly the point of Teixeira(1999), who shows that under a quota arrangement, the most productive technology will not be used and investment and capital stock will be smaller than under free trade. Simulations of the model reproduce observed cross-country per capita GDP differences. Once again, the monopoly power, over factor supply, of some coalition groups are the imposing force behind the different trade regimes.

In summary, the argument of this literature can be broken up into two consecutive parts. First, interest groups with monopoly power over factors supply are able to impose barriers to trade and/or to technology adoption. Second, these barriers hurt growth. The second part of the argument was

tested, among others, in Cavalcanti Ferreira and Rossi (1999), using a panel data set of Brazilian manufacturing industries. The hypothesis that higher levels of tariffs and effective rate of protection imply smaller TFP and labor productivity growth could not be rejected. Similar results were obtained by Lee (1998), using Korean industry data[1].

In the present paper we test the first step of the argument above, more exactly, the link between monopoly power and trade protection. We want to investigate if there is any evidence from Brazilian manufacturing data that industries with higher monopoly power are more protected than those in competitive sectors.

We construct and estimate two groups of data sets for Brazilian industries. The first one is a small cross-section at a level that corresponds to the two digit classification used in the U.S. The other group is composed of annual or bi-annual panel data sets at a higher disaggregation level than the first group, in some cases with 21 cross-industry observations and in others with 42. In most of our regressions we use two alternative measures of trade protection, average nominal tariffs and effective rate of protection[2]. For the cross-section case we have three measures of industry concentration but for the panel data only one, but given the high correlation among these series we lost no information.

In the period of analysis, 1988 to 1994, the country experienced a major trade liberalization with general tariff reduction and elimination of non-tariff restrictions. However, not all sectors were affected equally, and while tariff dispersion was reduced, some differences remained. The interesting point here is that protection from trade fell less in some sectors where concentration is high and the lobby strong (e.g., motor vehicle) than in more competitive sectors (e.g., textiles). The main question of the paper, hence, is to test if this anecdotal evidence extends to the whole manufacturing sector and is statistically significant.

It has to be said that this literature does not claim exactly that monopoly power of the form we use is the ultimate cause of barriers to trade or to tech-

[1] Evidence of the negative effect of trade protection on growth at country level is also strong (see, for instance, Edwards (1997), Harrison (1995), and Taylor (1996) among many), but some of the data used in part of these studies have been criticized by Rodríguez and Rodrik (1999) for not measuring trade barriers accurately.

[2] We do not have data on quantitative restrictions, but this is not a serious problem in the present case because in the period of study - 1988 to 1994 - tariffs were the main policy instruments and almost all quantitative barriers had already been abandoned.

nology adoption. However, we follow Trefler (1993), among others, in assuming that greater concentration alleviates the free-rider problem in coordinating a lobby so that it reflects or is proportional to the political power of the industry lobbies.

This study relates to the literature of political economy of trade policy (e.g., Brock and Magee (1978), Trefler (1993) and Grossman and Helpman (1994)), which studies the endogenous determination of trade protection and is surveyed in Rodrick (1995). In Grossman and Helpman (1994), special interest groups make donations to election campaigns to obtain trade protection. The model predicts, among other things, that protection should be higher in industries represented by a lobby. In this model, however, all lobbies are equally influent and the relevant difference is whether a sector is organized or not. Koujianou Goldberg and Maggi (1999) tested and could not reject the main conclusions of this model. Trefler (1993) and Marvel and Ray (1983) among others, found a positive relationship between seller concentration and protection in U.S. industry. Moreover, Trefler (1993) finds that business lobbying had much more influence than organized labor on American trade policy, which minimizes, to a certain degree, the problem caused by the lack of labor data in the present study.

This paper is organized in 4 sections in addition to this introduction. The next section discusses the data and some speculative evidence on the relationship of trade policy and industry concentration in Brazil. Section 3 presents the cross-section estimations, section 4 the panel data estimations and section 5 concludes.

2 Industry concentration and trade barriers in the Brazilian manufacturing industry

Before the trade liberalization started in 1988, dispersion of nominal and effective tariffs was extremely high in Brazil. Table 1 presents the average nominal tariff for 16 sectors of the Brazilian manufacturing industry at a level that roughly corresponds to a 2-digit level in the classification adopted in the United States. In fact, in 1985 the ratio between the maximum and the minimum average nominal tariff is almost 6 but in 1997 it fell to 2.7. The standard deviation in 1985 was almost half the (non-weighted) average tariff while in 1997 it was close to one quarter for a mean tariff 10 times smaller.

Table 1: Average Nominal Tariffs

Sector	Year		
	1985	1990	1997
Nonmetal mineral products	98.7	24.5	7.30
Metalworking	72.8	23.7	12.80
Machinery	62.1	39.5	13.90
Electronic and commun. equip.	100.4	39.6	14.55
Transport and motor vehicles	115.9	55.9	16.70
Paper and paper products	82.2	23.1	11.90
Rubber products	101.7	49.6	12.80
Chemicals	34.2	13.4	8.23
Pharmaceuticals	42.2	26	10.00
Perfumes, soap and candles	184.4	59.2	10.00
Plastic products	164.3	40	16.50
Textiles	161.6	38.8	15.80
Cloth., fabric prod. and footwear	192.2	50	19.60
Food	84.2	27.4	12.15
Beverages	183.3	75.1	14.50
Tobacco	204.7	79.6	9.00
mean	117.81	41.59	12.86
DP	56.01	19.02	3.40
max/min	5.99	5.94	2.68

The figures for effective rate of protection are even more telling: in 1985 it was 427% for the Plastic Product industry and negative for the Tobacco and Beverages industries. In addition, the standard deviation was of the same order of magnitude as the average rate (about 100%). After liberalization, the average rate fell to less than 20% and the standard deviation to one third of this number.

The same pattern can be observed from more disaggregate data. In 1988 the highest estimated effective rate of protection among the 46 sub-sectors for which we have data was 270% in the "Resins" industry and the smallest were -0.7% and 16%, in the "Fertilizer" and "Basic steel products" industries respectively. Likewise, in the same year the mean rate and the standard deviation were extremely high, around 70% and 60%, respectively. Six years later, the mean rate fell to 17% and the dispersion to 12.8%.

If the reduction of protection is a general phenomenon, it did not affect all the sectors in the same form. Take for instance the "automobiles, trucks and buses" and the "artificial textile fibers" sub-sectors. Between 1988 and 1990, the average tariff among the 46 sub-sectors - which together represent about 90% of the value added of the manufacturing sector - fell by a quarter while increasing 21% in the "automobiles, trucks and buses" sub-sector. The tariff in this sub-sector went from 1.53 times the mean tariff in 1988 to 2.40 times in 1993 and 1.7 times in 1994. On the other hand, the average tariff of "artificial textile fibers" sub-sector went from 1.43 the mean tariff in 1988 to less them 90% of the 1994 mean[3].

Clearly, there are forces specific to the "automobiles, trucks and buses" sub-sector partially offsetting the general movement of protection reduction of the Brazilian economy. Most probably those forces are weaker in the textile industry. We think that monopoly power and concentration may be that force. The figure below is illustrative:

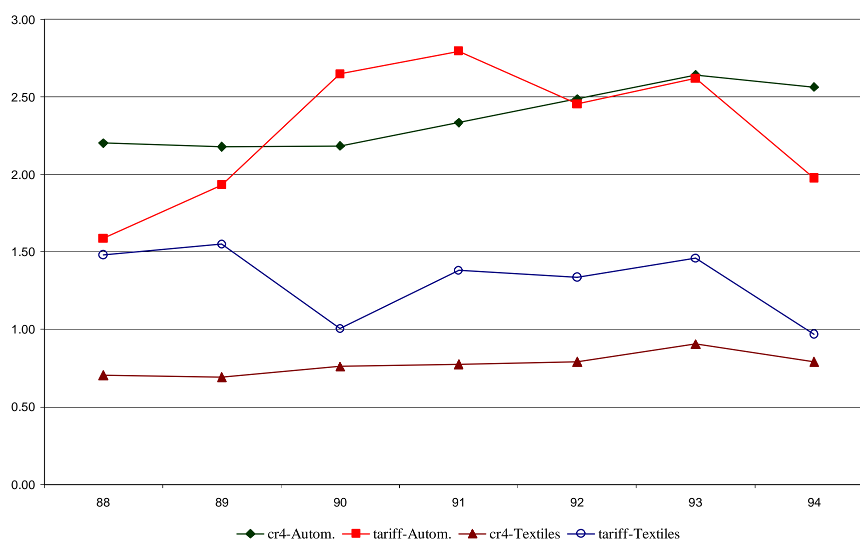

Figure 1: Tariffs and concentration as a proportion of the median (textiles and motor vehicles)

[3] The behavior of the effective tariff is similar: between 1988 and 1991 it fell, on average, 35% but it increased by 23% in the car industry. After that, and until 1994, both the sub-sector and the average protection rates fell continuously but less so in the former: the effective rate of protection in the sub-sector went from 2.66 times the average in 1988 to 5.6 in 1993 and 2.9 in 1995. As for the textile industry, the change was in the opposite direction: its 1988 rate was very close to the mean, but only half the mean in 1992.

Figure 1 presents the evolution of nominal tariffs and concentration of both sectors as a proportion of the median indices of the industry. The concentration index used is the proportion of the sector revenue appropriated by the four largest firms (CR4). Note that while concentration in the "automobiles, trucks and buses" sector is at least twice as large as the median concentration of the manufacturing industry, in the artificial textile fibers industry it was on average only 75% of the median. At the same time, while average nominal tariffs of both sectors were almost the same in 1988, about 1.5 times the median, in 1994 it was twice the median in "automobiles, trucks and buses" and exactly the median in the textile industry. In summary, the decrease in tariffs is notably larger in the less concentrated industry.

The strong monopoly power of the "automobiles, trucks and buses" industry is reflected in the behavior of Anfavea, the official industry federation. Anfavea is in fact a powerful lobby and has been able to obtain a number of advantages in terms of the timetable of tariff reduction, tax breaks and subsidies that sectors with less political muscle were not able to achieve[4]. In the sub-sector of "Auto parts", for instance, tariffs dropped steadily and fast and most of Brazilian firms either close down or were sold to foreigners companies as they could not face competition from imports. This, of course, benefited even further the "automobiles, trucks and buses" sector. The question that we want to investigate econometrically now is whether this relationship extends significantly to the other sectors of the Brazilian manufacturing industry.

3 Industry concentration and tariffs: cross section data

Table 2 below presents 3 different concentration indices for the same 16 manufacturing sectors displayed in Table 1. They were calculated with 1985 data.

[4] For instance: after the Asian crisis, the average nominal tariff in the sector jumped to 55% from 20%, while the average tariff of the manufacturing sector went from 11% to 14%.

Table 2: Concentration Indices

Sector	CR4	CR8	H
Nonmetal mineral products	0.128	0.188	0.009
Metalworking	0.200	0.278	0.015
Machinery	0.103	0.161	0.006
Electronic and commun.equip.	0.156	0.228	0.012
Transport. and motor vehicles	0.425	0.54	0.055
Paper and paper products	0.170	0.274	0.015
Rubber products	0.606	0.661	0.116
Chemicals	0.458	0.498	0.168
Pharmaceuticals	0.180	0.285	0.019
Perfumes, soap and candles	0.490	0.642	0.115
Plastic products	0.155	0.210	0.010
Textiles	0.088	0.134	0.005
Cloth., fabric prod., and footwear	0.099	0.136	0.005
Food	0.071	0.120	0.004
Beverages	0.245	0.339	0.025
Tobacco	0.686	0.831	0.277

Although there are (serious) potential problems of aggregation, as the sectors are very broad, the data above are a good starting point. The $CR4$ and $CR8$ indices measure the proportion of the sector revenue appropriated by the four and eight largest firms, respectively. The H index is the Herfindahl index[5]. As expected they are highly correlated across industries and, for instance, correlation between $CR4$ and $CR8$ is above 0.98. It is worth mentioning the extremely high dispersion of these indices: the standard deviation of $CR4$ (0.20) is higher than the median index (17.5) and the maximum is almost ten times higher than the minimum: while in the Tobacco industry the four largest firms generate almost 70% of the sector revenue, in the Food industry they generate only 7%.

We want to test if industry concentration is correlated to tariffs level. Although the degrees of freedom of regressing tariffs displayed in Table 1 on the concentration data in Table 2 are too small, it is useful as a first

[5] The index is given by $\sum_i (S_i)^2$ where S_i is the ith firm industry share measured through net revenue. All 3 indices and the variable RAK were obtained in Macedo and Portugal (1995).

approximation. A good result here could give us a hint about the type and size of the true relationship. We tested for endogeneity of $CR4$, $CR8$ and H using the Hausman test (more on this in the next session) and the result rejected this hypothesis, so we used ordinary least squares in all regressions. We regressed 1985 and 1988 tariffs ($NT85$ and $NT88$) on the concentration indeces. As already mentioned, trade liberalization started in 1988, so we wanted to test if past concentration in any way affected the new tariffs. We are implicitly assuming that monopoly power today affects legislation with a lag due maybe to the long political process of lobbying, debate in Congress and with bureaucrats, and voting. In all regressions we controlled for the sector capital requirement (RAK, defined as the product of the mean size of the efficient plant and the sector capital intensity). All variables are in logs.

Table 3: Regressions of concentration on nominal tariffs

Dependent	Independent Variables				R^2
	$CR4$	$CR8$	H	RAK	
$NT85$	0.44 (2.67)			−0.42 (−4.19)	0.57
$NT88$	0.30 (3.78)			−0.29 (6.08)	0.74
$NT85$		0.46 (2.38)		−0.40 (−3.98)	0.54
$NT88$		0.32 (3.45)		−0.28 (5.70)	0.72
$NT85$			0.22 (2.43)	−0.43 (−3.99)	0.55
$NT88$			0.15 (3.23)	−0.30 (−5.49)	0.70

The results favor the hypothesis of monopoly power affecting trade protection. For all measures of concentration and both years the estimated coefficients are positive and significant. Moreover, the magnitudes estimated are relatively high: a 100% difference in the industry concentration implies tariffs 30% to 45% higher for the $CR4$ and $CR8$ indices and 20% for the H index. It is also worth mentioning that concentration in 1985 affects tariffs in 1988 (and in 1990, not displayed in the above table), an indication that the most powerful sectors were able to obtain advantages in terms of higher

protection (or smaller reductions in tariffs) during the process of trade liberalization[6]. Note also that the R^2 is consistently higher when the dependent variable is $NT88$.

Following the endogenous trade literature, we included in the regressions a measure of import penetration. The estimated coefficient was never significant at the usual levels, in contrast with the studies for the U.S. economy. It did not affect, however, the estimated coefficients of the concentration indices and RAK.

The results for effective rate of protection are not as good as the previous one. There is not much difference when the 1988 series ($ERP88$) is the dependent variable: the estimated coefficient of the concentration index used is always significant, positive and the magnitudes are close to those in Table 3, although the R^2 is smaller (about 0.50). However, when the dependent variable is the 1985 effective rate of protection ($ERP85$), the estimated coefficient is only significant (and at 10%), when $CR4$ is used, but not when $CR8$ and H are. These results may indicate, on the one hand, that the link between monopoly power and protection is mostly obtained directly through tariffs on its products, and not indirectly through tariffs on inputs and other factors depicted by the effective rate of protection. On the other hand, it may indicate that in this case only the lag effect hypothesis makes sense. Table 4 below displays the results for $CR4$.

Table 4: Regressions of effective rate of protection on concentration

Dependent	Independent Variables		R^2
	$CR4$	RAK	
$ERP85$	0.73 (1.79)	-0.43 (-1.92)	0.28
$ERP88$	0.43 (2.83)	-0.30 (-3.61)	0.53

As already said, the small degree of freedom of the above regressions does not give us much confidence in the specification tests. However, the

[6] It is true that concentration indices are very stable, so that CR4 of 1985 should not be very different from that of 1988 or 1990. But the regressions of CR4 on TN94 or TN95 rejected the hypothesis of CR4 affecting tariffs, so that there are limits to the lag effect.

results displayed above, and particularly those using nominal tariffs, are a first indication that there is a potential link between trade protection and monopoly power. Moreover, the positive impact of concentration measures on future tariffs and effective rates of protection hints that a dynamic model may fit the data better.

4 Industry concentration and tariffs: panel data

The panel data set used in this section was constructed with data from two different sources. Average nominal tariff and average effective rate of protection data were obtained from Kume (1996) and span from 1988 to 1994. It originally included 56 sub-sectors, but eight of these were either agricultural or mining sectors and so were eliminated. Moreover, gasoline and oil imports are public monopolies and hence were also eliminated. The median nominal tariff of the 46 remaining industries went from 41% in 1988 to 13% in 1994. In 1988 the lowest tariff was that of the "Fertilizers" industry (14%) and the highest that of "Other Textile Products" sector (80%) while in 1994 they were, respectively, that of the "Artificial Textile Fibers" industry (2.26%) and that of the "Processed Milk" sector (30%). The behavior of effective rate of protection is similar: its median went from 52.65% in 1988 to 15.29% in 1994.

Data for concentration were limited to the CR4 index. Given its high correlation to CR8 and H and the close results of the cross-section estimations with the three concentration indices, this does not seem to be a problem. The data base spans from 1986 to 1995 and includes 51 sub-sectors. In this period the median (and the mean) CR4 changed little although there was some fluctuation. However, in certain sectors it doubled ("Processed Rice") or almost doubled ("Machines and Equipment") and in others ("Sugar") it declined to 67% of its 1986 value.

Apart from the difference in the number of cross-section and time series observations, the two data bases differ sometimes in the sectors included, in the aggregation level, and even in the definition of sectors. As a consequence, the number of cross-section observations were reduced to 21, which are the number of exact matches among industries in the data bases. These industries represents 46% of the total value added of the manufacturing in-

dustries. In addition to concentration, we have data on capital-output ratio (KY), on total machine and equipment purchased as proportion of revenues (MP), investment-output ratio (INV) and also a profitability measure (J)[7]. These series were constructed from "Pesquisa Industrial Anual" data (Annual Industry Survey, FIBGE) and obtained from Geraldino da Silva (1999).

Our data, therefore, consist of a panel of 21 industries for seven years (from 1988 to 1994). There are basically two main techniques for panel estimation. One is the fixed-effects method, which is essentially an OLS regression with cross-section dummies. The other is the random-effects method in which the intercept is considered a random variable and the generalized least square method is used. According to Hsiao (1986) the former is the proper procedure when estimating regressions with a specific number of sectors of firms and the inference is restricted to the behavior of this set. On the other hand, if the study is concerned with a large number of individuals or firms, so that they could be viewed as a random sample of a larger population, the latter method is recommended.

We ran the Hausmann specification test in order to decide between the two methods. When nominal tariff was the dependent variable the result favored the fixed-effects method, which we therefore used in all regressions. When effective rate of protection was used the results were ambiguous depending on the control variables included in the regression and the time period of the sample. For the sake of comparison, only the estimations that used the fixed-effect method will be presented, but some of the results with the alternate method will also be discussed.

In section 3 we argued that it is possible that monopoly power today affects not current but future legislation, due to the long political process of lobbying, debate in Congress, negotiations with government officials and voting. The evidence in favor of this hypothesis was found to be strong when using cross-section data. For these reasons we chose to present first regressions with lagged CR4. We used the following equation in all estimations:

$$T_{it} = \beta_i + \phi . Z_{it} + \varepsilon_{it}, \qquad i = 1, ..., 21, \quad t = 1988, ..., 1994$$

where T_{it} is one of the two openness indicators for sector i at time t, Z_{it} is a

[7] The variable J is defined as the cost of products and services bought by the sector divided by its net revenue. KM, in its turn, is the ratio between fixed assets and net revenue.

vector of independent variables that always contain the (lagged) concentration index and may or may not contain additional control variables, β_i is the industry-specific fixed effect, and ε is the error term. Table 5 below presents the results for NT (variables are in log except the trend) [8]:

Table 5: NT regressions (Fixed-Effect Method, lag concentration)

Model	Independent Variable			
	$CR4(-1)$	$CR4(-2)$	KY	$trend$
1	0.37			-0.23
	(3.35)			(-29.43)
2	0.26		-0.10	-0.21
	(2.95)		(-2.29)	(-27.50)
3		0.39		-0.23
		(4.29)		(-29.22)
4		0.26	-0.09	-0.20
		(3.60)	(-2.97)	(-27.52)

Note: t-statistic in parentheses; 21 cross-section observations

The results above favor the hypothesis that monopoly power (i.e., past industry concentration) impacts nominal tariffs, as the estimated coefficient of CR4 is positive and significant at 5% in all regressions. Moreover, the estimated impact is large: for a given capital-output ratio, a difference of 20% in CR4 between industries implies 5% to 7% higher tariffs. .

The inclusion of a time trend was meant to capture macroeconomic and policy changes that affected the economy as a whole in the period. As already said, starting in 1988 there was a generalized reduction in trade barriers for the manufacturing sector. In our sample, the median tariff goes from 45.8% to 10.6%. But this did not affect all sectors equally, as tariffs of some sectors were in 1994 still two or even three times above the median tariff. The presence of the time trend in the regression simply excludes the common element of this phenomenon. In fact, the estimated coefficient had the expected sign and was highly significant in all regressions. It says that

[8] We could not think of a solid theoretical argument for using instrumental methods in this set up, as we were not convinced that commercial policy today could affect industry concentration two years ago. Even if that was the case, regressions using the weighted two stage least squares method obtained results very similar to those of OLS regressions.

there was a 20% negative trend in the nominal tariff value in the period[9]. In this sense, it is maybe more exact to interpret the estimated coefficient of CR4 as the impact of industry concentration differences around the trend: on average, all sectors had their tariffs reduced by 20% a year, but the reduction was smaller in those industries were CR4 was higher.

The results are robust to the inclusion of additional variables. Different models with (various combinations of) INV, MP, J and KP were tested, and the estimated coefficient of CR4 did not change considerably and always remained significant. The negative estimated impact of the capital output ratio (models 2 and 4) follows Teter (1993). It may be indicating that KY acts as an entry barrier for both domestic and foreign competitors, and not only domestic, so that it reduces the need for protection and hence the observed levels of tariffs.

Table 6 below presents the outcome of the ERP regressions (all variables, but the trend, are in logs):

Table 6: ERP regressions (Fixed-Effect Method, lag concentration)

Model	Independent Variable			
	$CR4(-1)$	$CR4(-2)$	KY	$trend$
1	0.43 (2.96)			-0.22 (-22.82)
2	0.33 (3.11)		-0.11 (-2.48)	-0.20 (-27.50)
3		0.48 (5.12)		-0.22 (-22.85)
4		0.21 (5.09)	-0.15 (-8.10)	-0.17 (-29.77)

Note: t-statistic in parentheses; 21 cross-section observations

Results for effective rate of protection are similar to those for nominal tariff although the estimated coefficient of lagged CR4 is higher in most cases. The estimated trend remained around 0.20 and KY was found significant and negative in all models. As in the previous case, we tested for robustness

[9] In fact, 20% annual reductions of the 1988 mean tariff (45.9%) for seven consecutive years almost matched the 1994 observed average tariff. The latter is 10.5% and the former 9.5%.

including di¤erent combinations of INV, MP, J and KP in several regressions and the estimated coe¢ cient of CR4, trend and KP did not change considerably and always remained signi…cant.

The interpretation of the results in Table 6 also follows that of nominal tari¤s: there is a common trend across industries of e¤ective rate of protection reduction, about 20% per year. However, in those industries where concentration is higher the decrease in protection was smaller. A 10% difference in concentration implies 2% to 5% di¤erence in the e¤ective rate of protection. We thus obtain an indication that a given industry´s monopoly power also in‡uences the level of tari¤s on its inputs, and not only on its own tari¤. The anecdotal reference to the auto industry seems to extend with statistical signi…cance to the other industries.

We now turn to regressions with contemporary $CR4$. One important question to be addressed in this case is that of endogeneity. It can be argued that the causation goes the other way around: higher tari¤s would produce less competition and consequently higher concentration. If this were the case, then OLS estimates would be biased and inconsistent. To test this hypothesis, we run a version of the Hausman test proposed by Davidson and MacKinnon (1993) and used as instrument the variable J, which is correlated with $CR4$ but not with NT and ERP[10]. Again, the results are ambiguous. For NT the test could not reject the hypothesis of consistent OLS estimates but for ERP, depending on the time period, the test marginally rejects this hypothesis. To compare results, we will present in this case the OLS and (weighted) two stage least square results.

Table 7 below presents the results for NT.

[10] The test consists of two OLS regressions. In the …rst CR4 is regressed on all exogenous variables (here KY and a time trend) and the instrument and the residuals are retrieved. Then in the second regression, we re-estimate the NT or ERP equation including the residuals from the …rst regression as additional regressors. We then check if the coe¢ cient in the …rst stage residuals are signi…cantly di¤erent from zero. If this is the case, then OLS estimates are consistent.

Table 7: NT regressions (Fixed-Effects Method)

Method	Independent Variable		
	$CR4$	KY	$trend$
OLS	0.13		-0.22
	(0.22)		(-26.96)
OLS	0.19	-0.14	-0.20
	(2.22)	(-4.22)	(-21.13)
$2SLQ$	-0.02		-0.18
	(-0.18)		(26.94)
$2SLQ$	0.27	-0.14	-0.21
	(2.99)	(-4.40)	(-28.67)

Note: t-statistic in parentheses; J was the instrument in the two last equations. Variables are in logs.

Results are similar to those in Table 5 in the case of the second and fourth equation, when KY is also one of the dependent variables. In these cases the estimated coefficient of concentration is significant and positive, the trend found to be around 0.20 and barriers to entry (KY) also significative. Hence we could not reject the hypothesis of past concentration affecting current trade policy.

However, unlike the case of past concentration, $CR4$ loses significance once KY is removed from the model. And this is still true when we introduce other variables in the model such as INV and J. One possible interpretation is that in fact the model in which concentration affects trade policy without delay have no support by the data.

Results for effective rate of protection are similar, as shown by table 8 below:

Table 8: ERP regressions (Fixed-Effect Method)

Method	Independent Variable		
	$CR4$	KY	$trend$
OLS	0.22	-0.14	-0.19
(88-94)	(1.81)	(-3.01)	(-19.17)
OLS	0.20	-0.29	-0.17
(88-93)	(3.19)	(-6.65)	(-20.60)
OLS	0.13		-0.22
(88-94)	(0.75)		(-20.62)

Note: t-statistic in parentheses; Variables are in logs.

The estimated coefficient of $CR4$ is around (or slightly above) 0.20 and that of the trend around 0.20 too (or slightly below). However, for the full sample the coefficient of $CR4$ is only significant at 7%. We included a regression with a smaller sample to show that this result is not robust as in the 88-93 sample the coefficient was significant at the usual level. The problem here, however, is that once KY is excluded, $CR4$ estimates are not significant any longer, as in the previous case. We interpret this outcome as additional evidence against the idea of contemporary effect.

We also estimated the models above using an extended data set. In this case we included sectors where the quality of the data was not as good as in the previous data set, but we obtained 20 extra cross-section observations. Problems with the data were mostly due to imprecise definition of industries, different aggregation levels between NT and ERP on the one hand and $CR4$ on the other, and imperfect matches between sectors (e.g., the $CR4$ and NT refer to different, but close, sub-sectors of the same industry). In some cases, however, we are not even sure if there is any problem at all, we only have less confidence in the data. Moreover, tariff dispersion across sub-sectors is not very large, so that we believe the quality of these data is acceptable. Industries with more serious data problems were eliminated from the database. These 41 industries were responsible, in 1994, for 80% of the manufacturing industry value added, as opposed to 46% in the previous data set. The results are presented in Table 9 below.

Table 9: Extended data set (Fixed-Effect Method)

Dependent	Independent Variable		
	$CR4(-2)$	KY	$trend$
NT	0.42		-0.25
	(7.08)		(-45.53)
NT	0.28	-0.07	-0.23
	(5.21)	(-5.24)	(-45.30)
ERP	0.51		-0.24
	(6.81)		(-31.52)
ERP	0.41	-0.08	-0.22
	(6.42)	(-3.68)	(-29.91)

Note: t-statistic in parentheses; 41 cross-section observations

The estimated elasticity of the NT or ERP to $CR4(-2)$[11], as in the reduced data set, is always positive and significant. Moreover, the values found were in general considerably higher than in Tables 6 and 7. For instance, one could expect that a sector twice more concentrated that another would have effective protection rates 50% higher than the latter. The estimated trend, as in all previous cases, is also around minus 20% a year in the 4 regressions and barriers to trade seems to play an important role. Once again, the link between industry concentration and trade protection appears to be solid.

5 Concluding Remarks

In this paper we estimated, using different data sets and econometric techniques, the impact of monopoly power on trade policy. We did not divide the industries between organized and non-organized sectors, but we assumed that the degree of industrial concentration of a sector reflects its political strength and the influence of the sector's lobby. We assumed that monopoly power is proportional to industry concentration. We also did not estimate a structural model. Instead, we estimated reduced form equations that we think reflect the ideas behind the literature on growth, which asserts that interest groups with control over specific markets obtain some form of monopoly rights that end up decreasing productivity. Our investigation here focuses on the first part of this reasoning - i.e., whether organized groups in fact are able to obtain policy advantages that reduce competition.

The results derived in the paper show that there is strong evidence that industries with higher monopoly power are those with higher trade protection. This result is robust to changes in the database used, to estimation techniques, to changes in the dependent variable - nominal or effective tariffs - and, for the cross-section data base, to concentration index.

In many regressions we controlled for capital-output ratio, which was always significant with negative estimated effect, following Trefler (1993). Moreover, the inclusion of a time trend in the panel regression was essential to the results, as it controlled for the generalized reduction in trade barriers observed in the country after 1988. Hence, another way of interpreting the panel data results is that although all industries experienced reduction in trade protection, in those sectors with higher monopoly power the decrease in tariffs was smaller. Finally, if we believe the literature that links higher

[11] Results for CR4(-1) are similar and hence we chose not to show it.

trade protection to smaller productivity growth, the result in this paper allows one to conclude that monopoly power has an indirect, and negative, influence on growth by way of its positive impact on nominal and effective tariffs.

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