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Monopoly Power, Trade Protection and Growth: Cross Industry Evidence.*

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Abstract

This paper investigates the impact of monopoly power 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 industries with higher monopoly power are more protected than competitive sectors. 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 sectors with higher monopoly power. We thus have evidence favoring recent growth literature which stresses that interest groups with control over specific markets obtain some form of monopoly rights that end up decreasing productivity. The results here confirm the first part of this argument and show that organized groups in fact are able to obtain policy advantages that reduce competition.

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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 break up in two consecutive parts. First, groups of interest 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). This paper investigates the link between trade protection and productivity growth using a panel data set of Brazilian manufacturing industries and 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 this paper we test the first step of the argument, more exactly, the link between monopoly power and trade protection. We want to investigate if there is any evidence from Brazilian manufacturing data if 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 which is comparable to the data used in Cavalcanti Ferreira and Rossi(1999). The other group is composed of annual or bi-annual panel data sets at a slightly larger 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 Tefler(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), Tefler(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, either a sector is organized or not, but all lobbies are equal. Koujianou Goldberg and Magi(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, Tefler(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, productivity growth and industry concentration. Section 3 presents the cross-section estimations, section 4 the panel data estimations and section 5 concludes.

2 Growth, monopoly power and trade barriers in the Brazilian manufacturing sector

In a previous paper, Cavalcanti Ferreira and Rossi (1999) estimated the impact of trade protection on the evolution of labor productivity, total factor productivity (TFP) and output in the Brazilian manufacturing sector. An annual panel-data set of 16 industries for the years 1985 through 1997, a period that included a major trade liberalization, was used. The results suggested that barriers to trade negatively affected productivity growth at industry level: those sectors with lower barriers experienced higher growth. Whether trade barriers were measured by effective rate of protection or nominal tariffs,their estimated effect on total factor productivity growth was neg-

ative, robust to control variables and always significant. The same was true for regressions using labor productivity. The paper links the observed increase in industry productivity growth after 1991 to the widespread reduction in trade protection experienced in the country in the nineties. Table I below reproduces some of the results of the article:

Table 1: The impact of trade restrictions on growth

Dependent	Independent Variable			
	ERP	NT	Dk	Dn
$D(TFP)$	-0.040			
	(-6.10)			
$D(TFP)$		-0.031		
		(-6.23)		
$D(y/n)$	-0.048			
	(-7.18)			
$D(y/n)$		-0.041		
		(-7.96)		
Dy	-0.067		0.47	0.53
	(-6.98)		(6.94)	-

Note: t-statistic in parentheses, Di: growth rate of output (y), physical capital (k), labor force (n), productivity (y/n), and total factor productivity (TFP); ERP; effective rate of protection and NT; nominal tariff. Sources: see original paper

Whether the dependent variable is the growth rate of labor productivity, of total factor productivity or of output, the estimated impact of trade variables is always negative and significant. For the case of output growth, after controlling for capital and labor growth, the estimated impact of nominal tariffs and effective rates of protection ranges from -0.07 to -0.06 and is highly significant.

In a related article, Lee(1996) used Korean industry data to estimate the impact of public policies - credit and trade policies among them - on the growth of value-added, total factor productivity and capital stock growth and found that the impact of trade policy (nominal tariff and non-tariff barriers in this case) is negative and significant. On the other hand, Tybout, de Melo and Corbo(1991) found no evidence of overall productivity improvement in the Chilean manufacturing sector after trade liberalization. However, those

industries in which the reduction in protection was more drastic experienced faster productivity growth.

In the case of Brazil, before the trade liberalization started in 1988, dispersion of nominal and effective tariffs was extremely high. Table 2 presents the average nominal tariff for 16 Brazilian industries 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 2:Average Nominal Tariffs

Industry	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 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 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 output of the manufacturing sector value added - 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 the textile industry 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:

[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 in 1988, but only half the mean in 1992.

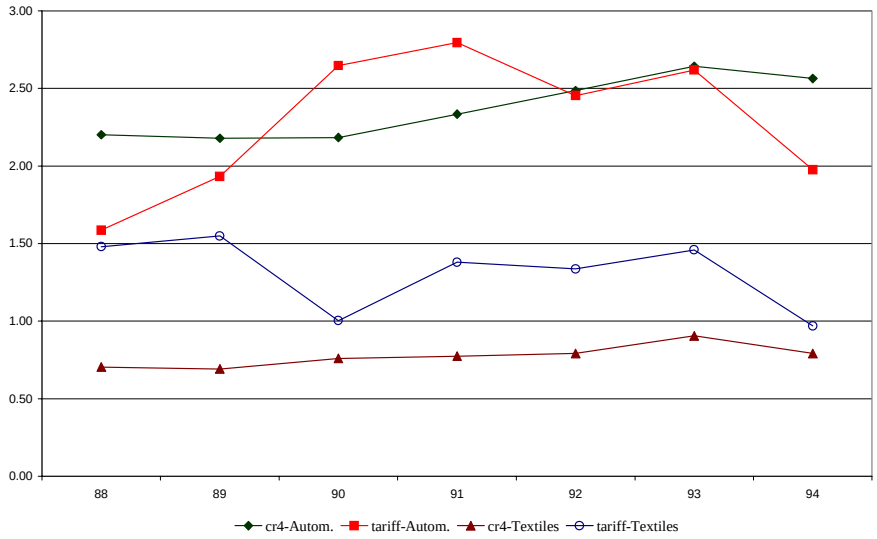

Figure 1: Tariffs and concentration as a proportion of the median (textiles and motor vehicles)

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 textile 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

[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%.

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

Table 3: Concentration Indices

Industry	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 too 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 Herfindal 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 can partly explain tariff levels. Although the degrees of freedom of regressing the data in Table 3 on the tariffs displayed in Table 2 are too small, we did it anyway as a first 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 the concentration index on 1985 and 1988 tariffs ($NT85$ and $NT88$). 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.

[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)

Table 4: 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

[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 for the lag effect.

is always significant, positive and the magnitudes are close to those in Table 4, 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 5 below displays the results for $CR4$.

Table 5: Regressions of effecive rate of protection on concentration

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

As already said, the small degree of freedom of the above regressions does not give us much confidence in the specification tests. However, the 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 not seems 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 almost did not change although it fluctuated a little. 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 44% of the total value added of the manufacturing industries. In addition to concentration, we have data on capital-output ratio (KY) and also a profitability measure (J)[7]. These three series were constructed from "Pesquisa Industrial Anual" data (Annual Industry Survey, FIBGE) and obtained in 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

[7]The variable J is defined as the cost of products and services bought by the sector divided by its revenue.

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.

One important question to be addressed is that of endogeneity. It can be argued that the causation goes the other way around: higher tariffs 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 an instrument the variable J, which is correlated with CR4 but not with NT and ERP[8]. 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 6 below presents the results for NT.

[8] The test consists of two OLS regressions. In the first 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 first regression as additional regressors. We then check if the coefficient in the first stage residuals are significantly different from zero. If this is the case, then OLS estimates are consistent.

Table 6: NT regressions (Fixed-Effects Method)

Method	Independent Variable		
	$CR4$	KY	$trend$
OLS	0.19	−0.14	−0.20
	(2.22)	(−4.22)	(−21.13)
$WTSLQ$	0.27	−0.14	−0.21
	(2.99)	(−4.40)	(−28.67)

Note: t-statistic in parentheses; J was the instrument in the second equation. Variables are in logs.

The results above favor the hypothesis that monopoly power impacts nominal tariffs, as the estimated coefficient of CR4 is positive and significant at 5%. Moreover, the estimated impact is large: for a given capital-output ratio, a difference of 20% in CR4 between industries implies 4% higher tariffs. The results are robust to the method, as seen in the second estimation, sample of an additional variable. In the last case, the inclusion of J in the first model did not change the results.

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 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 negative estimated impact of capital output ratio follows Tefler(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.

[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%.

Table 7 below presents the outcome of the ERP regressions:

Table 7: 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)
$W2SLS$	0.26	-0.27	-0.17
(88-94)	(3.41)	(-8.05)	(-24.14)

Note: t-statistic in parentheses; J was the instrument in the third equation. Variables are in logs.

Results for effective rate of protection are similar to those for nominal tariff. 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 interpretation of the results in Table 7 also follows that of nominal tariffs: there is a common trend across industries of effective rate of protection reduction, about 18% per year. However, in those industries where concentration is higher the decrease in protection was smaller. A 10% difference in concentration implied a 2% difference in the effective rate of protection. We thus obtain an indication that a given industry´s monopoly power also influences the level of tariffs on its inputs, and not only on its own tariff. The anecdotal reference to the auto industry seems to extend with statistical significance to the other industries.

We ran some additional regressions to test the robustness of the link between CR4 and trade protection measures. In the previous data base, the 1991 observations of the CR4 and KY series were obtained through linear interpolation between the 1990 and 1992 observations. There was no industrial survey in 1991, hence the gap in these series. This is not exactly a problem because both series do not fluctuate very much in the short run. However, we constructed a bi-annual data base using only the original observations of the 1988, 1990, 1992 and 1994 years to replicate the exercises of Tables 6 and 7.

The results did not change significantly in the case of the nominal tariff regressions, although the estimated coefficient of CR4 was a little higher in most regressions - around 0.28. The estimated (corrected) annual trend was, in most cases, close to 23%. For regressions of effective protection rate, the results are slightly different, as one can see from the regression below[10]:

$$\underset{}{ERP} = \underset{(2.30)}{0.35\,CR4} + \underset{(3.36)}{0.06\,KY} - \underset{(-96.27)}{0.24\;trend}$$

The estimated coefficient of the trend is almost the same. However, that of CR4 jumped from 0.22 in the annual panel to 0.35 in the bi-annual panel data set and the coefficient of KY changed sign. The instability of the estimated effect of concentration is not a serious problem, as it remained significant and with the expected sign. If anything, the interpolation hurt the case of monopoly power´s affecting trade policy, as it may have biased the CR4 coefficient downward. Moreover, in the regressions without KY the results for CR4 and the trend did not change much - in the ERP and NT regressions - as opposed to the results with annual data, where the estimated coefficient of the concentration measure fell in some cases and was found non-significant in others.

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. These 41 industries were responsible, in 1994, for 80% of the manufacturing industry value added, as opposed to 46% in the previous data set[11]. The results are presented in Table 8 below:

[10] The regression was estimated by the fixed-effect method and variables are in logs.

[11] 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 that large, so that the quality of these data is acceptable in our understanding. Industries with more serious data problems were eliminated from the database.

Table 8: Extended data set (Fixed-Effect Method)

Dependent	Independent Variable			Method
	$CR4$	KY	$trend$	
NT	0.19	-0.13	-0.22	OLS
	(2.73)	(-6.55)	(-51.63)	
ERP	0.21	-0.09	-0.19	OLS
	(2.64)	(-4.04)	(-35.62)	
NT	0.27	-0.15	-0.22	$W2SLS$
	(4.13)	(-7.80)	(-56.45)	
ERP	0.21	-0.25	-0.17	$W2SLS$
	(3.91)	(-11.03)	(-38.87)	

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

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The estimated elasticity of the NT or ERP to CR4, as in the reduced data set, is always between 20% and 30%. As a matter of fact, the results here are almost identical to those of Table 6 and 7. Moreover, the estimated coefficients are all significant at the 5% level for any time period, and this was not the case for ERP in Table 7. The estimated trend, as in all previous cases, is also around minus 20% a year in the 4 regressions. 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 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 stress that interest groups with control over specific markets obtain some form of monopoly rights that end up decreasing productivity. We basically investigated here 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 protec-

tion. 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 almost all regressions we controlled for capital-output ratio, which was always significant with negative estimated effect, following Tefler(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 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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